BUCHAN AND HANNAY DECOMMISSIONING PROJECT ENVIRONMENTAL APPRAISAL

March 2020

Repsol Sinopec Resources UK Limited

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SUMMARY INFORMATION SHEET

Project Name	Buchan and Hannay Fields Decommissioning Environmental Appraisal
Block No	Block Numbers 20/5 and 21/1
Type of Project	Decommissioning
Undertaker	Repsol Sinopec Resources UK Limited., 163 Holburn Street, Aberdeen AB10 6BZ.
Licensees/Owners	The Buchan and Hannay fields were previously owned by Repsol Sinopec Resources UK Limited.
Short Description	This document considers the environmental and socio-economic impact of the activities associated with the decommissioning of the Buchan and Hannay fields in the Central North Sea. The fields comprise a total of 14 wells that were tied back to the Buchan Alpha Floating Production Unit (FPU). From the FPU the hydrocarbons were transported to the Forties Charlie platform. Both fields are now in the decommissioning phase, with Cessation of Production being formally approved by the Oil and Gas Authority (OGA) in March 2017. Under an Exchange of Correspondence (EoC), the FPU was taken off station in August 2017. Removal of the risers and associated structures (e.g. mid water arch and turning gabions) was approved under a second EoC, such that the impacts associated with the decommissioning of the FPU, risers and associated structures are not captured in this Environmental Appraisal. It should be noted that the offshore activities captured under both EoCs have been completed. Infrastructure at the Buchan and Hannay fields comprised a number of surface laid and trenched and buried pipelines and umbilicals, subsea structures and stabilisation features. In line with the results of a Comparative Assessment all surface laid pipelines and umbilicals will be recovered whilst the trenched and buried pipelines and umbilical will be decommissioned *in situ* and the exposed ends will be remediated. All subsea structures, mattresses and grout bags will be recovered. Existing rockdump will be decommissioned *in situ*. The impact assessment presented in this Environmental Appraisal determined that there are no significant environmental or socio-economic impacts associated with the proposed decommissioning activities.
Company Document Reference No.	RP-DTABUC001-HS-0093
EA Prepared by	Repsol Sinopec Resources UK Limited and Genesis Oil and Gas Consultants Ltd.

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EXECUTIVE SUMMARY

The Buchan and Hannay fields lie in the Central North Sea (CNS) *c.* 154 km from Aberdeen and *c.* 103 km from the Norwegian/UK median line. As operator, Repsol Sinopec Resources UK Limited has prepared this Environmental Appraisal (EA) under the Petroleum Act 1998, in support of four draft Decommissioning Programmes (DPs) that are being submitted to the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) to seek approval for the following decommissioning works:

- DP 1 covers the Buchan subsea installations;
- DP 2 covers the Buchan pipelines;
- DP 3 covers the Hannay subsea installations; and
- DP 4 covers the Hannay pipelines.

Given that the fields are in the same geographical area, the four draft DPs have been captured in a single DP submission and are supported by a single Comparative Assessment (CA) Report and a single EA Report.

Background Information

The Buchan field was discovered in 1974 and spans Blocks 20/5 and 21/1. First oil was achieved in May 1981. In total, 12 wells were drilled in the Buchan field: seven production wells; two appraisal wells: one exploration well and two water injection wells. The Buchan appraisal wells and exploration well are currently suspended. The remaining nine wells are shut-in and the flow lines have been disconnected. Four of the seven production wells are drilled at a template; referred to as the Buchan template, and one production well is drilled next to it. The remaining two production wells and the two water injection wells are located *c.* 2 km to the west and southwest of the Buchan template and are tied back to the template.

The Hannay field, located in Block 20/5 was discovered in 1996 and commenced production in 2002. The field is located *c.* 13.5 km northwest of the Buchan template, and comprises two production wells which are currently shut-in and disconnected from the flowlines.

The two fields were produced via the Buchan Alpha Floating Production Unit (FPU). Hydrocarbons were exported from the Buchan Alpha FPU to the Forties Charlie platform via a *c.* 56.3 km export line.

Both fields are now in the decommissioning phase, with Cessation of Production (CoP) being formally approved by the Oil and Gas Authority (OGA) in March 2017.

Under an Exchange of Correspondence (EoC), approved 10th May 2016, the FPU was taken off station in August 2017.

In addition, a second EoC was approved by OPRED on 13th October 2016 for the recovery of:

- 19 risers and associated hold back frame and turning gabions;
- A mid-water arch and its associated tethers and hold down anchors;
- A riser base structure associated with the Hannay umbilical riser; and
- Mattresses and grout bags associated with the above.

The environmental and socio-economic impacts of the activities captured under the two EoCs are not captured in this EA[1]. It should be noted that the offshore activities captured under both EoCs have been completed. Figure 1 distinguishes the infrastructure associated with the two EoCs and the DP scopes.

[1] Note the impacts associated with the activities carried out under the two EOCs have previously been assessed under the relevant permit applications.

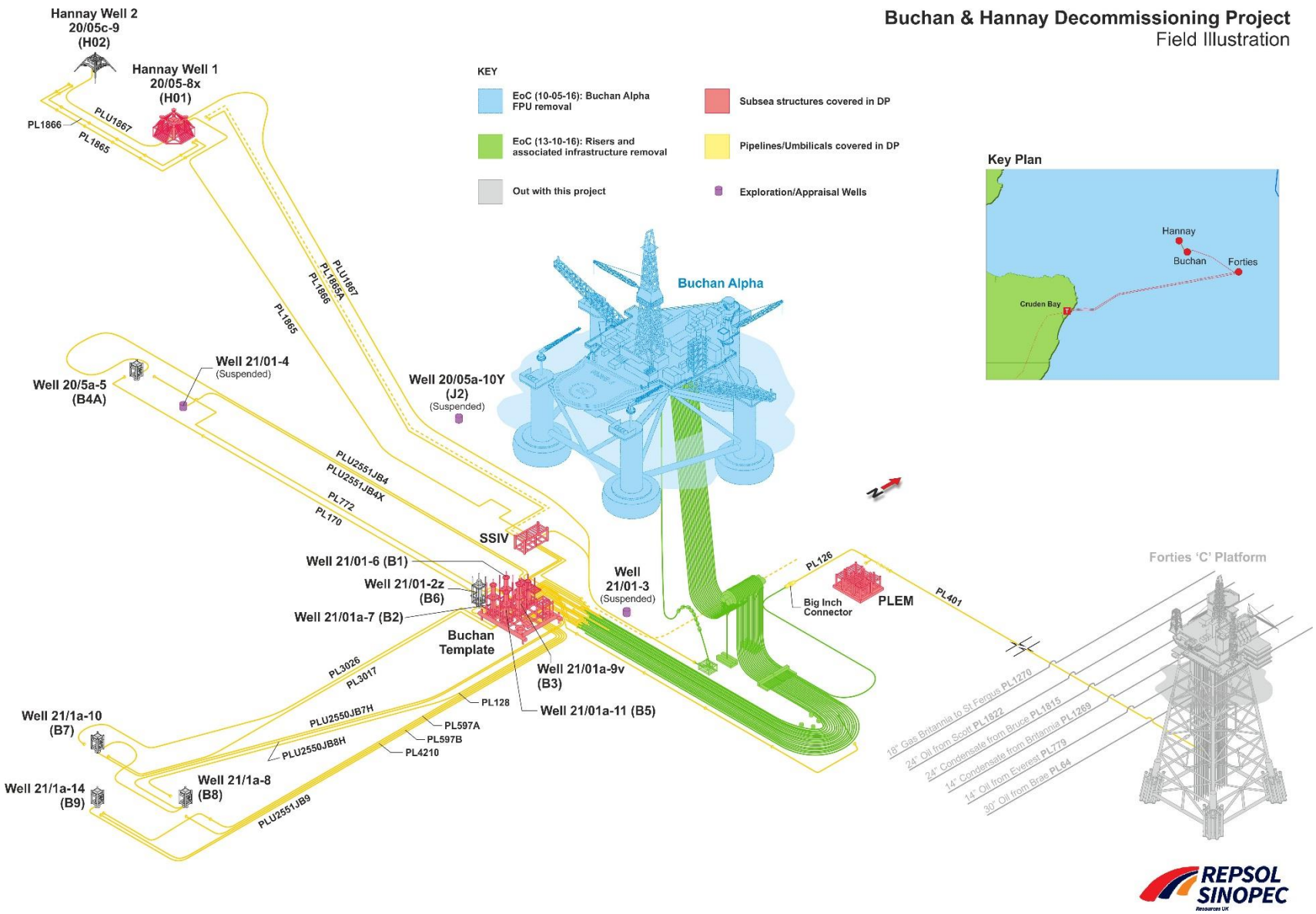


Figure 1: Representative schematic of the Buchan and Hannay fields.

The remaining infrastructure to be captured in the draft DPs include:

- The Buchan template;
- A Subsea Isolation Valve (SSIV);
- A Pipeline End Manifold (PLEM);
- An integrated manifold/Wellhead Protection Structure (WHPS) associated with one of the Hannay wells;
- A number of pipelines and umbilicals (some trenched and buried and some surface laid)
- Surface laid jumpers; and
- Protection structures including rockdump, mattresses and grout bags.

Stakeholder Engagement

In August 2019, as part of the informal stakeholder engagement process Repsol Sinopec Resources UK Limited issued a Scoping Report (Repsol Sinopec Resources UK Limited, 2019c) to a number of stakeholders. The Scoping Report provided an overview of the Buchan and Hannay Fields, the proposed decommissioning activities and an overview of the impacts to be assessed in this EA. Stakeholders were invited to comment on the Scoping Report with respect to any concerns they may have and comments received have been addressed in this report.

In addition to issuing the Scoping Report, Repsol Sinopec Resources UK held a Stakeholder Engagement Workshop (7th November 2019). Comments received on the Scoping Report and issues raised during the workshop have been addressed in this report.

Decommissioning Activities

A CA was carried out to determine the best method of decommissioning the pipelines and umbilicals associated with the Buchan and Hannay fields. In line with the results of the CA the surface laid pipelines and umbilicals will be recovered to shore whilst the trenched and buried pipelines and umbilical will be decommissioned *in situ*. The exposed ends of the buried pipelines and umbilical will be remediated to prevent potential snagging by fishing gear. With regards to the exposed end sections (total length of exposed sections is *c.* 1.446 km) preference will be given to trench and bury or cut and recover. However, if following the Contracts & Procurement (C&P) process, the option to rockdump is selected, *c.* 11,857 te of rock will be required to remediate these pipeline and umbilical ends. Repsol Sinopec Resources UK Limited will consult with OPRED and seek relevant approvals prior to any rock being laid.

All surface laid structures (i.e. the template, SSIV, PLEM and manifold/WHPS), mattresses and grout bags will be recovered to shore whilst existing rockdump will be decommissioned *in situ*.

Following recovery and remediation activities, Repsol Sinopec Resources UK Limited will get independent verification of a clear seabed. Preference will be given to methods not resulting in seabed disturbance e.g. side scan sonar surveys, however if deemed necessary over trawl trials will be commissioned.

Environmental and Socio-Economic Baseline

Water depths vary across the Buchan and Hannay fields from 107 m to 125 m and reach 139 m at the Forties Charlie end of the export pipeline.

Repsol Sinopec Resources UK Limited commissioned a pre-decommissioning environmental survey at the Buchan and Hannay fields in 2018. The sediments across the area covered by the pre-decommissioning survey were considered to be relatively homogenous and comprised three main habitats: sublittoral mud (EUNIS A5.3), deep circalittoral mixed sediment (EUNIS A5.45) and circalittoral fine sands (EUNIS A5.25).

At some locations megafauna burrowing communities were present at a density considered to be representative of the UK Habitat Feature of Conservation Importance of 'mud habitats in deep water'. However, the survey report concluded that it was likely that the burrowing densities were over estimated due to inclusion of non-megafaunal species (polychaetes) and by counting multiple burrow openings made by the same individuals. Applying a precautionary approach, this EA considers these areas of high density burrows as a protected habitat.

Pockmarks or depressions were observed at one of the stations along the export pipeline route to Forties Charlie, however there was no evidence of Methane Derived Authigenic Carbonates (MDAC) such that the pockmarks were not considered to represent the Annex I habitat 'Submarine structures made by leaking gases'.

Hydrocarbon contaminated drill cuttings occur at a number of the well locations. The largest volume of cuttings was observed at the Buchan template, covering an area of 3,731 m^2 with a volume of 828 m^3 and a maximum height of 1.3 m. The pile height decreased rapidly to less than 50 cm above natural seabed at 15 m south of the template, while to the north of the template the cuttings pile height did not exceed 20 cm height above the seabed. Total hydrocarbon content in the pile is estimated to be less than one tonne.

Plankton, benthic and fish species in the area are typical of the CNS. Of the fish species known to occur in the area, anglerfish, herring, mackerel, ling, blue whiting, cod, horse mackerel, saithe, sandeels and whiting have been assessed by Scottish Natural Heritage (SNH) and the Joint Nature Conservation Committee (JNCC) as Priority Marine Features.

Minke whale, harbour porpoise, Atlantic white-sided dolphin and white-beaked dolphin are among the cetacean species recorded in the area. All cetaceans in UK waters are considered to be European Protected Species such that under the Habitats Regulations, it is an offence to deliberately disturb, capture, injure or kill any of these species. Harbour porpoise is also protected under annex II of the Habitats Directive.

A number of seabird species are known to occur in the area including (but not limited to) black-legged kittiwake, northern fulmar, Atlantic puffin and northern gannet.

Fishing gear types associated with the area include both demersal and pelagic gear. Available fishing effort and landings data suggests the area is relatively important to the UK fishing industry.

Shipping activity in the area of the Buchan and Hannay fields is considered very low to low but increases to moderate at the Forties Charlie end of the export pipeline. There are no offshore windfarm developments or military exercise areas within the vicinity of the two fields.

Impact Assessment

In order to determine the significance of the impact of the proposed decommissioning activities an ENVironmental Issues IDentification (ENVID) Workshop was undertaken. Receptors considered in the workshop included: air quality, water quality, sediment quality, plankton, benthic species, fish, marine mammals, seabirds, fisheries, shipping, landfill resources and resource use. The impacts associated with emissions to air, discharges to sea, seabed disturbance, underwater noise, waste production, the physical presence of the vessels during operations and the legacy impacts of the items (buried pipelines and umbilical and surface laid rockdump) to be decommissioned *in situ* were considered on each of the receptors.

Applying industry standard mitigation measures (see Table 1), the impact significance of each of the planned activities was considered to be Low. Following scoping of the ENVID results, a further assessment was carried out on

1) the impacts of the potential seabed disturbance associated with the proposed activities, and

2) the legacy impacts associated with decommissioning the buried pipelines and umbilical, and the surface laid rockdump *in situ*.

In both cases the results of this further assessment aligned with the initial results of the ENVID Workshop and concluded that, with the application of industry standard mitigation measures, the impact significance is Low with respect to seabed disturbance and legacy impacts (both environmental and socio-economic).

Environmental Management

The Buchan and Hannay Decommissioning Project will be aligned to Repsol Sinopec Resources UK Limited's goal to 'minimise the impact to the environment'.

Atmospheric emissions will be managed by inspection of the vessels contracted to carry out the work and by planning vessel schedules to ensure efficient operations.

The inventory of decommissioned items will distinguish equipment that can be reused, materials that can be recycled and waste for appropriate disposal. Naturally Occurring Radioactive Material (NORM) is not expected to

be present, but if it is detected, the contaminated waste will be sent for appropriate treatment. Waste management activities will be conducted in full compliance with all relevant legislation and regulatory controls. Disposal to landfill will be the waste management option of last resort.

Following the decommissioning activities, independent verification of the seabed state will be obtained, and evidence of clearance will be provided to all relevant governmental and non-governmental organisations. A post-decommissioning environmental survey will be carried out following decommissioning activities to establish the condition in which the seabed is left. An ongoing monitoring survey strategy will be agreed with OPRED, the aim of which will be to verify recovery of the seabed and that the pipelines and umbilical decommissioned *in situ* remain buried and do not present a risk of snagging to other users of the sea.

Stringent control measures and operational procedures will be implemented to prevent accidental events involving the release of hydrocarbons or chemicals.

Table 1 lists procedural and technical controls and mitigation measures identified in the ENVID workshop and during the preparation of this EA to reduce impacts to a level that is 'as low as reasonably practicable'.

Table 1: Decommissioning of Buchan and Hannay: project specific commitments.

Aspect	Commitment
Physical presence	• Ongoing consultation with Scottish Fishermen's Federation (SFF). • Notice to mariners will be circulated. • Vessel use will be optimised. • A Collision Risk Management Plan will be produced if required. • All vessels engaged in the project operations will have markings and lightings as per the International Regulations for the Prevention of Collisions at Sea (COLREGS) (International Maritime Organisation, 1972). • A clean seabed will be achieved as part of the decommissioning activities. • If used, rock cover will be optimised and carefully managed. A fall pipe will be used to ensure accuracy of the rock dumping. Size of rock cover will be in accordance with industry practice which is also the preferred SFF / industry best practices. • Location of remaining material will be mark on Fishsafe.
Atmospheric emissions and energy use	• As part of the tendering process, proposed vessels will go through a detailed assurance process which will include a review of generator and engine maintenance which leads to better efficiency in line with manufacturer's specifications. • Decommissioning vessel schedules will be planned to minimise vessel use. • Prior to the contract award, Repsol Sinopec Resources UK Limited will audit the decommissioning yards to ensure suitable permits are in place and that atmospheric emissions are being managed. • Activities will be carried out in line with Repsol Sinopec Resources UK Limited's environmental policy which includes minimising emissions.
Discharges to sea	• Repsol Sinopec Resources UK Limited will carry out a detailed assurance process on all vessels prior to contract award. • Work procedures will be in place to minimise offshore campaigns. • Only MARPOL compliant vessels will be used. • Flushing and cleaning of pipelines and umbilicals has been completed in line with Best Available Technique (BAT)/Best Environmental Practice (BEP) requirements. • All contracted vessels will be signed up to the International Maritime Organisation (IMO) and will adhere to their guidelines. • Any associated discharges will be managed to minimise impact.

Aspect	Commitment
Physical disturbance of the seabed and marine species	• Cutting/jetting/dredging and lifting procedures will be in place. • With respect to remediation on the exposed ends of the buried pipelines and umbilical, trench and bury or cut and recover will be prioritised over rockdump. • If rockdump is used, volumes will be minimised, and a fallpipe will be used to lay it on the seabed. • With respect to determining a clear seabed status after decommissioning activities are completed, the use of surveys for example side scan sonar surveys will be prioritised over the use of over trawl trials.
Onshore activities	• Contract award will be to an established yard with appropriate experience, capability, licences, consents and community engagement in place.
Waste generation and resource use	• The Buchan and Hannay Decommissioning Project will have in place a Waste Management Plan (WMP) developed to describe and quantify waste arising from decommissioning activities and identify available disposal options for those wastes. • Waste management options will take account of the waste hierarchy. • As part of Repsol Sinopec Resources UK Limited's Duty of Care, contract award will be to an established yard with appropriate experience, capability, licences and consents in place.
Accidental events	• Any infrastructure decommissioned *in situ* will be marked on FishSafe and communicated accordingly. • Work procedures in place. • Vessel assurance inspections. • Pre-hire vessel audits. • Emergency response plans in place including the Buchan OPEP (oil pollution emergency plan) and SOPEPs (shipboard oil pollution emergency plan).

Conclusion

This EA has assessed the environmental and socio-economic impacts associated with the proposed Buchan and Hannay decommissioning activities in the context of the environment within which the fields are situated. With implementation of the proposed mitigation measures, the environmental impact of the decommissioning activities is likely to be minimal and the proposed decommissioning activities will leave the area in a condition suitable for re-colonisation by local species and safe for fishermen.

In addition, the EA has considered the objectives and marine planning policies of the Scottish National Marine Plan across the range of policy topics including biodiversity, natural heritage, cumulative impacts and oil and gas. Repsol Sinopec Resources UK Limited considers that the proposed decommissioning activities are in broad alignment with such objectives and policies.

ACRONYMS

%	Percent
“	Inches
<	Less than
>	More than
µM	Micro meter
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
BAT	Best Available Technique
BEIS	(Department of) Business, Energy and Industrial Strategy
BEP	Best Environmental Practice
c.	Circa
CA	Comparative Assessment
cm	Centimetre
CMID	Common Marine Inspection Documents
CNS	Central North Sea
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COLREGS	International Regulations for the Prevention of Collisions at Sea
C&P	Contracts and Procurement
CoP	Cessation of Production
CRA	Collision Risk Assessment
DP	Decommissioning Programme
DREAM	Dose-related Risk and Effect Assessment Model
DSV	Dive Support Vessel
E	East
EA	Environmental Appraisal
EBS	Environmental Baseline Survey
EC	European Commission
EEC	European Economic Community
EEMS	Environmental Emissions and Monitoring System
EIA	Environmental Impact Assessment
EIF	Environmental Impact Factor
EMT	Environmental Management Team
ENVID	ENVironmental issues IDentification
EoC	Exchange of Correspondence
EPS	European Protected Species
ESAS	European Seabirds at Sea
ESIA	Environmental and Socio-Economic Impact Assessment
ESRA	Environmental and Socio-Economic Risk Assessment
EU	European Union
EUNIS	European Nature Information System
FPU	Floating Production Unit
GEN	National Marine Plan General Policies
H	Height
HLV	Heavy Lift Vessel
HPVC	Hard Polyvinyl Chloride
HSE	Health, Safety and Environmental
IAMMWG	Inter-Agency Marine Mammal Working Group
ICES	International Council for the Exploration of the Sea
IMO	International Maritime Organisation
IoP	Institute of Petroleum
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
JIP	Joint Industry Project
JNCC	Joint Nature Conservation Committee
kg	kilogram
km	kilometres
km^2	Kilometres squared
KP	Kilometer Point
kW/m	Kilowatts per meter
L	Length
LTOBM	Low Toxicity Oil Based Mud
m	Meter

m^3	Meters cubed
m^2	Meters squared
MAS	Marine Assurance Standards
MARPOL	The International Convention for the Prevention of Pollution from Ships
MCZ	Marine Conservation Zone
MDAC	Methane Derived Authigenic Carbonates
MEMW	Marine Environmental Modelling Workbench
mg/kg	milligrams per kilogram
MPA	Marine Protected Area
m/s	Meters per second
MSS	Marine Scotland Science
MU	Management Units
MWA	Mid-Water Arch
N	North
N/A	Not Applicable
NCMPA	Nature Conservation Marine Protected Area
ng.g-1	Nanograms per gram
nm	Nautical miles
nm	Nanometres
NMP	National Marine Plan
NMPi	National Marine Plan Interactive
NMSF	National Marine Fisheries Services
NNS	Northern North Sea
NOAA	National Oceanic and Atmospheric Administration
NORM	Naturally Occurring Radioactive Materials
NOx	Nitrogen oxides
NTF	Not Technically Feasible
OBM	Oil Based Mud
OGA	Oil and Gas Authority
OGUK	Oil and Gas UK
OLF	Norwegian Oil Industry Association
OPEP	Oil Pollution Emergency Plan
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OSPAR	Oslo Paris Convention
P&A	Plug and Abandonment
PAH	Polycyclic Aromatic Hydrocarbons
P/C/B	Physical, Chemical and Biological
PEC	Predicted Environmental Concentration
PL	Pipeline
PLEM	Pipeline End Manifold
PMF	Priority Marine Feature
PNEC	Predicted No Effect Concentration
ppb	Parts per Billion
PPC	Prevention and control permits
ppm	Parts per million
PWA	Pipeline Works Authorisation
RAG	Red-Amber-Green
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RSRUK	Repsol Sinopec Resources UK
ROV	Remotely Operated Vehicle
ROVSV	Remotely Operating Vehicle Support Vessel
S	South
SAC	Special Area of Conservation
SCANS	Small Cetacean Abundance in the North Sea
SACFOR (scale)	Super abundant, abundant, common, frequent, occasional, rare and present
SD	Standard Deviation
SDM	Species Distribution Modelling
SDU	Subsea distribution Unit
SEEMP	Ship Energy Efficiency Management Plan
SEMS	Safety and Environmental Management System
SEPA	Scottish Environment Protection Agency
SFF	Scottish Fishermen's Federation
SI	Scale Inhibitor
SIMOPS	Simultaneous Operations

SINTEF	Stiftelsen for Industriell og Teknisk Forskning
SMRU	Sea Mammal Research Unit
SNH	Scottish Natural Heritage
SNS	Southern North Sea
SO	Screened Out
SO_X	Sulphur Oxides
SOPEP	Ship Oil Pollution Emergency Plan
SOSI	Seabird Oil Sensitivity Index
SPA	Special Protection Area
Spp.	Species
SSIV	Subsea Isolation Valve
SSS	Side Scan Sonar
Te / te	Tonnes
THC	Total Hydrocarbon Content
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UKCS	United Kingdom Continental Shelf
UKOOA	UK Offshore Operators Association
US	United States
UV	Ultra-violet
W	Width
W	West
WBM	Water Based Mud
WGS84	World Geodetic System
WHPS	Wellhead Protection Structure
WMP	Waste Management Plan
yr	year

1. INTRODUCTION

The Buchan and Hannay fields are located in Blocks 20/5 and 21/1 in the Central North Sea (CNS), *c.* 154 km from Aberdeen and *c.* 103 km from the Norwegian/UK median line (Figure 1-1). The fields are wholly owned and operated by Repsol Sinopec Resources UK Limited. Repsol Sinopec Resources UK Limited has prepared this Environmental Appraisal (EA) under the Petroleum Act 1998, in support of four draft Decommissioning Programmes (DPs) that are being submitted to the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) to seek approval for the following decommissioning works:

- DP 1 covers the Buchan subsea installations;
- DP 2 covers the Buchan pipelines;
- DP 3 covers the Hannay subsea installations; and
- DP 4 covers the Hannay pipelines.

Given that the fields are in the same geographical area, the four draft DPs have been captured in a single DP submission (Repsol Sinopec Resources UK Limited, 2019a) and are supported by a single Comparative Assessment (CA) Report (Repsol Sinopec Resources UK Limited, 2019b) and a single EA Report.

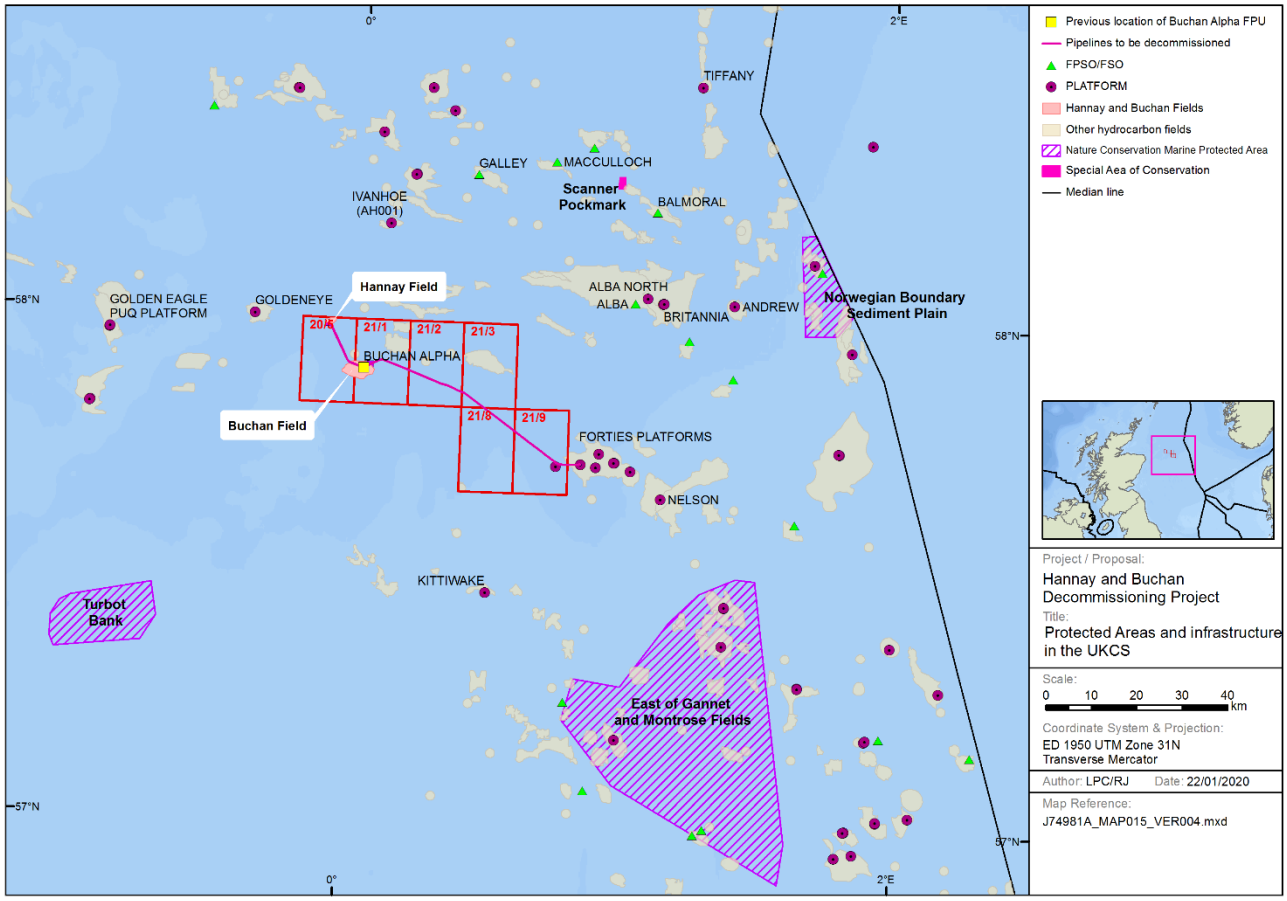


Figure 1-1: Location of the Buchan and Hannay fields.

1.1 Overview of the Buchan and Hannay Fields

The Buchan field was discovered in 1974 and spans Blocks 20/5 and 21/1. First oil was achieved in May 1981. In total, 12 wells were drilled in the Buchan field: seven production wells; two appraisal wells: one exploration well and two water injection wells.

The Buchan appraisal wells and exploration well are currently suspended. The remaining nine wells are shut-in and the flowlines have been disconnected.

The Hannay field, located in Block 20/5 was discovered in 1996 and commenced production in 2002. The field is located *c.* 13.5 km northwest of the Buchan template, and comprises two production wells which are currently shut-in and disconnected from the flowlines.

The fields were produced via the Buchan Alpha Floating Production Unit (FPU). From the FPU, the hydrocarbons were transported to the Forties Charlie platform via a *c.* 56.3 km export line. Under an Exchange of Correspondence (EoC), approved on 10th May 2016, the FPU was taken off station in August 2017 such that the decommissioning of the Buchan Alpha is not captured in this EA.

Prior to sail away, the risers which connected the fields to the Buchan Alpha and the export riser were disconnected from the FPU and left *in situ* in the water column. Removal of the risers, mid-water arch and associated equipment has been approved via a second EoC (approved on 13th October 2016) and therefore these structures are not captured in this EA. It should be noted that the offshore activities captured under both EoCs have been completed.

Figure 1-2 distinguishes the infrastructure associated with the two EoCs and the DP scopes. Infrastructure captured in the draft DPs include:

- A drilling template (referred to as the Buchan template);
- A Subsea Isolation Valve (SSIV);
- A Pipeline End Manifold (PLEM);
- An integrated manifold/Wellhead Protection Structure (manifold/WHPS) associated with the Hannay H01 well;
- A number of pipelines, umbilicals and surface laid jumpers; and
- Protection structures including rockdump, mattresses and grout bags.

1.2 Purpose of the Document

The purpose of the EA is to assess and describe, in a proportionate manner the potential environmental and socio-economic impacts associated with the proposed decommissioning activities, and to identify mitigation measures to reduce the level of these impacts to 'as low as reasonably practicable' (ALARP)

1.3 Regulatory Context

The UK's international obligations on decommissioning are governed principally by the 1992 Convention for the Protection of the Marine Environment of the North East Atlantic (OSPAR Convention). OSPAR Decision 98/3 requires that all installations should be completely removed and recovered to shore for re-use, recycling or final disposal unless a derogation is granted. Pipelines and cables are not included within the Decision, however OPRED's decommissioning guidance notes (BEIS, 2018) requires that operators aim to achieve a clear seabed and robustly assess decommissioning options, based on evidence and data, using the CA process.

The decommissioning of offshore oil and gas infrastructure (including pipelines) in the United Kingdom Continental Shelf (UKCS) is principally governed by the Petroleum Act 1998 (as amended by the Energy Act 2008). This Act sets out the requirements for a formal DP, which must be approved by OPRED before the owners of an offshore installation or pipeline may proceed with decommissioning.

There is no statutory requirement to undertake an Environmental Impact Assessment (EIA), but OPRED's decommissioning guidance notes (BEIS, 2018) advise that any DP is supported by an assessment of the environmental impacts of undertaking the decommissioning activities described. This EA has been prepared to meet this requirement.

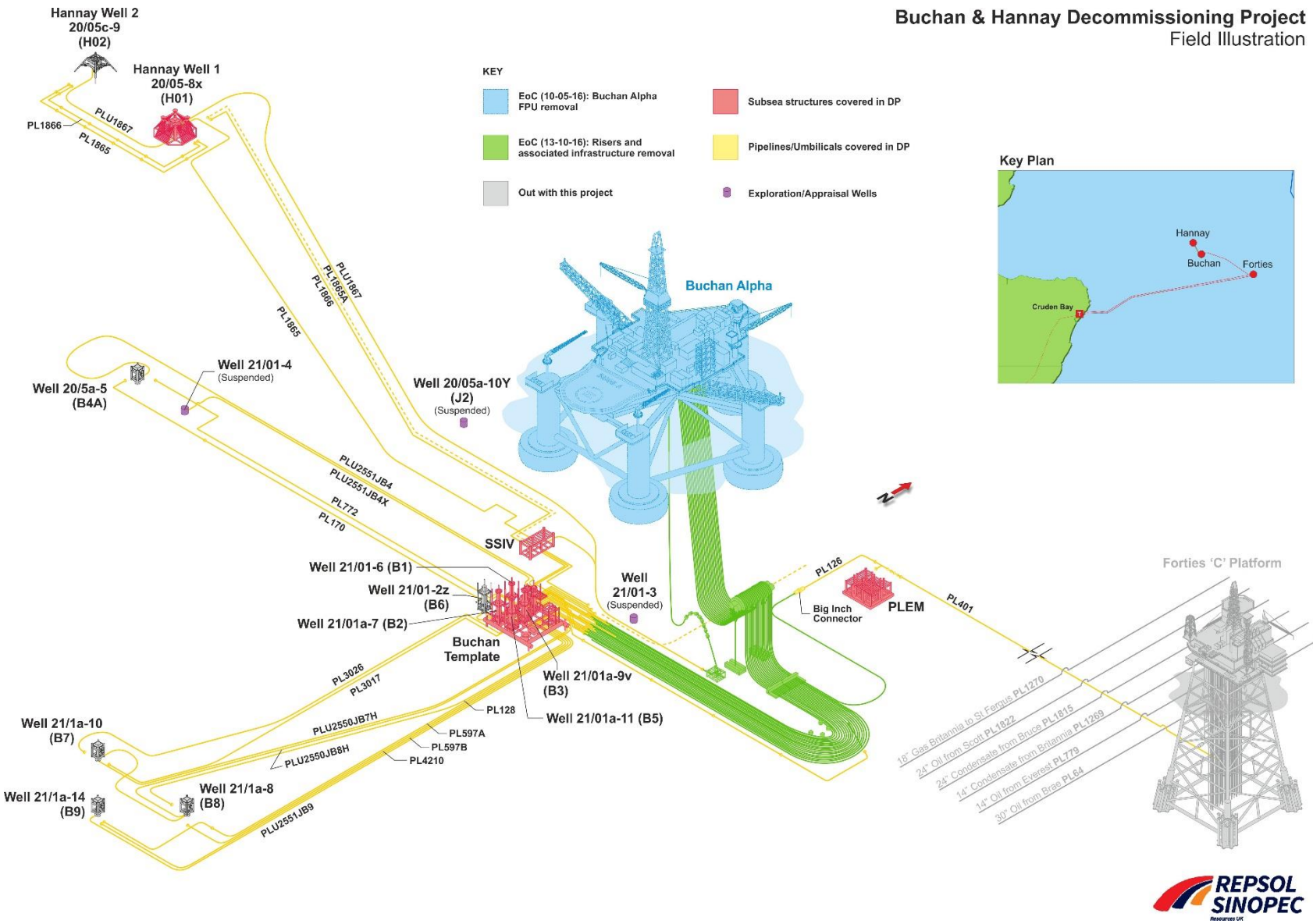


Figure 1-2 Representative schematic of the Buchan and Hannay fields.

1.4 Document Layout

Table 1-1 details the structure of the EA Report.

Table 1-1: Structure of the EA Report.

Chapter No.	Title	Contents
	Non-Technical Summary	A summary of the EA Report.
1	Introduction	Introduction to the project and scope of the EA. This chapter also includes a summary of applicable legislation.
2	Stakeholder Engagement	Details of the consultation process to date.
3	Project Description	A description of the infrastructure to be decommissioned, the proposed decommissioning activities and an indicative schedule of activities.
4	Comparative Assessment	Summary of the results of the CA carried out for the pipelines and umbilical.
5 and 6	Environmental and Socio-Economic Baseline	A description of the environmental (Chapter 5) and socio-economic (Chapter 6) receptors in the area.
7	Scoping of Potential Environmental Impacts	Overview of the methodology used to determine the environmental and socio-economic impact significance of the proposed decommissioning activities. Results of the ENVID (ENVironmental issues IDentification) Workshop and justification for selecting those aspects not requiring further assessment in the EA. Justification is also provided for those aspects that are assessed further.
8 to 9	Assessment of Aspects	Assessment of seabed disturbance during operations (Chapter 8); and physical presence with respect to legacy impacts on other sea users and on the environment (Chapter 9).
10	Environmental Management	A description of Repsol Sinopec Resources UK Limited's Environmental Management Procedures and how they apply to the Buchan and Hannay Decommissioning Project.
11	Conclusions	Key findings including a register of commitments.
12	References	Data sources used to support the EA.
Appendix A:		Impact Assessment Methodology.

2. STAKEHOLDER ENGAGEMENT

Consulting with stakeholders is an important part of the decommissioning impact assessment process as it allows any concerns or issues which stakeholders may have, to be communicated and addressed. In August 2019, as part of the informal stakeholder engagement process Repsol Sinopec Resources UK Limited issued a Scoping Report (Repsol Sinopec Resources UK Limited, 2019c) to stakeholders. The Scoping Report provided an overview of the Buchan and Hannay Fields, the proposed decommissioning activities and an overview of the impacts to be assessed in this EA. Stakeholders were invited to comment on the Scoping Report with respect to any concerns they may have. Table 2-1 identifies the stakeholders and captures the comments received.

In addition to issuing the Scoping Report, Repsol Sinopec Resources UK held a Stakeholder Engagement Workshop (7th November 2019). Comments received on the Scoping Report and issues raised during the workshop are summarised in Table 2-1 and Table 2-2.

The formal statutory and public consultation process will be triggered by the submission of the consultation draft of the DPs and supporting documents (including this EA report) to OPRED. As the project progresses further consultation will be undertaken in line with the Buchan and Hannay Decommissioning Project's Stakeholder Management Plan.

Table 2-1: Comments received on Scoping Report.

Date of contact	Comments / Issues / Concerns
OPRED Environmental Management Team (EMT)	
Email received on 10/09/19	OPRED EMT advised that they had no comments on the Scoping Report.
Joint Nature Conservation Committee (JNCC)	
JNCC reference: OIA 6749 issued on 6/09/19	With respect to survey data presented in the EA, JNCC advised that: • Survey data should at least include the area of proposed operations. • Survey data should provide adequate evidence that habitats and species of nature conservation concern (including Annex I habitats) are or are not present. • It is good practice to include a diagram indicating the surveyed area in the context of the proposed activity and to identify any sample points or the location of photographic evidence. Data provided should also include high resolution acoustic data, video and / or still images. *Survey data described in Section 5.1.* With respect to the environmental description provided in the EA, JNCC advised that: • The environmental description should focus on that of the actual area to be developed and not just provide a generic description of the local environment. • Any gaps or limitations in environmental information should be acknowledged with, where appropriate, strategies to address these gaps or limitations. • Though the environmental description should focus on the proposed site of operations, this area should also be placed in the context of its surroundings. • The Seabird Oil Sensitivity Index (SOSI) should not be used to inform environmental baselines on seabird populations. Instead JNCC recommends data sources such as Kober *et al.* (2010). • Reference to the presence of Risso's dolphins in the area should not be included as the SCANS III (Hammond *et al.*, 2017) suggests the species does not occur in the vicinity. • The status of any protected sites discussed in the EA and DP should be confirmed prior to submission of the EA. *JNCC's advice is noted and has been followed during production of Chapter 5 'Environmental Baseline'.* With respect to stabilisation material, JNCC:

Date of contact	Comments / Issues / Concerns
	• Recommend that the amount of hard substrate to be introduced is minimised; • Request following details for any rock that may be introduced: location of dump sites: size/grade of rock to be used; volume including continency volume; method of delivery; footprint of rock and assessment of impact. *This has been noted and Repsol Sinopec Resources UK Limited will aim to minimise the use of rockdump by prioritising recovery or trench and bury approaches. Volumes of contingency rock have been included in the EA.* With respect to the potential impact of underwater noise on marine mammals JNCC advises that: • The injury thresholds and hearing functions presented in the National Marine Fisheries Services (NMFS) and Southall *et al.* (2019) are identical and reflect the most comprehensive and up to date scientific knowledge relating to the risk of auditory injury to marine mammals. JNCC therefore request that these new thresholds and functions are used for any marine mammal noise assessments. *This has been noted. There is no piling activity, seismic surveys or explosive use associated with the proposed project, such that assessment of noise impacts in the EA is minimal (noise associated with vessel use is discussed in Table 7-1).* With respect to the EA, JNCC recommend that: • The worst case scenario is assessed in the EA; and • The Project is considered alongside other activities in the area. *JNCC's advice has been noted and has been followed during production of the EA.*
Scottish Environment Protection Agency (SEPA)	
Email received on 26/08/19	SEPA advised that they had no comments on the Scoping Report. They requested that they are kept informed as the project evolves and are provided the opportunity to discuss potential issues relating to, the landing of materials and wastes, waste minimisation, Transfrontier Shipment of Waste, and radioactive waste and sealed source registration. *SEPAs request has been noted and Repsol Sinopec Resources UK Limited will keep them informed as the project progresses.*
United Kingdom Hydrographic Office (UKHO)	
Email received on 12/08/19	• UKHO advised that they require five weeks advance notice of offshore activities to allow preparation of Admiralty Notices to Mariners and requested that they are notified of any amendments to the existing installations as offshore work progresses (e.g. structure removal). • UKHO require confirmation that the seabed is clear of debris, or details of and remaining debris/structures, to allow them to fully update their charts. • UKHO recommended that a decommissioning area' is added to their charts. They advised that the use of 'decommissioning areas' on their charts is relatively new but are becoming more common, now that more and more North Sea fields are entering the end of their lives. The decommissioning areas are aimed at providing further notification to mariners that ongoing decommissioning activity is occurring and that mariners may want to approach the charted area with caution. *Repsol Sinopec Resources UK Limited have noted UKOH requests/recommendations and will provide any further information UKOH may require.*
Other consultees that received the Scoping Report	
Marine Scotland Science (MSS), Scottish Fishermen's Federation, Scottish Natural Heritage Note: at the time of writing, feedback on the Scoping Report had not been received from these consultees.	

Table 2-2: Comments from Stakeholder Engagement Workshop.

Stakeholder Engagement Workshop (7th November 2019)	
Stakeholders / consultees represented	
• OPRED Offshore Decommissioning Unit (ODU) • Scottish Fishermen's Federation (SFF)	• Joint Nature Conservation Committee (JNCC) • Oil and Gas Authority (OGA)
Comments / Issues / Concerns	
Stakeholders were provided an overview of the Buchan and Hannay fields and the proposed decommissioning activities as captured in the DP. • JNCC queried the number of crossings on the export pipeline. *Repsol Sinopec Resources UK confirmed there are six third party crossings. These are discussed further in Section 3.2.5.3.* • SFF queried the impacts of over trawling on the cuttings pile and how to ensure they remain undisturbed after the 500 m zone has been surrendered. *Repsol Sinopec Resources UK advised that currently there is an industry wide response being prepared by OPRED with respect to cuttings piles and acknowledge that it is a concern for the fishermen. The cuttings pile is described in Section 5.5 of the EA and ongoing legacy impacts are considered in Section 9.4.* • SFF advised that any remaining infrastructure would need to be shown to be over trawlable, and that there will be a need for ongoing monitoring to see it remains that way. *Repsol Sinopec Resources UK confirmed that a clean seabed survey would be carried out at the end of works and advised that the Company would adhere to an ongoing monitoring regime agreed with OPRED. Commitment by Repsol Sinopec Resources UK to a clean seabed is captured in Section 9.6.* • SFF asked if there were any anchor scars post the Buchan FPU's removal? *Repsol Sinopec Resources UK advised no significant depressions were noted when the FPU anchors were removed. The mooring lines were wire as opposed to chain, so less impact observed along the length of the wire. Repsol Sinopec Resources UK did commit to revisiting the area during the post decommissioning survey to confirm. Commitment by Repsol Sinopec Resources UK to a clean seabed is captured in Section 9.6.*	
Note: Apologies were sent by MSS, OPRED EMT and SEPA. Note: MSS, OPRED EMT and SEPA were subsequently forwarded the presentation presented by Repsol Sinopec Resources UK at the workshop and the meeting minutes and comments were invited.	

3. PROJECT DESCRIPTION

This section describes the Buchan and Hannay infrastructure to be decommissioned and outlines the proposed decommissioning activities.

3.1 Buchan and Hannay Field Overview

As described in Section 1.1, 12 wells have been drilled in the Buchan field: seven production wells; two appraisal wells; one exploration well and two water injection wells, and two production wells have been drilled in the Hannay field. Four of the Buchan production wells were drilled from the Buchan template whilst one well was drilled adjacent to it. The remaining Buchan production and water injection wells were satellite wells tied back to the Buchan template. The two Hannay wells were drilled remotely and tied-back to the Buchan Alpha FPU.

The Buchan appraisal wells and exploration well are currently suspended. The remaining nine Buchan wells and the two Hannay wells are shut-in and the flowlines have been disconnected. Well names are provided in Table 2.5 of the draft DPs (further details are not provided here as the activities associated with Plug and Abandonment (P&A) are out with the scope of the draft DPs and the EA).

As summarised in Section 1.1, the fields were produced via the Buchan Alpha FPU. From the FPU the hydrocarbons were transported to the Forties Charlie platform via a *c.* 56.3 km export line (comprising PL126 and PL401). Under an approved EoC (approved 10th May 2016) the FPU was taken off station in August 2017. Prior to sail away, the fields were connected to the FPU via 18 risers: seven production risers; eight gas lift risers; one water injection riser; and two umbilical risers. In addition, one export riser connected the topsides to the export pipeline. Of these 19 risers, 18 of them maintained their position in the water column via a Mid-Water Arch (MWA) whilst buoyancy aids were used to maintain the position of the Hannay umbilical riser (Figure 1-2).

In addition to the EoC submitted for the removal of the Buchan Alpha FPU, a second EoC was approved by OPRED on 16/10/16 for the recovery of:

- 19 risers and associated hold back frame and turning gabions;
- A MWA and its associated tethers and hold down anchors;
- A riser base structure associated with the Hannay umbilical riser; and
- Mattresses and grout bags associated with the above.

As described in Section 1.1, decommissioning of the infrastructure captured in the two EoCs is out with the scope of this EA and therefore is not considered further.

Infrastructure captured within the draft DPs is illustrated in Figures 1-2 and Figure 3-1. Sections 3.2.4 and 3.2.5 provide details of this infrastructure and describe the proposed decommissioning activities.

Cuttings were discharged during the drilling of each of the wells. Section 5.5 describes the current seabed status around each of the wells. Cuttings from the four wells drilled from the Buchan template and those from the well adjacent to the template have resulted in a small cuttings pile at this location. Surey data (described further in Section 5.5) shows evidence of discharged cuttings at the tie-back wells, however in line with OSPAR Recommendation 2006/5, these cuttings are not considered to have formed a pile due to the small volumes[1]. Details of the Buchan template cuttings pile are provided in Section 5.5 whilst Section 3.2.6 describes the proposed approach for managing the pile.

[1] Note: OSPAR 2006/5 define cuttings pile as 'an accumulation of cuttings on the seabed which has been derived from more than one well'.

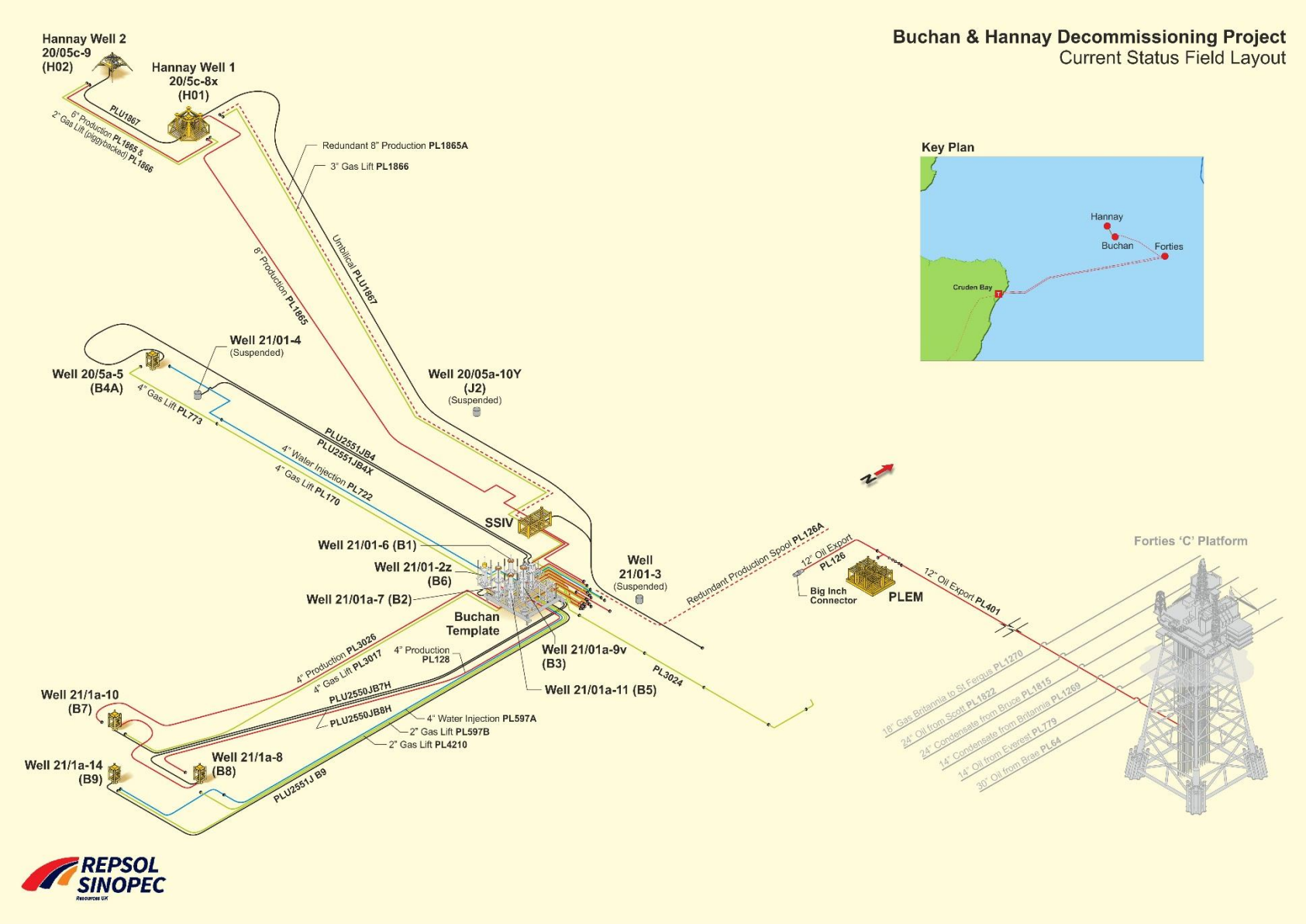


Figure 3-1: Infrastructure captured with the Buchan and Hannay draft DPs.

3.2 Proposed Activities

3.2.1 Schedule

Repsol Sinopec Resources UK Limited propose to progress P&A and decommissioning activities in line with the indicative schedule shown in Figure 3-2.

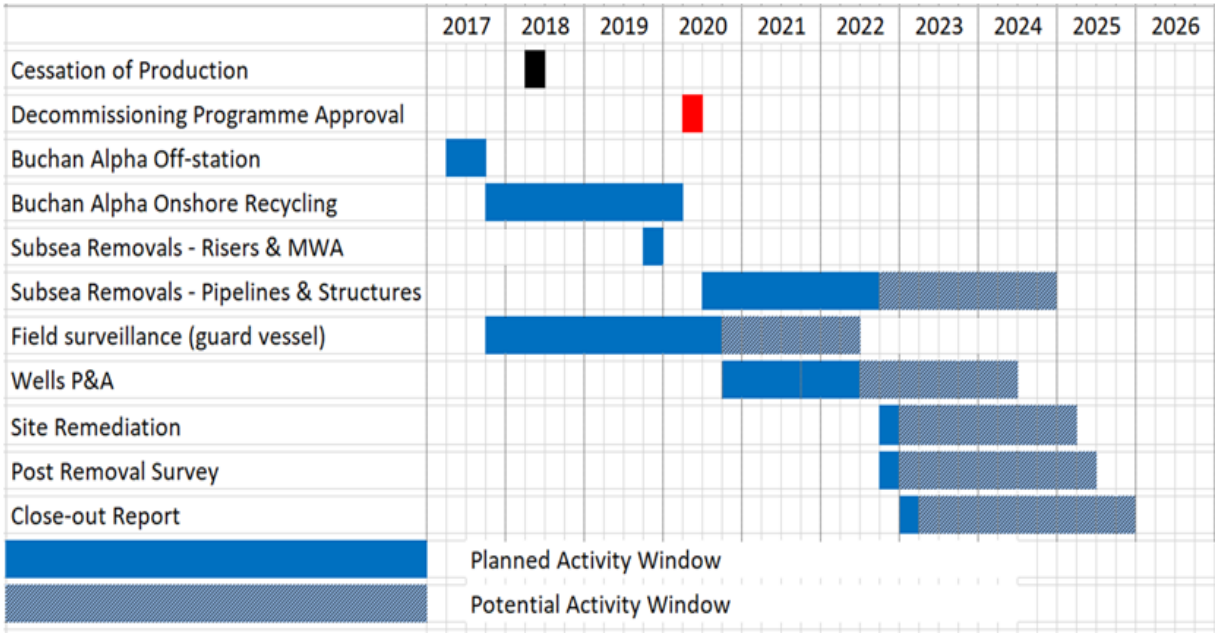


Figure 3-2: Indicative schedule for the Buchan and Hannay decommissioning project.

3.2.2 Preparatory Works

All the Buchan and Hannay hydrocarbon pipelines have been flushed and cleaned to reduce hydrocarbon content to ALARP. Most of the pipelines are currently filled with inhibited seawater containing a corrosion inhibitor (PRESERVAN 5500 dosed at 30 ppm). Two lines: gas lift line PL597B and water injection line PL597A contain produced water reinjection fluids to which a scale inhibitor (SI-4i4N) has been added.

The chemical cores within the umbilicals have been flushed with seawater or contain a a water based hydraulic fluid. The hydraulic fluids vary between fields: in the Buchan umbilicals it is Aqualink 300F (a water glycerol hydraulic fluid) whilst within the Hannay umbilical cores the hydraulic fluids are either Transaqua or Aquaglycol 24[2].

Prior to disconnection / recovery activities chemical permit applications will be submitted to OPRED seeking consent for the discharge of the pipeline and umbilical contents.

3.2.3 Plug and Abandonment

All the Buchan and Hannay wells will be P&A'd in accordance with Oil & Gas UK (OGUK) well decommissioning guidelines (OGUK, June 2018) and Repsol Sinopec Resources UK Limited standards.

3.2.4 Decommissioning of the Subsea Installations

As summarised in Table 2-2 of the DPs, the subsea installations captured in the draft DPs include the Buchan template, the Hannay SSIV, the PLEM, an integrated manifold/WHPS over Hannay well H01 and eight anode skids.

[2] Note: the hydraulic fluid cores could not be flushed as they were not on a round loop such that the fluids could not be flushed out of the lines. As the hydraulic fluids are water based, leaving these cores unflushed was not considered to result in a significant environmental impact.

All these structures will be recovered as part of the decommissioning project. The following subsections provide a summary description of each of the structures and the proposed recovery method.

3.2.4.1 Buchan Template

The Buchan template is an 8-slot template with associated manifold, installed to allow for the drilling of wells and for tie-in of remote satellite wells (Figure 3-3a). The template is a piled structure (four piles) and comprises the following elements: base frame; manifold; template valve module, Xmas trees and conductors, spool pieces, umbilical jumpers, and a subsea distribution unit (SDU). Combining all elements, the Buchan template weighs *c.* 237.5 te and measures 18.1 m (L) x 13.8 m (W) x 10.9 m(H).

The wells at the template will be P&A'ed prior to its recovery. The Xmas trees and conductors will be recovered. It is expected that recovery of the remaining elements will be piece-small given the geometry of the structure, the weight of the manifold and the age of the structure. The piles will be cut internally with best endeavours to achieve 3 m below the seabed. Any change in this depth will be discussed with OPRED at the time of execution. The piles will subsequently be recovered using separate lifts.

It will be necessary to disturb a portion of the cuttings pile during recovery of the Buchan template (discussed further in Section 3.2.6).

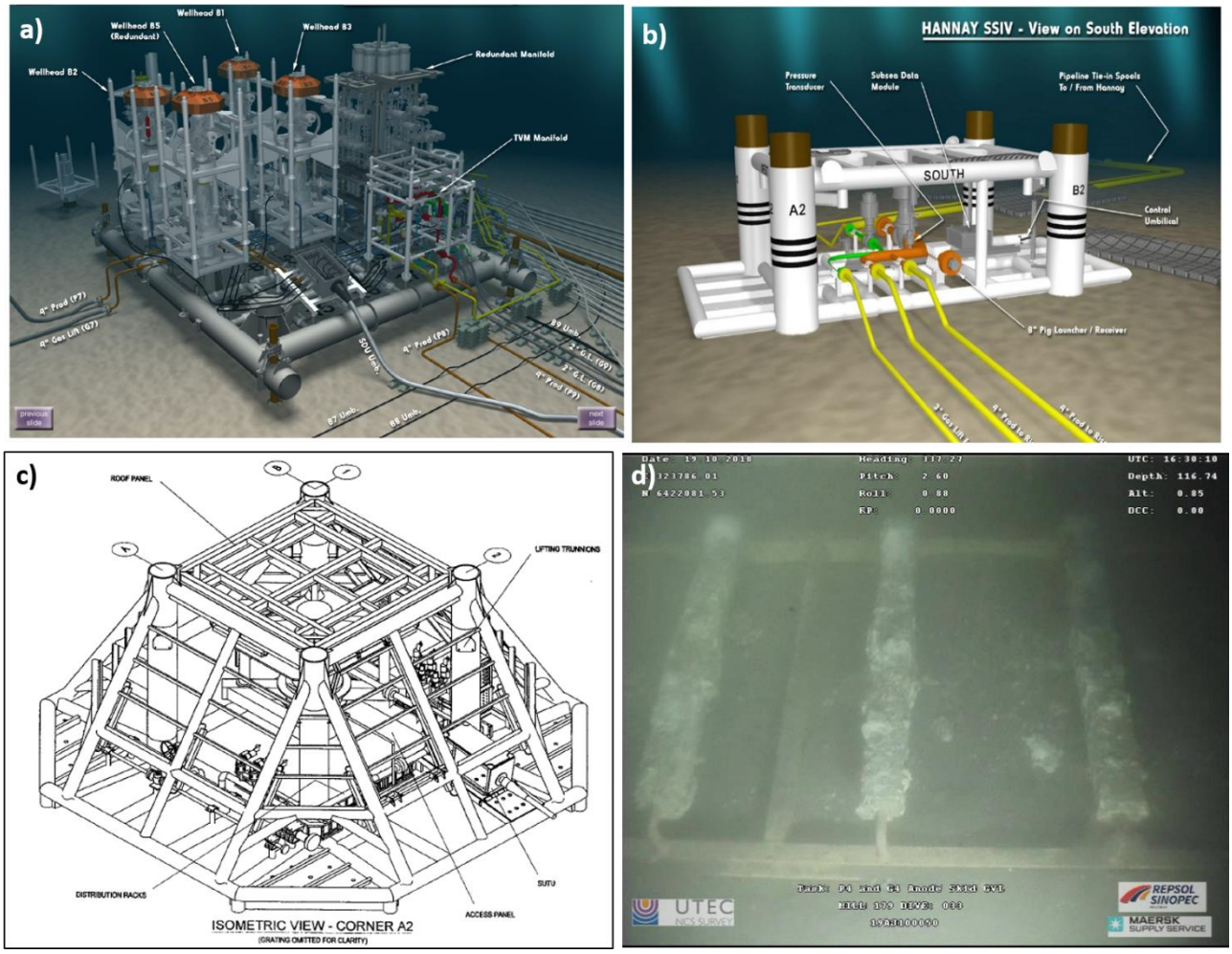


Figure 3-3: Schematics / photographs of some of the Buchan and Hannay subsea structures: a) Buchan template; b) Hannay SSIV; c) integrated manifold/WHPS and d) anode skid.

3.2.4.2 Hannay SSIV

The Hannay SSIV is a gravity base structure located *c.* 35 m north of the Buchan template. Four steel billets, one each located within the corner vertical members are used for ballast (Figure 3-3b). The structure (including the

steel billets) weighs *c.* 47 te and measures 6.65 m (L) x 4.65 m (W) x 3.2 m (H). The structure (including steel billets) will be recovered via a single lift.

3.2.4.3 Export PLEM

The PLEM structure was taken out of service in 1986 and left *in situ* following the introduction of the export route to Forties Charlie. The PLEM comprises a steel base frame supporting a short spool / valve arrangement and measures *c.* 9.9 m (L) x 5.0 m (W) x 2.13 m (H). It is a gravity based structure with four concrete blocks used for ballast. Each concrete block weights *c.* 30 te and the steel frame/spool/valve structure weighs *c.* 43.2 te. Each of the blocks will be recovered separately and the PLEM structure will be recovered via a single lift. Note the risers and tie-in spools associated with the original offloading system have previously been recovered.

3.2.4.4 Integrated Manifold/WHPS

The integrated manifold/WHPS is located over the Hannay well H01 Xmas tree (Figure 3-3c). The structure is piled, weighs *c.* 69 te and measures *c.* 13.0 m (L) x 13.0 m (W) x 6.5 m (H). The Xmas tree and wellhead will be recovered as part of the P&A campaign. The piles will be severed from the structure which will be recovered as a single lift. Each of the piles will be cut internally with best endeavours to achieve 3 m below the seabed. Any change in this depth will be discussed with OPRED at the time of execution. The piles will subsequently be recovered using separate lifts.

3.2.4.5 Anode Skids

Eight anode skids have been used to supplement the cathodic protection on six of the Buchan infield pipelines and on PL126 (part of the export pipeline)[3]. Six of the anode skids weigh *c.* 5 te each and measure *c.* 2 m (L) x 3 m (W) x 1 m (H). The remaining two skids weigh *c.* 0.22 te each and measure *c.*0.8 (L) x 1m (W) x 1m (H). It is expected each of the anode skids will be recovered either directly to surface or initially to a basket using a grab following cutting of the cable connections.

3.2.5 Decommissioning of the Pipelines and Umbilicals

3.2.5.1 Pipelines and Umbilicals

Table 3-1 summarises the pipelines and umbilicals associated with the Buchan and Hannay fields (information is taken from Table 2.3 of the draft DPs). The table shows which pipelines/umbilicals were surface laid and which were trenched and buried.

A CA was carried out to determine the optimal approach to decommissioning the pipelines and umbilicals. The CA approach and results are detailed in the CA report (Repsol Sinopec Resources UK Limited, 2019b) and summarised in Chapter 4 of this report.

In line with the results of the CA, Table 3-2 summarises the fate of the pipelines and umbilicals. In summary all surface laid pipelines and umbilicals will be recovered to shore whereas the trenched and buried pipelines and umbilical will be decommissioned *in situ*. All surface laid spools and umbilical jumpers will also be recovered to shore.

Table 3-2 provides summary details of the exposed lengths associated with the trenched and buried pipelines and umbilical to be decommissioned *in situ*. The CA process identified that the following remediate *in situ* options are acceptable for the exposed pipeline and umbilical ends:

- Trench and bury;
- Cut and recover; or
- Rockdump.

All three options will be carried through the Contracts and Procurement (C&P) tendering phase. Preference will be given to trench and bury or to cut and recovery. Should the option to rockdump the exposed sections be considered more favourable during the C&P tendering phase, Repsol Sinopec Resources UK Limited will engage with OPRED before a decision is taken on the overall strategy.

[3] Note there are two small anode skids on PL126.

Table 3-1: Pipelines and umbilicals associated with the Buchan and Hannay fields.

Description	Pipeline Number (as per PWA)	Length (km)	Description of Component Parts	Product Conveyed	From – To End Points	Burial Status	Current Content
Line connecting export riser to PL401[1]	PL126	1.697	Carbon steel/ plastic/ alloy & misc. coatings	Oil	Buchan Export riser connector to PLEM	Surface laid	Inhibited seawater (PRESERVAN 5500)
Redundant section of export line (previously connected export riser to the PLEM)[2]	PL126A	0.08	Carbon steel/ plastic/ alloy & misc. coatings	Oil	Cut pipeline end in close proximity to abeam big inch connector	Surface laid	Inhibited seawater (PRESERVAN 5500)
Oil export -pipeline to Forties Charlie[1]	PL401	54.043	Carbon steel/ plastic/ alloy & misc. coatings	Oil	From PL126 to Forties Charlie	Trenched/ natural backfill	Inhibited seawater (PRESERVAN 5500)
Production line from well B7[1]	PL3026 (ex PL127A)	1.617	Carbon steel/ alloy	Oil	well B7 to Buchan template	Surface laid	Inhibited seawater (PRESERVAN 5500)
Water injection line to well B4A[1]	PL772 (ex PL170A)	2.514	Carbon steel/ alloy	Water injection fluids	Buchan template to well B4A	Surface laid	Inhibited seawater (PRESERVAN 5500)
Gas lift line to well B4A[1]	PL170 (ex PL170B)	2.519	Carbon steel/ alloy	Lift gas	Buchan template to rigid pipeline tie-in flange to PL773	Surface laid	Inhibited seawater (PRESERVAN 5500)
Well B8 Production[1]	PL128 (ex PL128A)	1.856	Carbon steel/ alloy	Oil	Pipeline end flange at well B8 to riser spool tie in to PL3026 riser spool	Surface laid	Inhibited seawater (PRESERVAN 5500)
Gas lift line to well B7 [1]	PL3017 (ex PL127B)	1.628	Carbon steel/ alloy	Lift gas	Buchan template to well B7	Surface laid	Inhibited seawater (PRESERVAN 5500)
Gas lift line to well B8[1]	PL4210	1.850	Carbon steel/ plastic & misc. coatings	Lift gas	Buchan template to well B8	Surface laid	Inhibited seawater (PRESERVAN 5500)

Description	Pipeline Number (as per PWA)	Length (km)	Description of Component Parts	Product Conveyed	From – To End Points	Burial Status	Current Content
Gas lift line to well B9[1]	PL597B	1.990	Carbon steel/ plastic & misc. coatings	Lift gas	Buchan template to well B9	Surface laid	Produced water re-injection fluids plus SI-4i4N
Water injection line to well B9[1]	PL597A (ex PL128B)	1.960	Carbon steel/ plastic & misc. coatings	Water injection fluids	Buchan template to well B9	Surface laid	Produced water re-injection fluids plus SI-4i4N
Umbilical to well B1[2]	PLU2551JB1	0.028	Carbon steel/ zinc/plastic & misc. coatings	Aqualink 300F	SDU mounted on Buchan template to well B1	Located in Buchan template	Aqualink 300F
Umbilical to well B2[2]	PLU2551JB2	0.026	Carbon steel/ zinc/plastic & misc. coatings	Aqualink 300F	SDU mounted on Buchan template to well B2	Located in Buchan template	Aqualink 300F
Umbilical to well B3[2]	PLU2551JB3	0.023	Carbon steel/ zinc/plastic & misc. coatings	Aqualink 300F	SDU mounted on Buchan template to well B2	Located in Buchan template	Aqualink 300F
Umbilical to well B4A[1]	PLU2551JB4	2.750	Carbon steel/ zinc/plastic & misc. coatings	Aqualink 300F	Buchan template to well B4A	Surface laid	Aqualink 300F
Redundant umbilical to well 21/01-4[1]	PLU2551JB4X	2.930	Carbon steel/ zinc/plastic & misc. coatings	Aqualink 300F	Buchan template (to well 21/01-4,	Surface laid	Aqualink 300F
Umbilical to well B6[2]	PLU2551JB6	0.036	Carbon steel/ zinc/plastic & misc. coatings	Aqualink 300F	Buchan template to well B6	Located in Buchan template	Aqualink 300F
Umbilical to well B7[1]	PLU2550JB7H	1.838	Carbon steel/ zinc/plastic & misc. coatings	Aqualink 300F	Buchan template to well B7	Surface laid	Aqualink 300F

Description	Pipeline Number (as per PWA)	Length (km)	Description of Component Parts	Product Conveyed	From – To End Points	Burial Status	Current Content
Umbilcal to well B8 (includes 200m jumper to well B7)[1]	PLU2550JB8H	2.132	Carbon steel/ zinc/plastic & misc. coatings	Aqualink 300F	Buchan template to well B8 and onwards to well B7	Surface laid	Aqualink 300F
Umbilical to well B9[1]	PLU2551JB9	2.066	Carbon steel/ zinc/plastic & misc. coatings	Aqualink 300F	Buchan template to well B9	Surface laid	Aqualink 300F
Gas lift spool at well B4[2]	PL773	0.017	Carbon steel/ plastic & misc. coatings	Lift gas	PL170 pipeline tie in flange to well B4a	Surface laid	Inhibited seawater (PRESERVAN 5500)
G3 riser gas lift spool[2]	PL3018	0.0127	Carbon steel/ plastic & misc. coatings	Lift gas	Flexible riser (G3) to well B3 Buchan template	Surface laid	Inhibited seawater (PRESERVAN 5500)
G6 riser gas lift spool[2]	PL3019	0.0183	Carbon steel/ plastic & misc. coatings	Lift gas	Flexible riser (G6) to well B2 Buchan template	Surface laid	Inhibited seawater (PRESERVAN 5500)
Redundant riser spool[2]	PL3020	0.0096	Carbon steel/ plastic & misc. coatings	Lift gas	Blind flange to Buchan template	Surface laid	Inhibited seawater (PRESERVAN 5500)
G1 riser gas lift spool[2]	PL3021	0.016	Carbon steel/ plastic & misc. coatings	Lift gas	Flexible riser (G1) to well B1 Buchan template	Surface laid	Inhibited seawater (PRESERVAN 5500)
P3 riser production spool[2]	PL3022	0.012	Carbon steel/ plastic & misc. coatings	Oil	well B3 Buchan template to flexible riser (P3)	Surface laid	Inhibited seawater (PRESERVAN 5500)
P2 riser production spool[2]	PL3023	0.016	Carbon steel/ plastic & misc. coatings	Oil	well B2 Buchan template to flexible riser (P2)	Surface laid	Inhibited seawater (PRESERVAN 5500)

Description	Pipeline Number (as per PWA)	Length (km)	Description of Component Parts	Product Conveyed	From – To End Points	Burial Status	Current Content
P6 riser production spool[2]	PL3024	0.2283	Carbon steel/ plastic & misc. coatings	Oil	well B2 Buchan template to flexible riser (P2)	Surface laid	Inhibited seawater (PRESERVAN 5500)
P1 riser production spool[2]	PL3025	0.016	Carbon steel/ plastic & misc. coatings	Oil	well B1 Buchan template to flexible riser (P1)	Surface laid	Inhibited seawater (PRESERVAN 5500)
Production line from Hannay[1]	PL1865	13.461	Carbon steel/ plastic & other non-ferrous	Oil	Hannay well H02 to Hannay well H01 to the Buchan template	Trenched/ buried/ spot rock	Inhibited seawater (PRESERVAN 5500)
Out of service production line from Hannay [1]	PL1865A	13.189	Carbon steel/ plastic & other non-ferrous	Oil	Hannay well H02 to Hannay well H01 to the Buchan template	Trenched/ buried/ spot rock	Inhibited seawater (PRESERVAN 5500)
Gas lift line to Hannay[1]	PL1866	13.408	Carbon steel/ plastic & other non-ferrous	Lift gas	Buchan template to Hannay well H01 to Hannay well H02	Trenched & buried	Inhibited seawater (PRESERVAN 5500)
Hannay umbilical[1]	PLU1867	13.461	Carbon steel/ zinc/plastic & misc. coatings/ copper	Aquaglycol 24, Transaqua and chemical injection fluids	Cut umbilical end on the seabed at Buchan to Hannay subsea well H02 SUTU	Trenched & buried	Seawater/ Aquaglycol 24
Chemical injection line to Buchan template [2]	PLU2550	0.1	Carbon steel/ zinc/plastic & misc. coatings	Biocide	Hannay riser base to Buchan template	Surface laid	Aqualink 300F
Buchan umbilical riser [2]	PLU2551	0.005	Carbon steel/ zinc/plastic & misc. coatings	Aqualink 300F	Umbilical laydown point to SDU at Buchan template	Surface laid	Aqualink 300F

1: This line was considered in the CA.

2: This item was not considered in the CA as Repsol Sinopec Resources UK Limited proposed to recover it from the beginning.

Table 3-2: Proposed decommissioning methods for the Buchan and Hannay pipelines and umbilicals.

PIPELINE/UMBILICAL	PROPOSED DECOMMISSIONING METHOD
CA Group A PL401 export line to Forties Charlie platform (54,043 m)	To be decommissioned *in situ*. PL401 is a concreted coated rigid pipeline laid in an open trench and left to backfill naturally. Apart from the start and end sections, the vast majority of the pipeline is buried, with only short sections of exposures of between 5 to 15 m in length. A burial status survey carried out in 2018 identified no spans on the line. Pipeline route surveys show that the minimum distance between the top of the pipe and the mean seabed level is 0.5 m. Natural backfill has occurred over most of the pipeline with depth of cover being > 0.4 m along 34.295 km of the trenched section. As the distance from top of pipe to mean seabed level is > 0.5 m, those areas where depth of cover is < 0.4 m are not considered a hazard. There is no evidence of spans and natural backfill is expected to continue over time. In addition, there is no evidence of snagging on the line over its history (i.e. in over 24 years). At each end of the pipeline there is an exposed section where the line exits the trench. Combined these exposed end sections measure 766 m. These sections will be remediated with preference given to trench and bury or cut and recover. If following C&P, the option to rockdump is selected, *c.* 7,423 te of rock would be required to remediate the exposed ends. If the option to trench and bury the exposed ends is selected a depth of burial of > 0.6 m will be targeted. At the Buchan end of the pipeline a surface laid 80.95 m spool connects it to the surface laid PL126 whilst at the Forties Charlie end, three spools with a total length of 79.48 m tied PL401 to the Forties Charlie riser. The spools at the Forties Charlie have previously been recovered whilst those at the PL126 end will be recovered as part of the decommissioning project. In addition to the rock associated with the six crossings identified in Table 3-4, three other sections have rock associated with them: 13 m berm at KP 15.138 (344 te) ; 18 m berm at KP 15.159 (476 te) and 39 m berm at KP 16.028 (1,032 te). All rock associated with the pipeline will be decommissioned *in situ*.
CA Group B PL126 export line from riser to tie-in to PL401 (1,697 m) PL128 Production line to well B8 (1,856 m) PL3026 Production line to well B7 (1,617 m) PL170 Gas lift line to well B4a (2,519 m) PL772 Water injection line to well B4a (2,514 m) PL3017 Gas lift line to well B7 (1,628 m) PL597A Water injection line to well B9 (1,960 m)	To be recovered to shore. All pipelines in this group are surface laid rigid pipelines which will be returned to shore for recycling/disposal in adherence to the waste hierarchy. Total length of pipelines in this group is 13,791 m. In addition, there is 210 m of spools associated with this group to be recovered (note spools associated with tie-in of the gas lift lines to Well B7 and Well B4 and tie-in of the production line to Well B7 have previously been recovered).

PIPELINE/UMBILICAL	PROPOSED DECOMMISSIONING METHOD
CA Group C PL1865A/PL1866 Redundant production and gas lift lines to Hannay (13,189 m and 13,408 m) PL1865 Production line to Hannay (13,461 m)	To be decommissioned *in situ*. All pipelines in this group are rigid trenched and buried lines. The lines were installed with a minimum depth of cover of around 0.6 m. There is no evidence of spans and there is no evidence of snagging on the pipelines since they were first installed (installed in 2001 with replacement line installed in 2010). Total length of pipelines is 40,058 m. At each end of the pipeline there is an exposed section where the pipelines exit the trench. Combined these exposed end sections have a length of 392 m. These sections will be remediated with preference given to trench and bury or cut and recover. If following C&P, the option to rockdump is selected, *c.* 2,898 te of rock would be required to remediate the exposed ends. If the option to trench and bury the exposed ends is selected a depth of burial of > 0.6 m will be targeted. There are 681 m of surface laid spools associated with these pipelines all of which will be recovered. Approximately 1,2038 m of PL1865a and 363 m of PL1865 m is rockdumped.
CA Group D PL4210 Gas lift line to well B8 (1,850 m) PL597B Gas lift line to well B9 (1,990 m) PLU2551JB4 Umbilical to well B4 (2,750 m) PLU2551JB4X Redundant umbilical to suspended well 21/01-4 (2,930 m) PLU2550JB7H Umbilical to well B7 (1,838 m) PLU2550JB8H Umbilical to well B8 (2,132 m) PLU2550JB9 Umbilical to well B9 (2,066 m)	. To be recovered to shore. All pipelines and umbilicals in this group are flexible surface laid lines and will be will be returned to shore for recycling/ disposal in adherence to the waste hierarchy. Total pipeline length is 3,840 m and total umbilical length is 11,716 m. In addition, there is 15 m of spools and 283.4 m of umbilical jumpers associated with these pipelines and umbilicals, all of which will be recovered.
CA Group E PLU1867 Hannay main umbilical (13,461 m)	To be decommissioned *in situ*. PLU1867 is a trenched and buried umbilical. The depth of cover is > 0.5 m for most of its length. Along approximately 2 km of the umbilical the depth of cover varies from 0.2 m to around 0.6 m though for the most part along this 2 km length depth of cover is > 0.4 m. There is no evidence of spans and there is no evidence of snagging on the umbilical since it was installed over 19 years ago (2001). At each end the umbilical there is an exposed section where the umbilical exits the trench. Combined these exposed end sections have a length of 288 m. These sections will be remediated with preference given to trench and bury or cut and recover. If following C&P, the option to rockdump is selected, *c.* 1,536 te of rock would be required to remediate the exposed ends. If the option to trench and bury the exposed ends is selected a depth of burial of > 0.6 m will be targeted. There are 231 m of surface laid umbilical jumpers associated with this umbilical, all of which will be recovered.

PIPELINE/UMBILICAL	PROPOSED DECOMMISSIONING METHOD
Not considered in the CA as it is the intention to recover these surface laid short lines. Surface laid umbilical jumpers and spools, not associated with the pipelines and umbilicals identified above. Umbilical jumpers: PLU2551JB1 (28 m); PLU2551JB2 (26 m) PLU2551JB3 (23 m); PLU2551JB6 (36 m), PLU2550 (100 m); and PLU2551 (5 m) Spools: PL126A (80 m);PL773 (17 m); PL3018 (127 m); PL3019 (183 m); PL3020 (9.6 m); PL 3021 (16 m); PL3022 (12 m); PL3023 (16 m); PL3024 (228.3 m); PL3025 (16 m)	To be recovered to shore. Total length of umbilical jumpers in this group is 218 m and total length of spools is 704.9 m. Note: the impact assessment does not include additional seabed disturbance associated with the four umbilical jumpers listed here, as these occur within the Buchan template and will be recovered with the template.

3.2.5.2 Stabilisation Features

Stabilisation features associated with the Buchan and Hannay fields are summarised in Table 3-3. Where technically feasible to do so Repsol Sinopec Resources UK Limited plan to recover all concrete mattresses and all 25 kg grout bags. Should it not be possible to remove some of the mattresses or grout bags, Repsol Sinopec Resources UK Limited will consult with OPRED before any alternative option is executed. All rockdump and the four concrete saddles associated with the crossing with the Brae to Forties pipeline will be decommissioned *in situ*.

Table 3-3 : Summary of stabilisation features associated with the Buchan and Hannay fields.

Stabilisation Feature	No.	Weight (Te)	Location	Comments/Status
Flexible concrete mattresses measuring 6 m (L) x 3 m (W) x 0.5 m (H)	132	626	Various locations across the field as summarised in Table 2-4 of the draft DPs.	All mattresses are exposed and it is expected that all will be recovered.
Grout bags (25 kg bags)	500	12.5	Grout bags provide support to the Buchan template.	Comprise hessian sacks filled with cement grout. It is proposed to recover all grout bags at the time of decommissioning.
Rockdump	-	43,270	37,070 te associated with Hannay pipelines PL1865 and PL1865a; 1,852 te across three locations on PL401; and 6,200 te at the third party crossing between PL401 and the Brae to Forties Charlie oil pipeline (Section 3.2.5.3).*	Rockdump will be decommissioned *in situ*.
Concrete saddles measuring 10 m (L) x 1 m (W) x 1 m (H)	4	12.4	Concrete saddles at the crossing with the Brae to Forties Charlie oil pipeline (Section 3.2.5.3)	Buried below rockdump and therefore, will be decommissioned *in situ*.
*Note there are six third party crossings associated with PL401. Of these six crossings only one passes under the Buchan export pipeline i.e. the Brae to Forties Charlie pipeline. All other third party crossings pass over the Buchan export line such that the rock associated with these crossings is out with the scope of the Buchan and Hannay decommissioning projects.				

Flexible Concrete Mattresses

The flexible concrete mattresses will be recovered to a vessel either using a grab or will be lifted onto recovery frames or steel cargo nets or speed loaders while subsea, and then lifted to the surface via vessel crane. Should any individual flexible concrete mattresses be found to be severely degraded and at risk of disintegrating on removal, baskets may be deployed on the seabed for filling by Remotely Operate Vehicles (ROVs) or divers. If during the offshore campaign it is found that any of the flexible mattresses cannot be recovered, Repsol Sinopec Resources UK Limited will consult with OPRED before any alternative option is executed.

Grout Bags (25 kg)

Where technically feasible to do so, Repsol Sinopec Resources UK Limited plan to recover all of the grout bags. It is likely these will be placed into baskets for removal to the surface. If during the offshore campaign it is found that any of these 25 kg grout bags cannot be recovered, Repsol Sinopec Resources UK Limited will consult with OPRED before any alternative option is executed.

Rockdump

All existing rockdump will be decommissioned *in situ*. Surveys to monitor the burial status of the pipelines and umbilical and associated protection materials are discussed in Section 3.3.

Other Stabilisation Features

Four concrete saddles associated with the crossing with the Brae to Forties Charlie pipeline are covered in rockdump and will be decommissioned *in situ*.

3.2.5.3 Third Party Crossings

There are a number of third party crossings associated with the export pipeline (PL401) as summarised in Table 3-4. For those crossings numbered 1 to 5, the third party pipeline crosses over the Buchan export pipeline and therefore decommissioning of these crossings will be captured in the DPs associated with the third party pipelines. For crossing No. 6, the Buchan export pipeline crosses over the PL64 such that this crossing is captured in the Buchan and Hannay draft DPs. PL64 is a live line and it is proposed to decommission this crossing *in situ*.

Table 3-4: Third party crossings.

No	Third party infrastructure	Location (WGS 84)	Crossing details
1	PL 1270: 18" Britannia to St Fergus gas trunkline passes over PL401	57°53'50.519" N 0°13'12.303"E	Crossing at KP 12.1 comprising a rock berm of *c.* 22 m.
2	PL1822: 24" Scott to Forties Unity oil pipeline passes over PL401	57°44'23.684"N 0°43'38.724" E	Crossing at KP 47.4 comprising a rock berm of *c.* 49 m.
3	PL1815: 24" Bruce to Forties Unity condensate pipeline passes over PL401	57°43'37.334"N 0°45'46.068"E	Crossing at KP 49.9 comprising a rock berm of *c.*4 m.
4	PL1269: 14" Britannia to Forties Unity condensate pipeline passes over PL401	57°43'36.008"N 0°45'53.406"E	Crossing at KP 50.1 comprising a rock berm of *c.* 15 m.
5	PL779: 14" Everest to Forties Charlie oil pipeline passes over PL401	57°43'34.825"N 0°48'40.84"E	Crossing at KP 52.8 comprising a rock berm of *c.* 18 m.
6	PL64: 30" Brae to Forties Charlie oil pipeline passes under PL401	57°43'35.494"N 0°49'12.119"E	Crossing at KP 53.3 comprising a rock berm of c. 264m.
Note: All third party crossings are associated with live lines.			

3.2.6 Management of the Buchan Cuttings Pile

The four wells drilled at the Buchan template and the well drilled adjacent to it, contributed to the formation of a small cuttings pile estimated to be 828 m^3 and to have a physical footprint of 3,731 m^2 and a maximum height of 1.3 m. The pile comprises cuttings contaminated with WBM, LTOBM and OBM.

As part of the pre-decommissioning survey, samples were taken to determine the level of contamination within the the cuttings pile (Benthic Solutions, 2019a). Full details are provided in Section 5.2.

In 2006, OSPAR agreed Recommendation 2006/5 (OSPAR, 2006) on a Management Regime for Offshore Cuttings Piles. Stage 1 of the Recommendation required the assessment of drill cuttings piles against two criteria:

- A rate of oil loss to the water column of less than 10 tonnes/yr.; and
- A persistence, over the area of seabed contaminated, of less than 500 km^2.yr (*Note: a persistence of 500 km^2.yr could mean an area of 1 km^2 is contaminated for 500 years, or an area of 500 km^2 is contaminated for one year*).

Where both the rate and persistence are below the set thresholds and no other discharges have contaminated the cuttings pile, no further action is considered necessary and the cuttings pile may be left *in situ* to degrade naturally.

Leaching rates were not estimated during the survey of the Buchan cuttings pile however, as the total hydrocarbons content (THCs) concentrations in the pile is estimated at less than 1 te (Genesis 2019a) it is not possible for the OSPAR threshold of 10 te/year to be exceeded.

The chemical footprint of the cuttings pile (i.e. the area of the seabed where the concentration of THCs exceeds 50 mg/kg, see Figure 5-5) extends over an area of approximately 0.068 km^2 (Benthic Solutions, 2019a). This would need to persist for over 7,000 years to exceed a persistence of more than 500 km^2.year. Therefore the Buchan cuttings pile does not exceed the OSPAR threshold, if left undisturbed.

As mentioned previously (see Section 3.2.4.1) it is expected that the cuttings pile will be disturbed during recovery of the Buchan template. The level of disturbace to the cuttings pile will depend on whether the Buchan template piles can be cut internally or not. The presence of grout in the piles could prevent internal cutting, however, from the available records, it is considered highly likely that internal cutting will be possible.

To cut the piles internally it is expected that around 5-10% of the cuttings pile would be disturbed whilst cutting them externally would result in around 28% of the cuttings pile being disturbed during removal of the template.

As a result of this anticipated disturbance, Repsol Sinopec Resource UK Limited commissioned a BAT (Best Available Technique) assessment to determine the optimal approach for decommissioning the Buchan cuttings pile (Genesis 2019b). In accordance with OSPAR Recommendation 2006/5 the options considered in the BAT assessment were:

1. Leave undisturbed *in situ*;
2. Recover by suction dredging and dispose of by reinjection;
3. Recover by suction dredging, treat and discharge offshore;
4. Recover by suction dredging, transport for treatment onshore, coastal discharge of aqueous waste, reuse or disposal of treated solids; and
5. Spreading of cuttings pile using a dredger.

The assessment undertook a high level comparative evaluation of several key environmental aspects (resuspension of the cuttings material, emissions to air (associated with vessel use), chemical use (likely to be required for reinjection), underwater noise, waste generation and accidental events for each option. In addition, safety, technical feasibility, regulatory clarity and cost were considered. Modelling was undertaken to determine the fate of the disturbed cuttings and the results were used to support the BAT assessment (Genesis 2019b).

Recovery of the Buchan template means that leaving the whole pile undisturbed (Option 1) is not a viable option. The conclusion of the comparative evaluation was that the environmental differences between Options 2 – 5 were small and, taken as a whole, the aggregated environmental impact was similar for all options, with Option 5 assigned best overall.

However when considering the non-environmental aspects there was considerable technical uncertainty over the fesibility of the Buchan wells to accommodate the recovered cuttings and the risk of implications for P&A. Technical uncertainties over the feasibility of combined dredging, uplift and treatment were also identified, resulting in lower ratings for these options.

Therefore, Option 5, which enables access to the Buchan template by dispersal of a proportion of the drill cuttings pile either by suction dredging or high pressure water jetting is concluded to be BAT.

3.2.7 Vessel Use

A range of specialist and support vessels (Table 3-5) will be required to complete the decommissioning activities. At the time of writing, specific vessels have not yet been identified, however, the types of vessel required are well known and standard performance characteristics for typical vessels have been used for the purposes of estimating energy consumption and emissions to air. By estimating the fuel use based on generic vessel types (Institute of Petroleum (IoP) Guidelines, 2000 and industry experience) and the likely duration of the work programme for each vessel, estimates of fuel consumption can be made (Table 3-5). Although the detailed schedules for the different workscopes are still to be defined, the predicted maximum estimates of vessel use have been presented.

Table 3-5: Anticipated vessel requirements and fuel usage.

Vessel type	Duration (days)[1]	Fuel consumption rate (te/day)[2]	Fuel usage (te)
Subsea decommissioning			
Remotely Operated Vessel Support Vessel (ROVSV)	80	21.5	1,720
Dive Support Vessel (DSV)	25	22	550
Reel lay vessel	28	18	504
Seabed clearance and over trawlability surveys			
Trawler (trawl sweeps and trawl trials) (if used)	16	4	64
Post decommissioning survey			
Survey vessel (assumes seabed sampling and visual surveys full length of lines and area of 500 m zones)	28	24	672
Maximum anticipated fuel use across all operations			**3,510**

1. Vessel day estimates include mobilisation, working and demobilisation. Allowance has been made for waiting on weather (10%).
2. IoP guidelines do not always have exact equivalent vessel: e.g. for the reel lay vessel – figures for a multipurpose support vessel were used.
Note: vessel days provided are worst case estimates and include mobilisation, transit and working days. Prior to contract award it is difficult to determine accurately. Final vessel days will be captured in the environmental impact assessment supporting the Marine Licence to be submitted prior to commencement of offshore activities.
If following the C&P process the option to rockdump the exposed ends of the trenched and buried pipelines and umbilical is selected it is estimated that a rockdump vessel would be required for six days (this includes mobilisation, working and demobilisation). However fewer days would be required for the DSV such that the total fuel use presented is expected to be the worst case no matter which remediation approach is selected for the exposed sections of the trenched and buried pipelines and umbilical.

3.3 Survey and Monitoring Programme

A post decommissioning site survey will be carried out on final completion of all decommissioning works. Surveys will be undertaken along all pipeline routes and at all sites where structures have been removed. Any significant debris will be recovered for onshore recycling or disposal. Independent verification of the seabed state will be obtained for the pipeline areas and installation locations and evidence of clearance will be provided to all relevant governmental and non-governmental organisations. Preference will be given to an approach not impacting on the seabed for example using side scan sonar data to show a clear seabed. However if deemed necessary by any of the stakeholders, an overtrawl trial may be carried out. The EA assumes a worst case of an over trawl trial being carried out.

Inspections of the pipelines and umbilicals decommissioned *in situ* will be carried out to confirm that no further exposures develop and that existing rock berms have maintained their position. The timeline for inspections will be agreed with OPRED.

A post decommissioning environmental seabed survey (centred on the sites of the subsea structures and those sections of pipelines and umbilicals where remedial activities are required) will be carried out. The objective of the survey is to identify any chemical or physical disturbances to the seabed following decommissioning and to provide a baseline from which future surveys can be compared. The survey reports will be submitted to OPRED and a post monitoring survey regime will be agreed.

4. COMPARATIVE ASSESSMENT

4.1 Introduction

OPRED's Guidance Notes on the decommissioning of offshore installations and pipelines (BEIS, 2018) provide for a case by case consideration of pipeline decommissioning alternatives on the basis of a CA.

A CA was carried out in line with the OGUK Guidelines for CA (OGUK, 2015). The CA Report (Repsol Sinopec Resources UK Limited, 2019b), submitted in support of the draft DPs provides full details of the assessment carried out for the decommissioning of the Buchan and Hannay pipelines and umbilicals. This chapter summarises the process followed and the results of the CA.

4.2 Pre-Screening of Decommissioning Options

In order to facilitate the CA workshop, and as per standard CA methodology, the Buchan and Hannay pipelines and umbilicals were split into groups dependent on:

- Type (flexible or rigid);
- Whether or not they were concrete coated; and
- Whether they were trenched and buried or surface laid.

The pipeline and umbilical groupings were as identified in Table 4-1.

Table 4-1: Pipeline and umbilical groupings used for the CA.

Group ID	Component type / as-laid condition	Pipeline/umbilical
A	- Concrete coated rigid pipeline -Trenched	PL401 export line to Forties Charlie platform
B	-Rigid pipeline -Surface laid	PL126 export line from riser to tie in to PL401 PL128 Production line to well B8 PL3026 Production line to well B7 PL170B Gas lift line to well B4a PL772 Water injection line to well B4a PL3017 Gas lift line to well B7 PL597A Water injection line to well B9
C	-Rigid pipeline -Trenched and buried	PL1865A/PL1866 Redundant production and gas lift lines to Hannay PL1865 Production line to Hannay
D	-Flexible pipelines and umbilicals -Surface laid	PL4210 Gas lift line to well B8 PL597B Gas lift line to well B9 PLU2551JB4 Umbilical to well B4 PLU2551JB4X Redundant umbilical to suspended well 21/01-4 PLU2550JB7H Umbilical to well B7 PLU2550JB8H Umbilical to well B8 PLU2550JB9 Umbilical to well B9
E	-Umbilical -Trenched and buried	PLU1867 Hannay main umbilical

Prior to the CA a pre-screening of a wide range of the potential decommissioning options for the pipeline and umbilical groups was carried out. Options considered included:

Option 1A: Total removal by reverse reeling.

Option 1B: Total removal by reverse s-lay.

Option 1C: Total removal by cut and lift.

Option 2A: Partial remediation: rock cover exposed sections.

Option 2B: Partial remediation: trench and bury exposed sections.

Option 2C: Partial remediation: cut and remove exposed sections.

The total removal options (1A to 1C) refer to total removal of the pipelines or umbilicals. The partial remediation options (2A to 2C) refer to leaving the buried pipelines and umbilical *in situ* and remediating the exposed sections.

In the pre-screening each of the groupings were assessed against the above options. A qualitative assessment taking into account safety, environment, technical, societal and economic impacts was carried out using a Red-Amber-Green (RAG) evaluation method. The pre-screening is detailed in the CA Report submitted with the DPs (Repsol Sinopec Resources UK Limited, 2019b). The results of the pre-screening of the decommissioning options are shown in Table 4-2.

Table 4-2: Results of the decommissioning options pre-screening assessment.

Pipeline / umbilical group	Full removal			Partial remediation		
	1A	1B	1C	2A	2B	2C
Group A	X (NTF)	X (SO)	✓	✓	✓	✓
Group B	✓	X (SO)	✓	✓	✓	X (NA)
Group C	✓	X (SO)	X (SO)	✓	✓	✓
Group D	✓	X (NA)	✓	✓	✓	X (NA)
Group E	✓	X (NA)	X (SO)	✓	✓	✓

✓	Selected for assessment in the CA	X (NTF)	Not technically feasible	X (SO)	Screened out	X (NA)	Not applicable

4.3 Comparative Assessment Approach and Results

For all options selected for each of the Groups, scoring at the CA was carried out against safety, environment, technical feasibility, societal impacts, and economics. Within each of these criteria a number of sub-criteria were considered.

The conclusions of the CA are that Repsol Sinopec Resources UK Limited propose to recover all surface laid pipelines and umbilicals (Groups B and D) whilst the trenched and buried pipelines (Groups A and C) and umbilical (Group E) will be decommissioned *in situ* with remediation of the exposed ends or mid-line sections.

The CA process identified that all remediate *in situ* options are acceptable, such that all three will be carried through the C&P tendering phase. The preferred remediation options will be to trench and bury or to cut and recover the exposed ends. Should the option to rock cover the exposed sections be considered more favourable during the C&P tendering phase, Repsol Sinopec Resources UK Limited will engage with OPRED before a decision is taken on the overall strategy.

5. ENVIRONMENTAL BASELINE

5.1 Introduction

This section describes the environment and the environmental receptors in the vicinity of the Buchan and Hannay fields and has been prepared with reference to available literature and the results from a pre-decommissioning environmental survey carried out across the fields between September and November 2018 (Benthic Solutions Ltd., 2019a, 2019b and 2019c).

5.2 Pre-Decommissioning Environmental Survey

As part of the pre-decommissioning survey a combination of geophysical and acoustic datasets, physical seabed samples and high definition seabed imagery were acquired. Following acquisition of acoustic data, seabed photography/video was used to ground-truth all key seabed habitats identified in the acoustic data.

The main objectives of the environmental survey were to:

- Establish the current gradients of Physical, Chemical and Biological (P/C/B) perturbation within:
  - The 500 m zone of the Buchan FPU location and the 500 m zone at the Hannay drill centre;
  - 100 m corridors around the associated pipelines and umbilicals (50 m either side of each line).
- Identify and quantify any species/features of conservation importance near to the infrastructure to be decommissioned; and
- Determine the P/C/B characteristics of the drill cuttings, associated with the Buchan and Hannay fields, in line with OSPAR Recommendation 2006/5, the OLF/NOREG Guidance 2016 and OSPAR Guidelines for the Sampling and Analysis of Cuttings Piles (Agreement 2017-03).

Figure 5-1 shows the location of the grab samples in excess of 50 m from each drill location and along the pipeline routes (total of 61 stations). Stills/video were also collected at all of the grab sample locations. Grab samples and stills/video were taken at two additional reference locations: REF_01 (4,400 m SW of Buchan B4 well) and REF_02 (7300 m W of Hannay).

A further 19 stations were sampled across the seven well locations as shown in Figure 5-2. At most of these 19 stations, a sample was taken at the top, middle and bottom layers of the discharged cuttings (see Table 5-2 for those stations where only one or two layers were sampled).

This section refers to the 61 sample locations out with the cuttings as the EBS (Environmental Baseline Survey) samples, whilst the 19 samples taken within the cuttings will be referred to as the cuttings samples[1].

[1] Note: as described in the footnote in Section 3.1, only the cuttings discharged at the Buchan template are considered to comprise a cuttings pile.

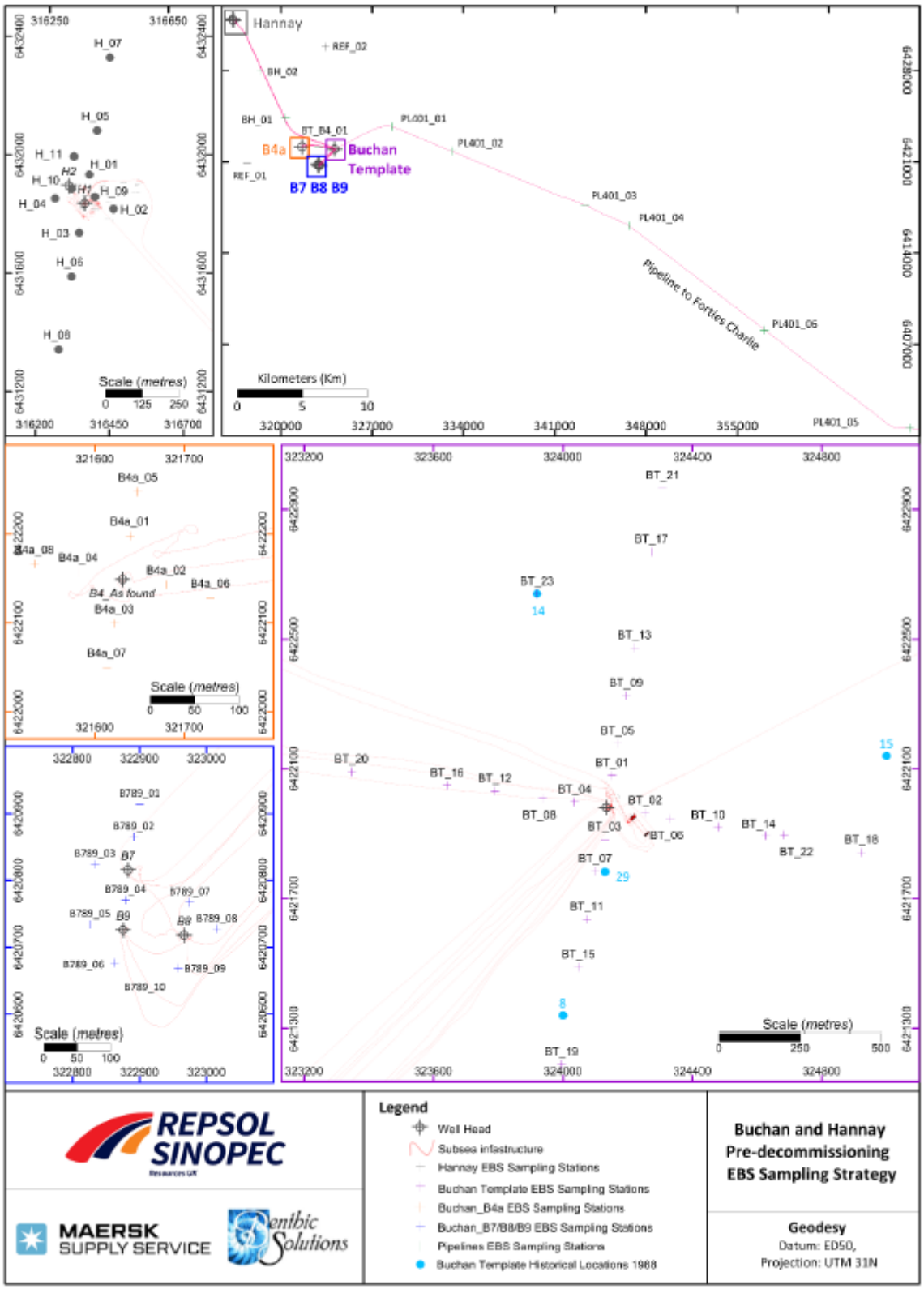


Figure 5-1: Locations of the EBS grab samples (and video/photography) collected during the pre-decommissioning survey Note at location H-9 and BT-22 only video transects were acquired. (Benthic Solutions Ltd., 2019b).

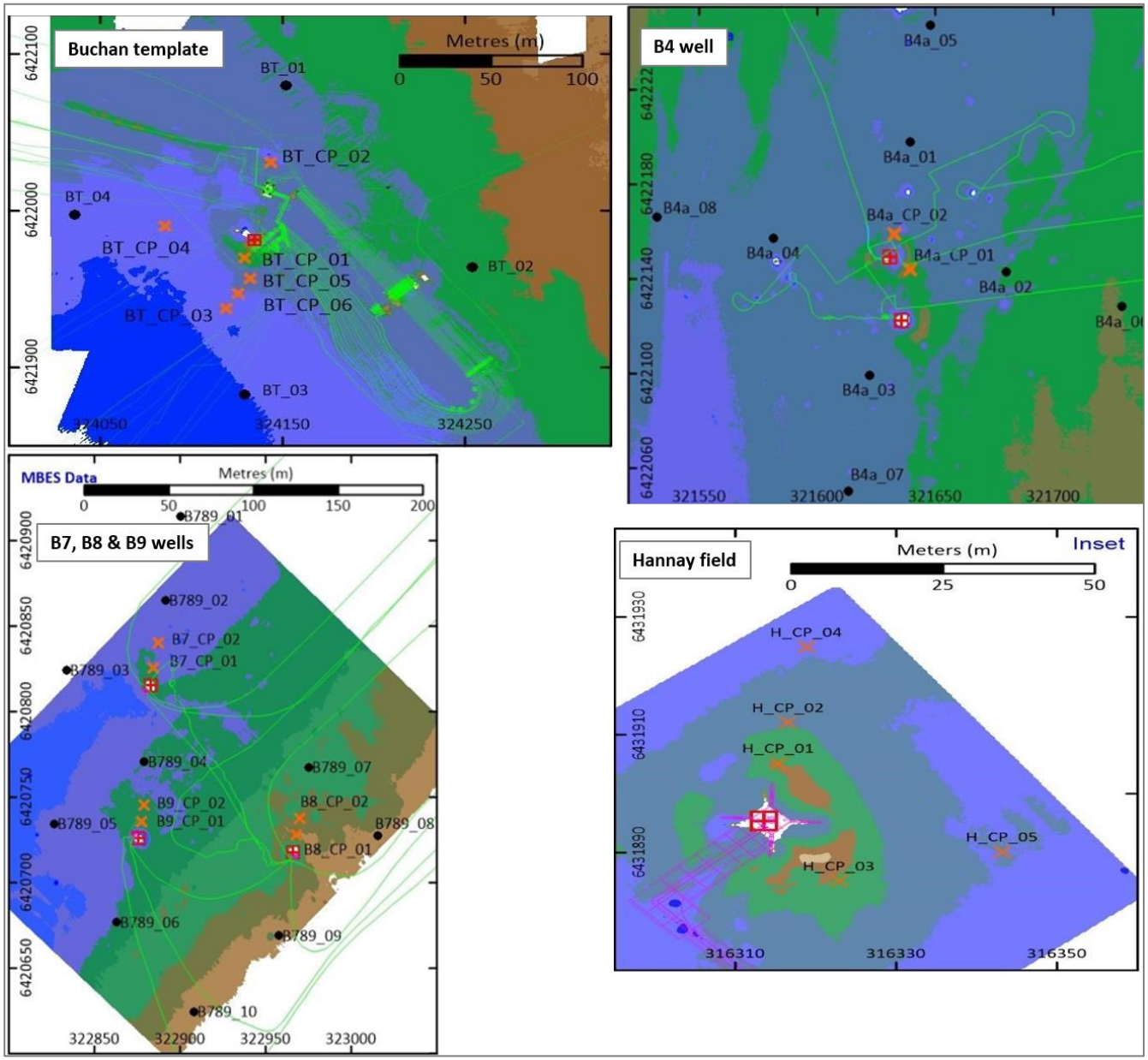


Figure 5-2: Location of the cuttings samples taken at each well (locations indicated with an orange X) (Benthic Solutions Ltd, 2019a).

5.3 Metocean Conditions

Metocean (meteorological and oceanographic) conditions including bathymetry, currents, tides and circulation patterns all influence the type and distribution of marine life and the behaviour of emissions and discharges from offshore facilities. For example, the speed and direction of water currents have a direct effect on the transport, dispersion and ultimate fate of any discharges from a vessel or installation (Benthic Solutions Ltd., 2019a).

5.3.1 Bathymetry

Water depths within the area of the Buchan and Hannay fields range from:

- 107 – 122 m at the Buchan field;
- 120 – 125 m at the Hannay field; and
- 108-139 m along the export pipeline to the Forties Charlie platform.

The slope gradient across the fields is considered very minor such that the seabed is generally considered flat throughout (Benthic Solutions Ltd, 2019c).

5.3.2 Hydrology

Water masses, and local current speeds and direction all influence the transport, dispersion and fate of marine discharges. The major water masses in the North Sea can be classified as Atlantic water, Scottish coastal water, Northern North Sea water, Norwegian water, CNS water, Southern North Sea water, Jutland water and Channel water (Turrell, 1992). The Buchan and Hannay fields are located in the area influenced by the Northern North Sea water mass (Figure 5-3). The predominant regional current in the CNS originates from the vertically well-mixed coastal water and Atlantic water inflow of the Fair Isle/Dooley current, which flows around the north of the Orkney Islands and into the North Sea.

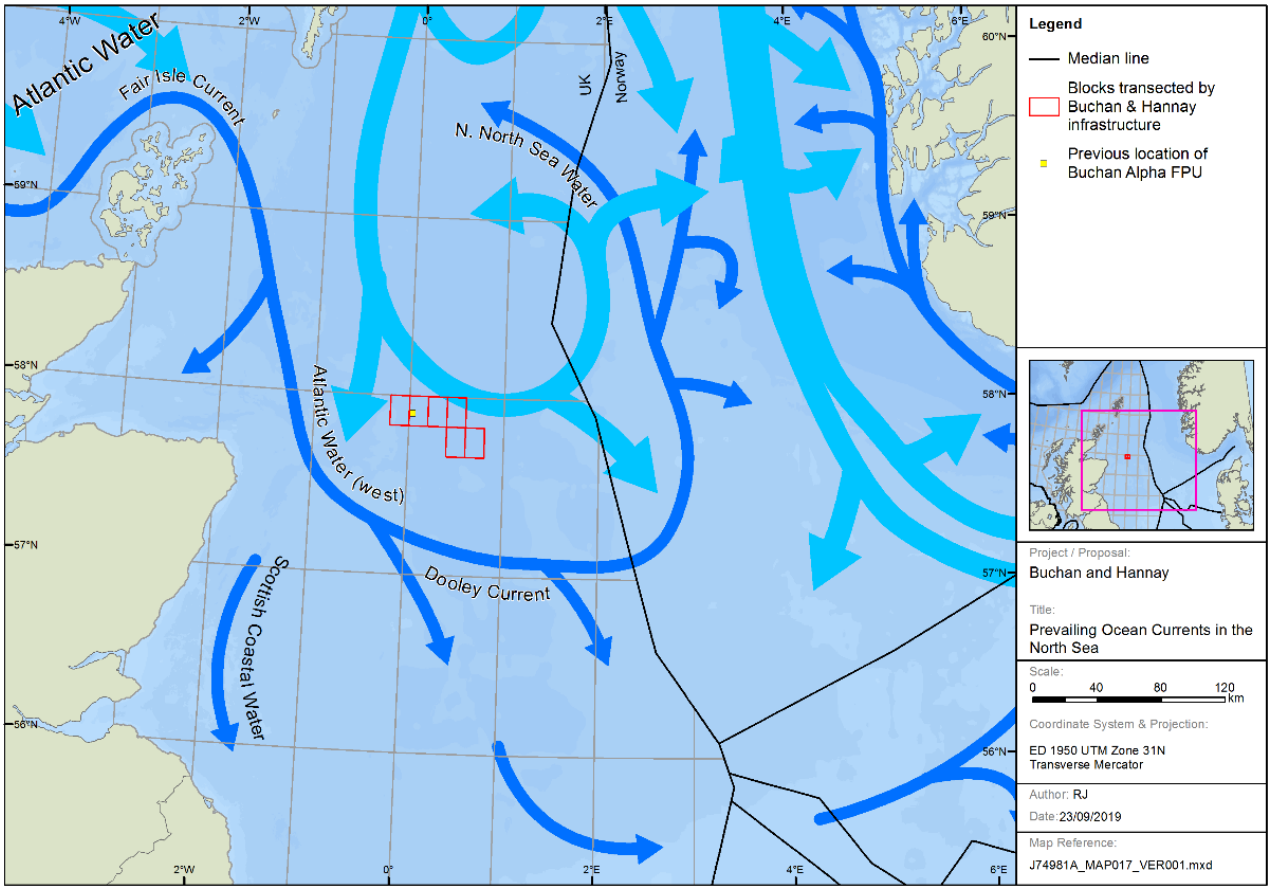


Figure 5-3: General circulation in the North Sea (Turrell, 1992).

Mean significant wave heights in the area are 2.2 m and as can be seen from Figure 5-4a around 65-70 % of the waves in the area originate from a north / northwest or south direction.

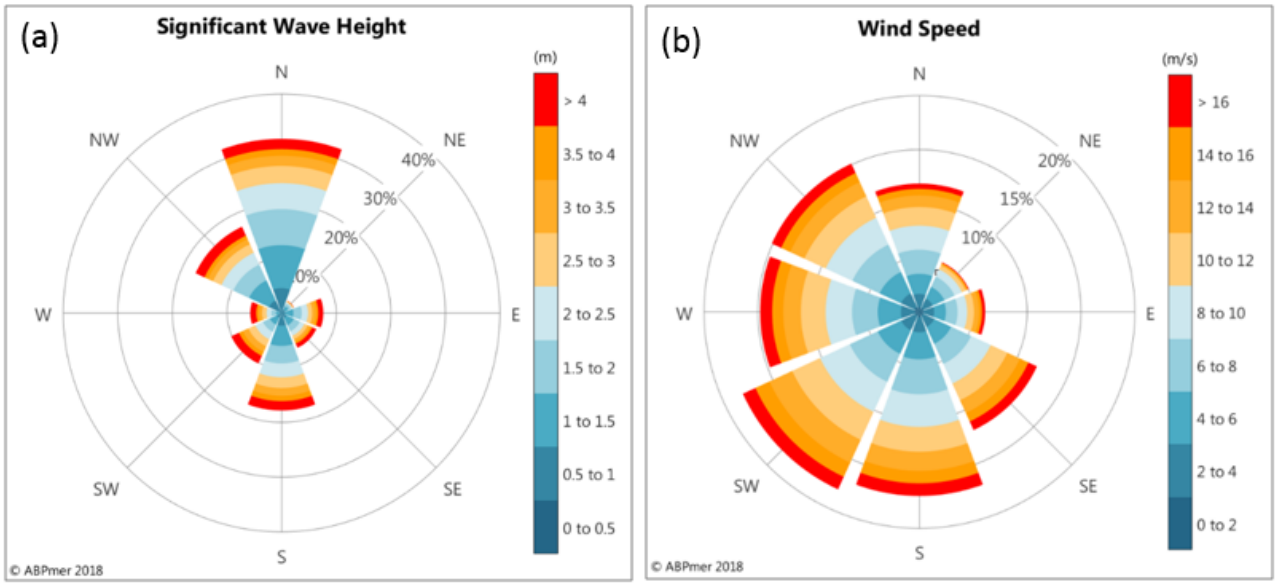


Figure 5-4: Wave rose (a) and wind rose (b) for the Buchan and Hannay area (Data Explorer, 2018).

The mean spring tidal range within the area is 1.1 – 2.0 m and the annual mean wave power is 25.26 kW/m (Scottish Government National Marine Plan Interactive (NMPi)).

5.3.3 Meteorology

Wind speed and direction directly influence the transport and dispersion of atmospheric emissions. These factors are also important for the dispersion of water borne emissions, including oil, by affecting the movement, direction and break up of substances on the sea surface. Mean wind speed in the area is 8.8 m/s and as can be seen from Figure 5-4b, winds in the area originate from all directions though primarily from the south / southwest / west and northwest.

5.3.4 Sea Temperature and Salinity

Sea surface temperature and salinity in the area are governed by the flow of oceanic Atlantic waters into the North Sea through the Fair Isle Channel (Turrell, 1992). According to data collected between 1971 and 2000, the annual mean seawater surface temperature in the Buchan and Hannay area is *c.* 10 °C and the annual mean temperature at the seabed is between 8 °C (Scottish Government NMPi).

Salinity in the area shows little seasonal variation through the water column with annual mean salinity near the seabed equalling 35.1 % and 35.02 % in surface waters (Scottish Government NMPI).

5.4 Seabed Characteristics out with the Cuttings

This section focuses on the results of the analysis of the EBS samples. Those samples taken within the discharged drill cuttings are discussed in Section 5.5.

5.4.1 Particle Size Distribution

The mean sediment particle size recorded in the EBS samples ranged from 0.01 mm to 0.13 mm demonstrating variability in the proportions of silts, clays, sands and gravels recorded around a generally sandy profile (Benthic Solutions Ltd, 2019b). The average sediment composition across the samples was:

- Fines: mean 53.33 % ±11.99 SD (standard deviation)
- Sand: mean 49.02 % ± 11.99 SD
- Gravel: mean 0.66 % ± 1.76 SD.

Fine sediments (< 63 µm) were present at all stations and exhibited a low overall coefficient of variation (24.73 %) as expected in the CNS region. The seabed near the Buchan template presented a coarser sediment with higher proportion of shell debris (*Mytilus edilus*) induced by the presence of the infrastructure changing the near-seabed current flows and increasing the ecosystem diversity and from the dispersal of mollusc shells growing on the structures themselves.

The Wentworth Classification[2] scale identified five different sediment classifications ranging from very fine silt to fine sand with 81 % of stations described as coarse silt. A comparison of the particle size distribution dataset by Wentworth Classification indicated that the majority of samples showed a bi-modal distribution spiking in the silt (i.e. silts and clays, 63 µm) and sand fractions (> 63 µm and < 200 µm).The geographical distribution of sandy sediment peaked at three sites: sample H_10 located 50 m south of the Hannay H2 well; sample BT_02 located 100 m east of the Buchan template; and sample BT-04 located 100 m west of the Buchan template. Across these samples percentage sands ranged from *c.* 68 % to 76 % and are expected to be associated with the discharged cuttings from the upper sections of the wells (i.e. those cuttings discharged at the seabed prior to the riser being installed). Habitat classifications associated with these sediment compositions are discussed in Section 5.6.2.1.

5.4.2 Sediment Hydrocarbons

5.4.2.1 Total Hydrocarbon Concentrations

Across the EBS samples, similar THC concentrations (ranging from 5.06 $mg.kg^{-1}$ to 21.0 $mg.kg^{-1}$) were noted between the samples taken at the Hannay field, at the remote Buchan wells (i.e. at wells B4a, B7, B8 and B9) and along the export pipeline route. Results from analysis of these samples also suggested there was no spatial distribution with respect to the proximity of the samples collected at these locations from the well infrastructure. In addition, THC concentrations at all these locations were well below the UKOOA 95th percentile (40.1 $mg.kg^{-1}$) and none of the levels were significantly higher than the mean of the reference locations (12.5 $mg.kg^{-1}$).

Higher THC concentrations (ranging from 5.59 mg.kg-1 to 407 $mg.kg^{-1}$) were recorded in the samples taken at least 100 m from the Buchan template, however it should be noted that the THC concentrations exceeded the UKOOA 95th percentile in only two samples (BT_03 at a concentration of 407 $mg.kg^{-1}$ and BT_05 at a concentration of 60.1 $mg.kg^{-1}$). THC concentrations were higher than the mean of the reference locations in all but six of the Buchan template samples.

5.4.2.2 Polycyclic Aromatic Hydrocarbons

Total Polycyclic Aromatic Hydrocarbons (PAHs) concentrations within the EBS samples showed a similar pattern to the THC concentrations for those samples taken at least 50 m from the well locations in that the highest concentrations of PAHs were found in those samples taken around the Buchan template (ranged from 83.7 $ng.g^{-1}$ to 694 $ng.g^{-1}$). PAH concentrations in samples taken (i.e. samples other than the cuttings samples) at the Hannay field, at the remote Buchan wells (wells B4a, B7, B8 and B9) and along the export pipeline route ranged from 70.1 $ng.g^{-1}$ to 388 $ng.g^{-1}$ and showed a direct negative correlation between concentration and distance from the B7, B8 and B9 wells. Such a correlation with distance was not evident at the B4a or Hannay well location. It should be noted that the PAHs in all these samples fell below the US Environmental Protection Agency toxicity reference value of 870 $ng.g^{-1}$ and the NOAA effect range low of 552 $ng.g^{-1}$ with the exception of one sample at the Buchan template: sample BT-05 located *c.* 100 m from the Buchan template which had a PAH concentration of 694 $ng.g^{-1}$. However it should be noted that all of the PAH concentrations in these samples fell within the range of PAH values (20 to 74,700 $ng.g^{-1}$) recorded by Cefas for sediments surrounding North Sea oil and gas installations. PAH concentrations across all of the surveyed area exceeded the background location mean (191 $ng.g^{-1}$) at the majority of stations.

5.4.2.3 Other

Three stations within 50 – 100 m of the Hannay wells showed refined peaks in the nC13-nC15 range which was thought to be indicative of low toxicity or synthetic drilling mud (Benthic Solutions Ltd., 2019c). A further petrogenic signature indicative of heavy weight oil was observed at four stations located up to 200 m north and east of the Buchan template, with trace signatures evident up to 350 m away. The spatial differentiation of these

2 The Wentworth Classification assigns a single sediment classification based upon the average size class for the distribution.

hydrocarbon contamination signatures is consistent with likely sources from historical drilling at the Hannay and Buchan template wells.

5.4.3 Heavy Metals

Drilling activities tend to result in increased concentrations of a number of metals in the surrounding seabed. This section summarises the results of the analysis on the EBS samples taken as part of the pre-decommissioning survey. All information provided was taken from the Benthic Solutions Ltd. report (2019c).

Elevated levels of natural barium, exceeding the UKOOA 95th percentile for the CNS (523 mg.kg^{-1}), were recorded at 56 of the 61 stations sampled outwith the cuttings piles (Benthic Solutions Ltd., 2019c). Stations within 100-200 m north and east of the Buchan template displayed higher levels (up to 11,800 mg.kg^{-1}) than any of the other stations. However, these levels were below levels recorded by Cefas within 500 m of active UK platforms where concentrations in the thousands of mg.kg^{-1} (33,562.12 mg.kg^{-1}) have been recorded (Cefas, 2001). Barium concentrations at the majority of the sample stations exceeded the mean of the reference locations (850 mg.kg^{-1}).

Cadmium levels were found to exceed the UKOOA 95th percentile (0.12 mg.kg^{-1}) at 19 of the EBS sample locations, of which eight were found in the Hannay field. The highest recorded level of 0.4 mg.kg^{-1} was recorded at BT_02 located *c.* 100 m from the Buchan template. Lower levels were found along the pipeline routes with all but one station (PL401_03, 0.1 mg.kg^{-1}) recording concentrations below the level of detection. Cadmium levels at the reference locations were below the levels of detection.

Average chromium concentrations were higher within the Buchan template samples (mean 36.18 mg.kg^{-1}) than they were at the Hannay wells (mean 26.89 mg.kg^{-1}), the B4 well (mean 20.24 mg.kg^{-1}) or at the B7, B8 or B9 wells (mean 28.90 mg.kg^{-1}). The mean of the reference locations was 21.05 mg.kg^{-1}. Chromium levels within three of the samples (BT_01, 124.5 mg.kg^{-1}; BT_03, 91.6 mg.kg^{-1}; BT_05, 97.2 mg.kg^{-1}) exceeded the NOAA effect range low (81 mg.kg^{-1}; Long *et al*, 1995).

Concentrations of copper were found to be relatively high across all survey areas, with 90% of stations exceeding the UKOOA 95th percentile for the CNS (6 mg.kg^{-1}) and all but three stations exceeding the reference location mean (5.55 mg.kg^{-1}). The three stations showing the highest concentrations were the same three showing highest concentrations for chromium: BT_01, 279.4 mg.kg^{-1}; BT_03, 285.2 mg.kg^{-1} and BT_05, 298.4 mg.kg^{-1}).

With respect to zinc concentrations, 92% of stations recorded levels exceeding the UKOOA 95th percentile for zinc levels in the CNS (32.59 mg.kg^{-1}) and most of the stations exceeded the mean of the background locations (38.85 mg.kg^{-1}). Six of the Buchan template samples (taken within 350 m distance of the Buchan template) had zinc levels at considerably high levels with a maximum concentration of 1,845.5 mg.kg^{-1} recorded at BT_01.

Mercury concentrations were below level of detection to low at the reference locations and at all stations excluding those close to the Buchan template where levels at three stations (BT_01, 0.35 mg.kg^{-1}; BT_03, 0.46 mg.kg^{-1}; BT_05, 0.23 mg.kg^{-1}) exceeded the UKOOA 95th percentile for the CNS (0.12 mg.kg^{-1}).

5.5 Drill Cuttings

Side scan sonar and multibeam echo sounder data was used to determine the boundaries of the discharged cuttings at each of the well locations, giving the area, height and volume of the cuttings. These results are summarised in Table 5-1 and illustrated in Figure 5-5 to Figure 5-8.

Table 5-1: Characteristics of the 'cuttings piles' associated with each well location.

Well location	Cuttings area (footprint) (m^2)	Cuttings volume (m^3)	Highest point above natural seabed (m)	Number of wells	Area exceeding OSPAR 50 ppm (m^2)
Buchan Template	3,731	828	1.3	5	68,000
B4a	68	60	-*	1	1,096
B7 (21/01a-10)	40	24	between 0.30 and 0.40	1	0
B8 (21/01a-08)	110	82		1	1,149
B9 (21/01a-14)	55	36		1	0
Hannay H01 (20/05c-8X)	235	15	-*	1	1,050
Hannay H02 (20/05c-9)	1,615	312	0.7	1	1,677
* Not reported, however given the minimal volumes of cuttings, the highest points at these wells are expected to be less than those recorded at the B7, B8 and B9 wells and therefore < 0.40 m.					

In summary the largest volume of cuttings was observed at the Buchan template, covering an area of 3,731 m^2 with a volume of 828 m^3 (Figure 5-5). These cuttings comprise discharges from five wells and are considered to comprise a cuttings pile. The pile measured 550 m long, 200 m wide, aligning with the prevailing current direction. The highest point of the pile was estimated to be approximately 1.3 m above the natural seabed. The pile height decreased rapidly to less than 50 cm above natural seabed at 15 m south of the template, while to the north of the template the pile height did not exceed 20 cm above the seabed. Oil content within the pile is estimated to be less than 1 te.

The cuttings surrounding the Hannay H02 well was less than half the volume (312 m^3) of the pile recorded at the Buchan template (Figure 5-6). The extent of the H02 well cuttings covered an area of 1,615 m^2 and the highest point of the discharges was estimated to be 0.7 m above the natural seabed layer within a 10 m range around the wellhead location.

Much smaller volumes of cuttings were observed at the remaining five wells (Table 5-1 and Figure 5-6 to Figure 5-8).

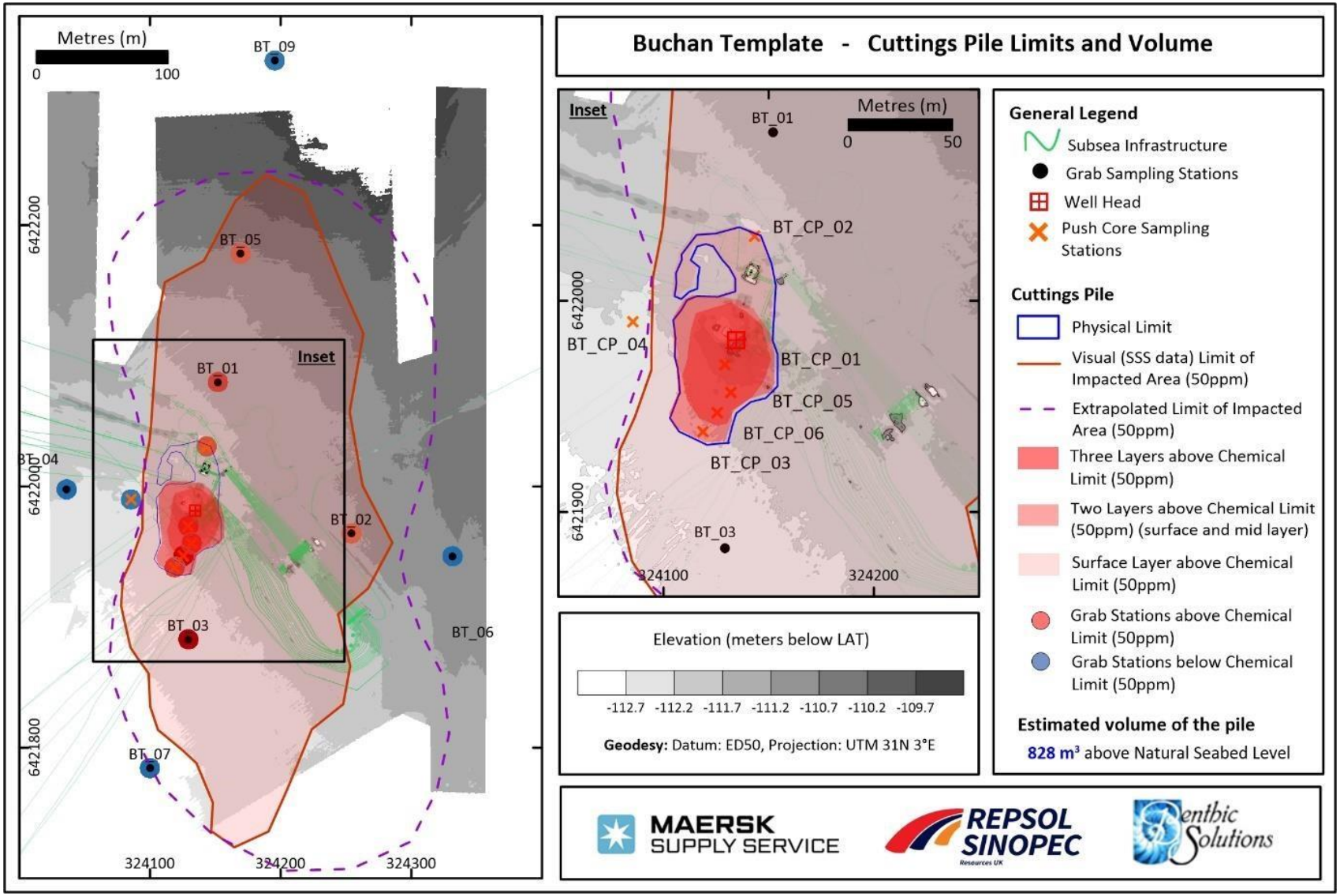


Figure 5-5: Estimated limit and volume of the cuttings pile at the Buchan template (Benthic Solutions Ltd., 2019a).

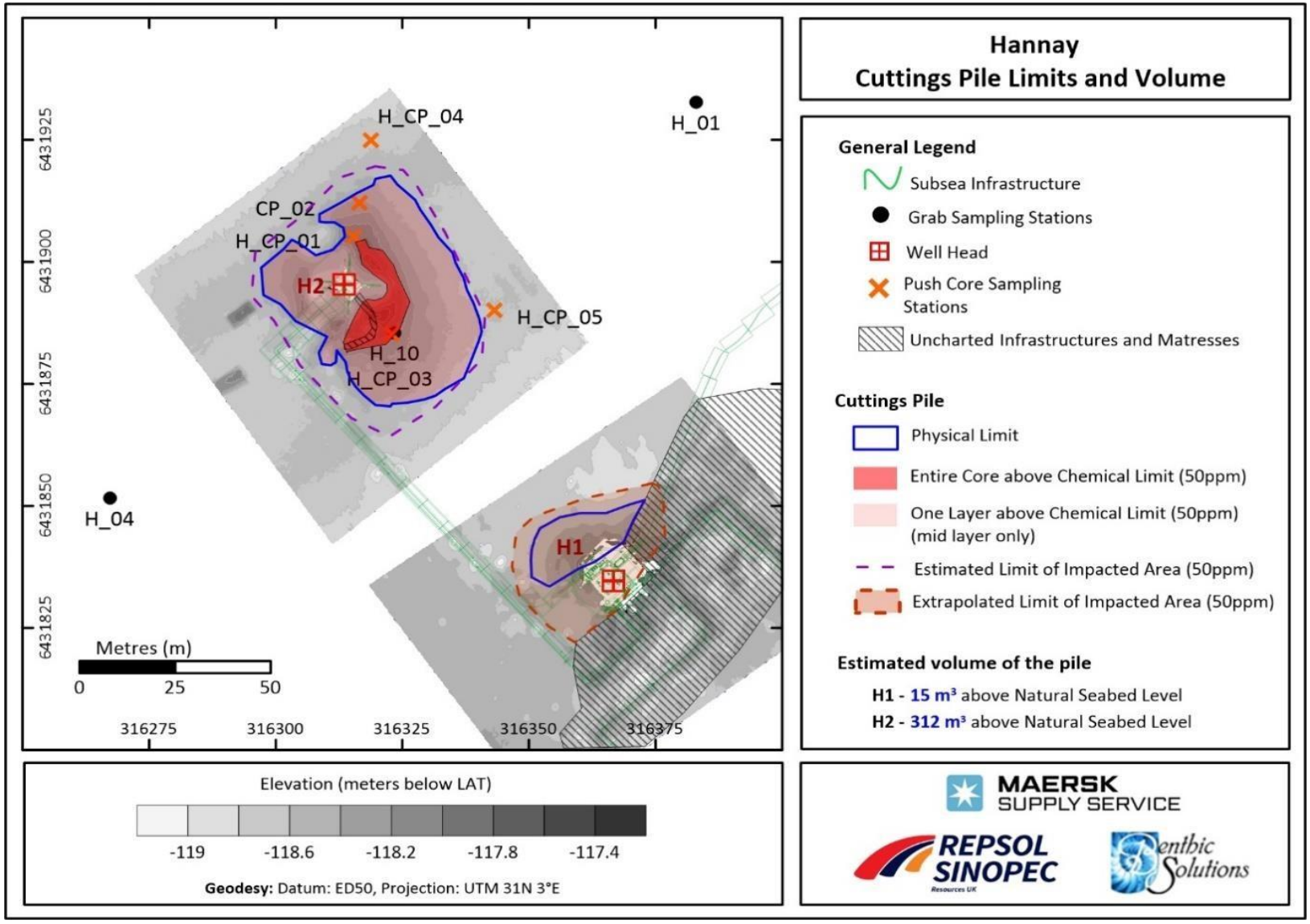


Figure 5-6: Estimated limit and volume of the cuttings at the Hannay wells (Benthic Solutions Ltd., 2019a).

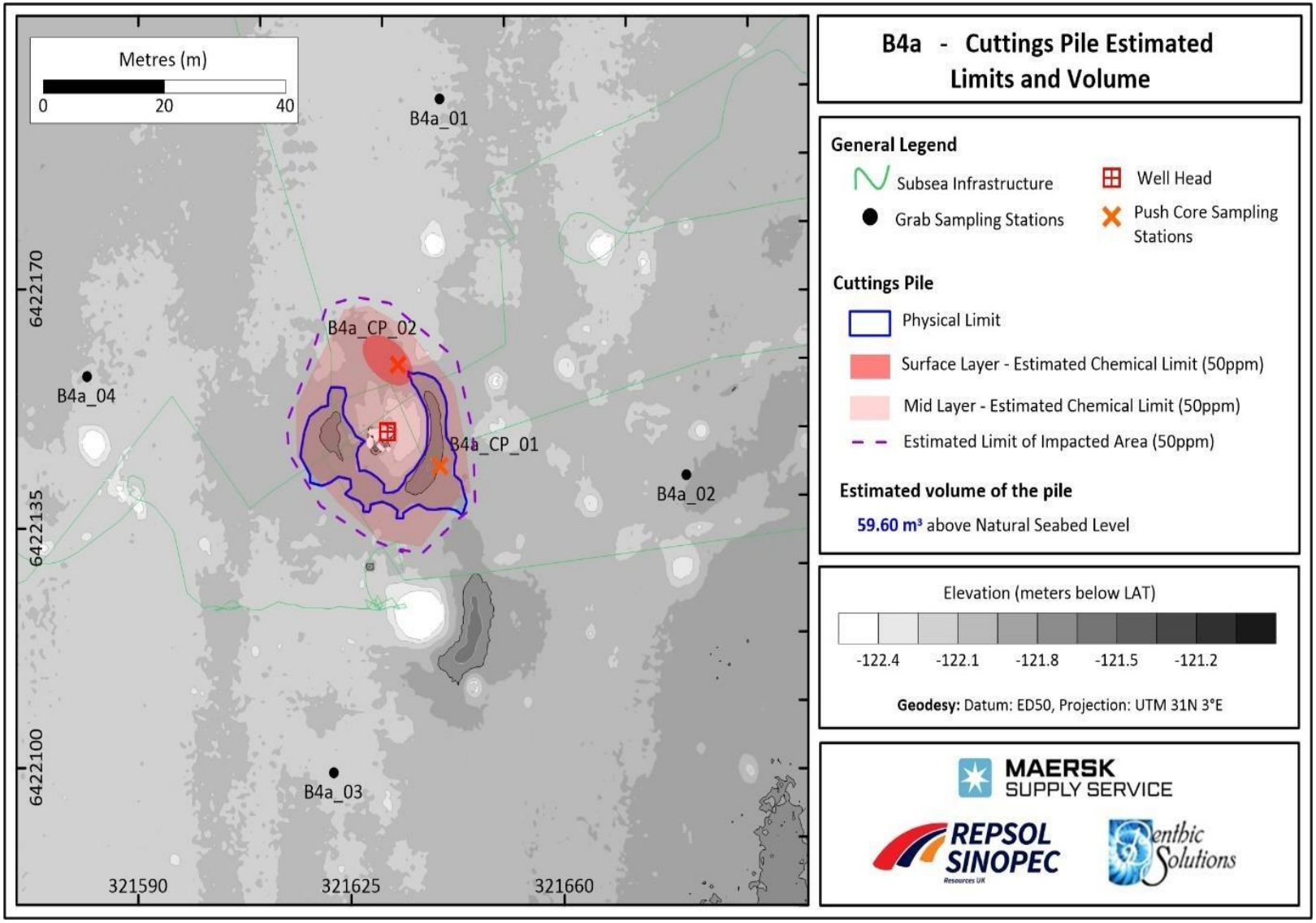


Figure 5-7: Estimated limit and volume of the cuttings at the B4a well (Benthic Solutions Ltd., 2019a).

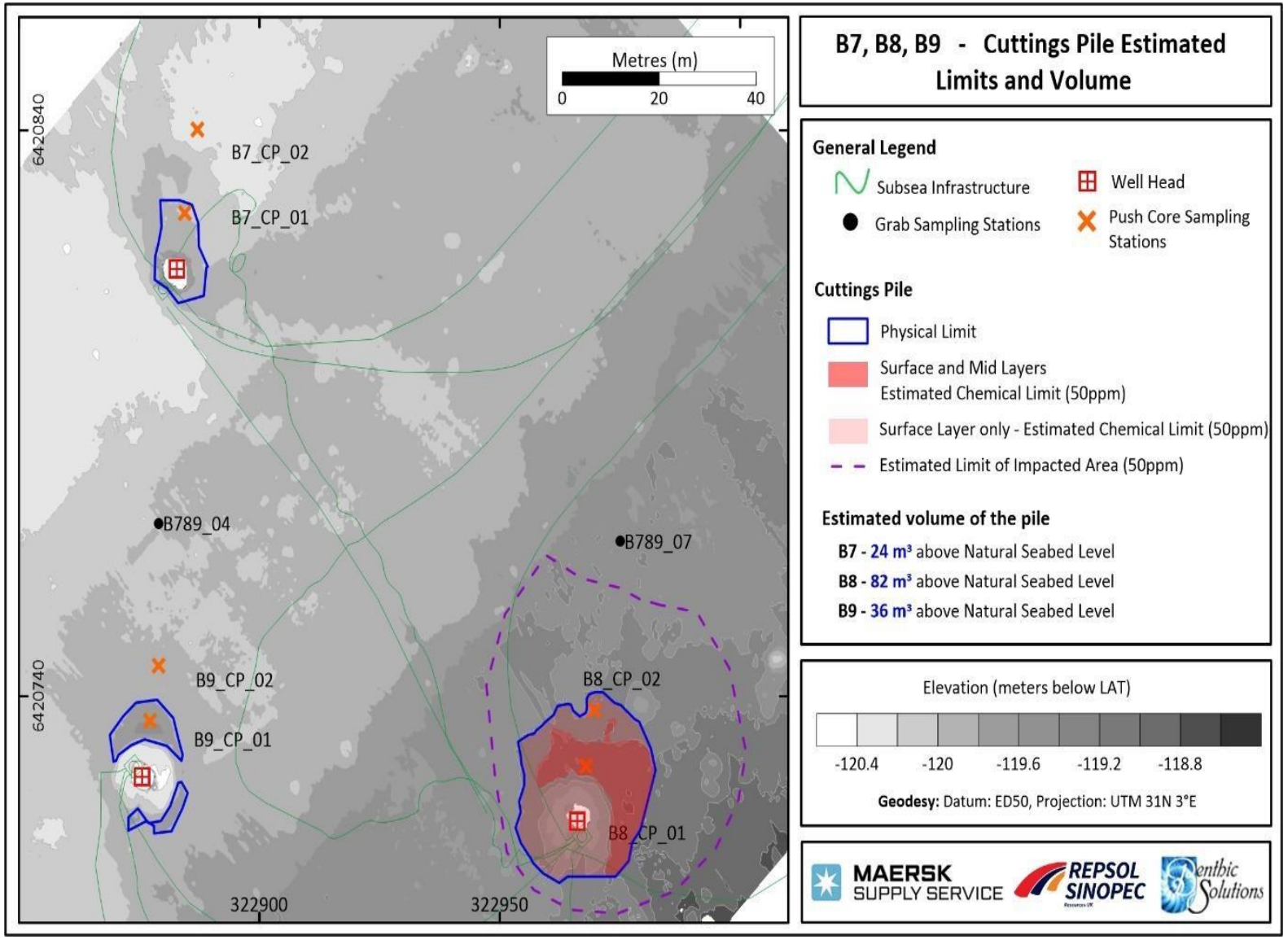


Figure 5-8: Estimated limits and volume of the cuttings at the B7, B8 and B9 wells (Benthic Solutions Ltd., 2019a).

5.5.1 Sediment Hydrocarbons

As described in Section 5.2, 19 stations were sampled to determine the composition of the cuttings discharged at each of the well locations.

5.5.1.1 Total Hydrocarbon Concentrations

Table 5-2 shows the THC concentrations recorded within each of the cuttings samples (locations of which are shown in Figures 5-5 to 5-8). THC concentrations are above the UKOOA 95th percentile (40.1 mg.kg^{-1}) for *c.* 50% of the samples, reflecting that historically OBM contaminated cuttings were discharged at these locations.

Table 5-2: THC and PAH concentrations recorded in the cuttings pile samples.

Station	Sub-layer location	Depth (cm)	Distance from well (m)	THC (mg.kg^{-1})	Total PAHs (ng.g^{-1})
Buchan template					
BT_CP_01 Along the prevailing current	Surface	0-13	13	182	685
	Mid	13-30	13	313	7,800
	Bottom	30-42	13	403	8290
BT_CP_02 Along the prevailing current	Surface	0-11.5	50	109	413
	Bottom	11.5- 53	50	11	265
BT_CP_03 Along the prevailing current	Surface	0-8.5	~50	134	446
	Mid	8.5-14	~50	118	1,170
	Bottom	14-73	~50	9.87	287
BT_CP_04 Perpendicular to the prevailing current	Surface	0-5	50	37.3	106
BT_CP_05 Along the prevailing current	Surface	0-14	~25	143	539
	Mid	14-20	~25	344	5,860
	Bottom	27-30	~25	185	2,370
BT_CP_06 Extra station between BT_CP_03 & 05	Surface	0-13	35	416	1,480
	Mid	13-32	35	115	464
	Bottom	32-64	35	157	324
Hannay drill centre					
H_CP_01 Along the prevailing current	Surface	0-32	10	10.1	<34
	Mid	32-42	10	2,680	455
	Bottom	42-84	10	6.42	450
H_CP_02 Along the prevailing current	Surface	0-21	17	2.98	63
	Mid	21-30	17	520	170
	Bottom	30-89	17	2.87	115
H_CP_03 Along the prevailing current	Surface	0-20	14	185	137
	Bottom	20-51	14	143	78
H_CP_04 Along the prevailing current	Surface	0-5	30	21.5	228
H_CP_05 Perpendicular to the prevailing current	Surface	0-20	30	42.9	242
	Bottom	20-57.5	30	2.75	59
B4 well location					
B4a_CP_01 Elevated area east of the well	Surface	0-9	10	31.5	247
	Mid	9-20	10	124	466

Station	Sub-layer location	Depth (cm)	Distance from well (m)	THC (mg.kg^{-1})	Total PAHs (ng.g^{-1})
	Bottom	20-72	10	15.8	131
B4a_CP_02 Prevailing current to the north	Surface	0-4	10	138	189
	Mid	4-19	10	1,190	1,990
	Bottom	19-59	10	6.32	80
B7, B8 and B9 well locations					
B7_CP_01 Elevated surface	Surface	0-8	10	16.7	280
	Mid	8-19	10	39.9	539
	Bottom	19-82	10	2.25	96
B7_CP_02 North elevated current	Surface	0-17	20	41.6	465
	Bottom	17-51	20	4.96	114
B8_CP_01 Elevated surface	Surface	0-11	10	3,190	48,000
	Mid	11-20	10	6,310	147,000
	Bottom	20-65	10	5.05	182
B8_CP_02 North elevated current	Surface	0-8	20	179	442
	Bottom	8-45	20	3.8	97
B9_CP_01 Elevated surface	Surface	0-18	10	8.72	195
	Bottom	18-59	10	3.11	64
B9_CP_02 North elevated current	Surface	0-21	20	11.3	276
	Bottom	21-74	20	3.18	128

5.5.1.2 Polycyclic Aromatic Hydrocarbons

Table 5-2 shows the PAH concentrations within the sediments located in the immediate vicinity of each of the wells. As can be seen from the data presented, the PAH concentrations within the samples taken from the cuttings exceeds the range of PAH values recorded by Cefas for sediments surrounding North Sea oil and gas installations (20 to 74,700 ng.g^{-1}) at just one location; mid cuttings sample taken at the B8_CP_01 which was located *c.* 10 m from the well location.

5.5.2 Comparison Against Other Cuttings Piles

The Buchan template cutting pile is well below the OSPAR Thresholds and falls under the OLF 'Small Cutting Pile' classification, indicating a relatively small impact on the surrounding sediment. Table 5-3 provides a comparison of the Buchan template cuttings pile to other Repsol Sinopec Resources UK Limited assets and other publicly available pile data.

Table 5-3: Summary of details of cuttings piles located at a number of Repsol Sinopec Resources UK Limited's installations.

Cuttings pile location	Area (m^2)	Volume (m^3)	Maximum height (m)	Survey report
Saltire A	6,580	2,455	2.4	Fugro, 2018a
Auk	5,000	2,336	1.2	Fugro, 2018b
Fulmar	11,000	18,746	6.9	Fugro, 2018c
Beatrice	1,698	678	1.4	Fugro, 2017
Buchan	3,731	828	1.3	Benthic Solutions, 2019a

5.6 Marine Flora and Fauna

5.6.1 Plankton

The plankton community in the waters around Buchan and Hannay is similar to that found over the wider CNS area (DECC, 2016).

The phytoplankton community is dominated by the dinoflagellate genus *Ceratium* (*C. fusus, C. furca, C. lineatum*), with diatoms such as *Thalassiosira spp.* and *Chaetoceros spp.* also abundant, whilst the zooplankton community is dominated by calanoid copepods, with *Paracalanus* and *Pseudocalanus* also abundant (DECC, 2016). *Euphausiids*, *Acartia*, and decapod larvae are also important components of the zooplankton assemblage (DECC, 2016).

5.6.2 Habitat Type and Benthic Communities

5.6.2.1 Habitat Type

Applying the JNCC marine habitat classification, three main habitats were identified across the Buchan and Hannay survey area. These habitat types are identified in Table 5-4 which also provides the corresponding European Nature Information System (EUNIS) classification. Figure 5-1 provides photographs of some of the habitats observed, whilst the distribution of the different habitat types across the survey area are shown in Figures 5-10 to 5-12.

Table 5-4: Habitat classifications.

Habitat	JNCC Marine Habitat Classification	JNCC Description	EUNIS Classification	EUNIS Description
Sandy silt with bioturbation and lebensspuren*	SS.SMu	Sublittoral cohesive mud and sandy mud communities	A5.3	Sublittoral mud
Sandy gravelly silt and fine shell debris	SS.SMx.OMx	Offshore circalittoral mixed sediment	A5.45	Deep circalittoral mixed sediment
Sandy silt with relic *Mytilus edulis* debris				
Sandy gravelly silt with occasional drop-stones				
Fine sand with relic shell material	SS.SSa.CFiSa	Circalittoral fine sand	A5.25	Circalittoral fine sand
*Lebensspuren are biologically formed sedimentary structures found in sediments including tracks, trails, burrows, borings, faecal casts and coprolite (fossilised faecal pellets).				

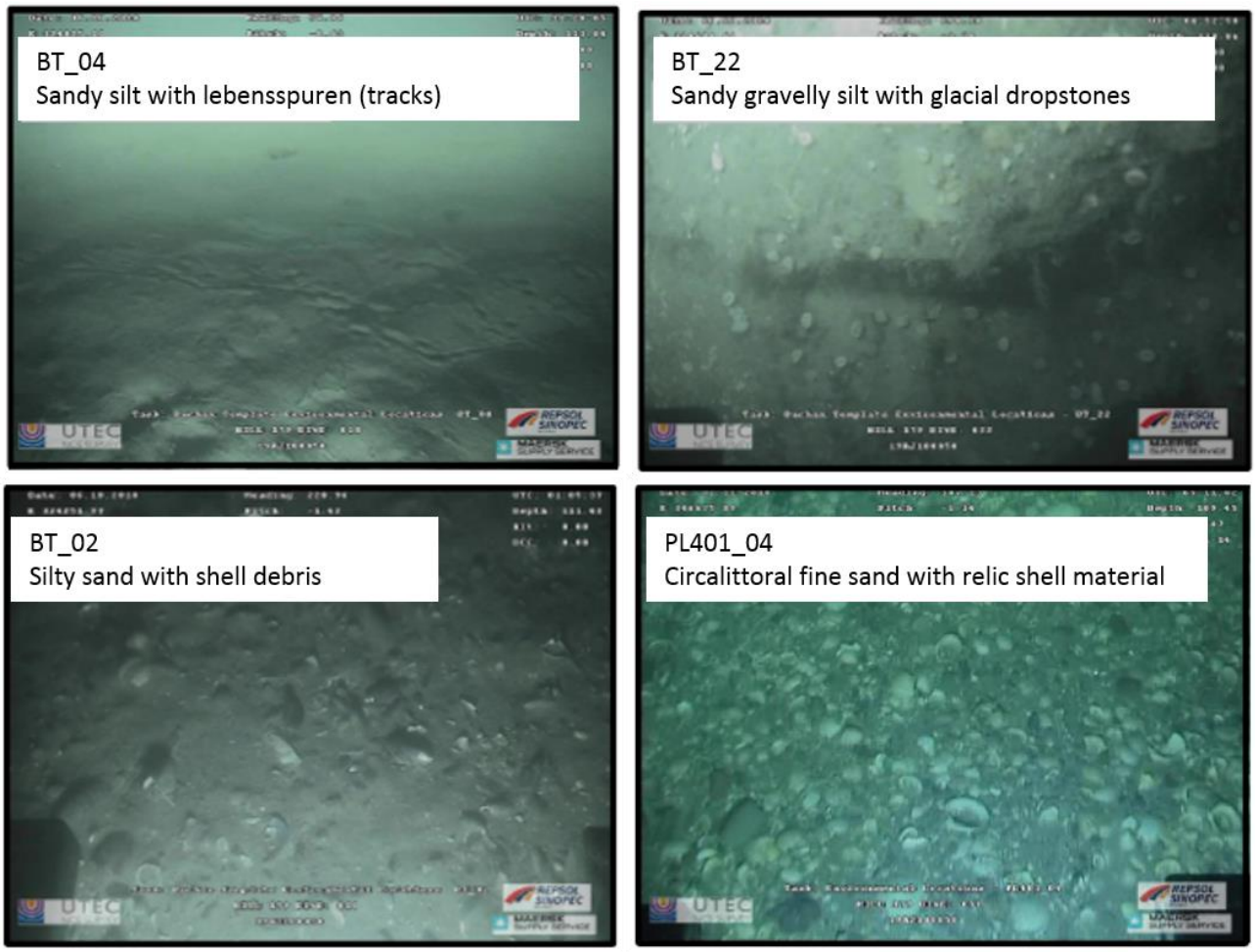


Figure 5-9: Photographs of different habitat types observed in the project area (Benthic Solutions Ltd, 2019b).

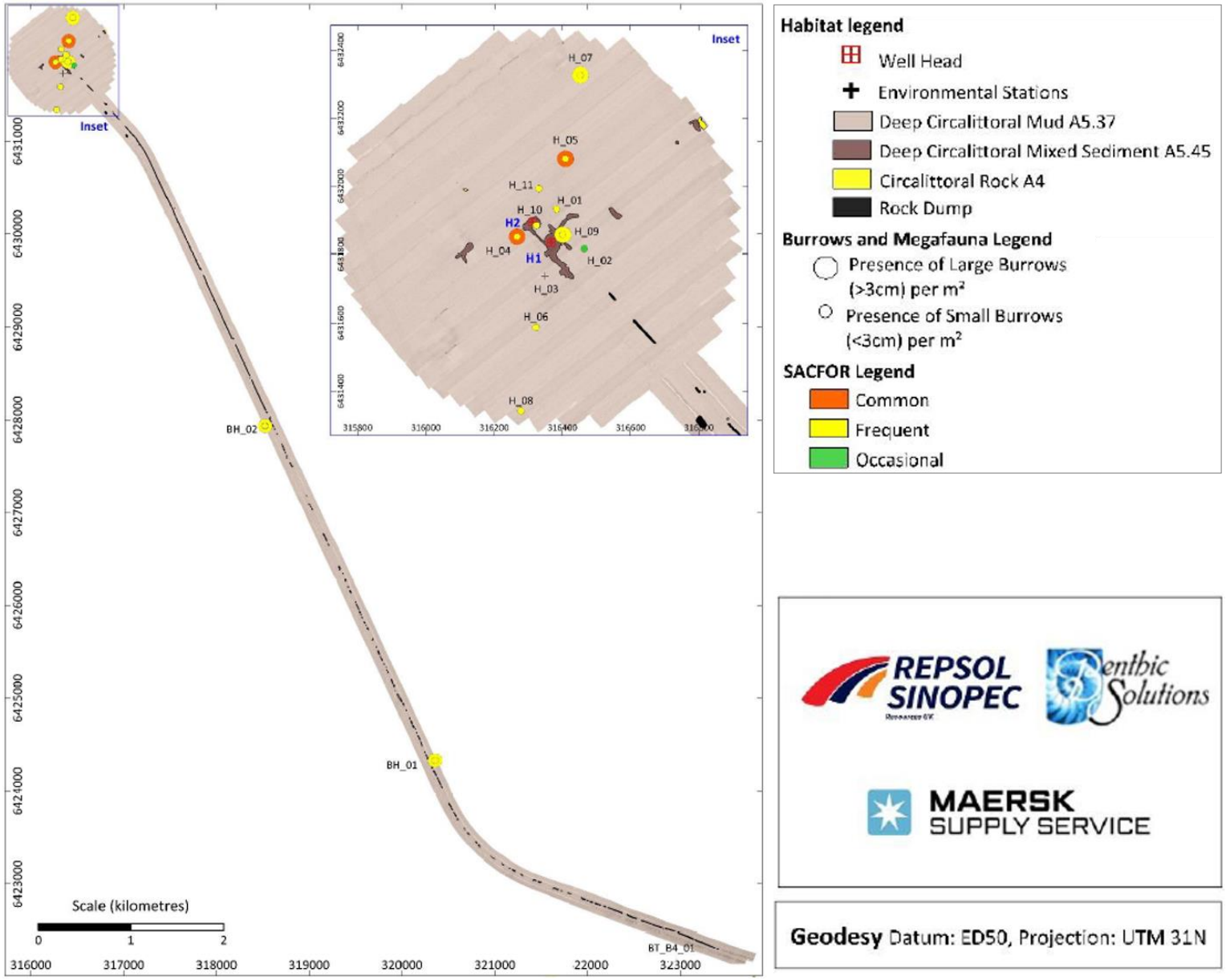


Figure 5-10: Distribution of habitat types at the Hannay field (Benthic Solutions Ltd, 2019b).

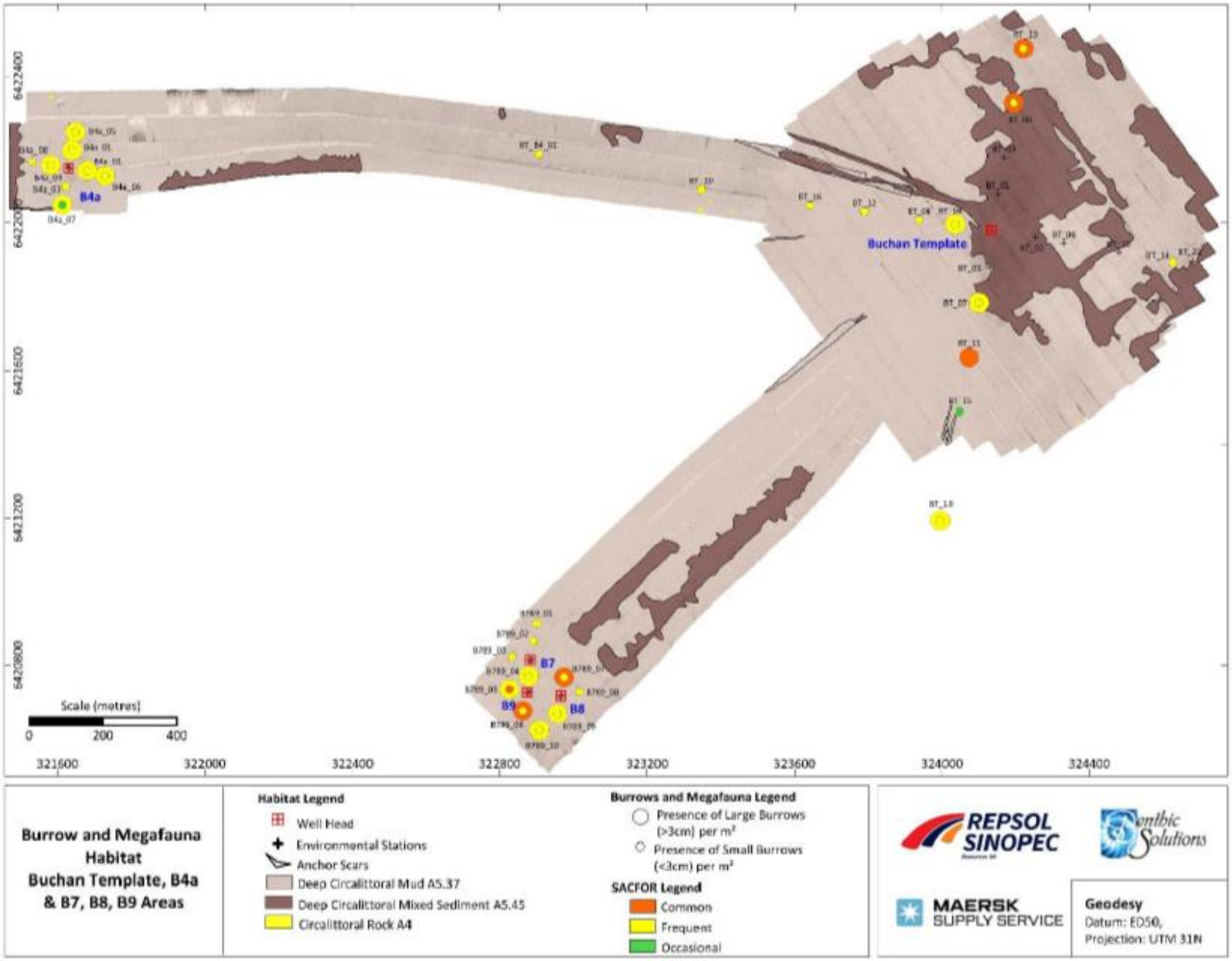


Figure 5-11: Distribution of habitat types at the Buchan field (Benthic Solutions Ltd, 2019b).

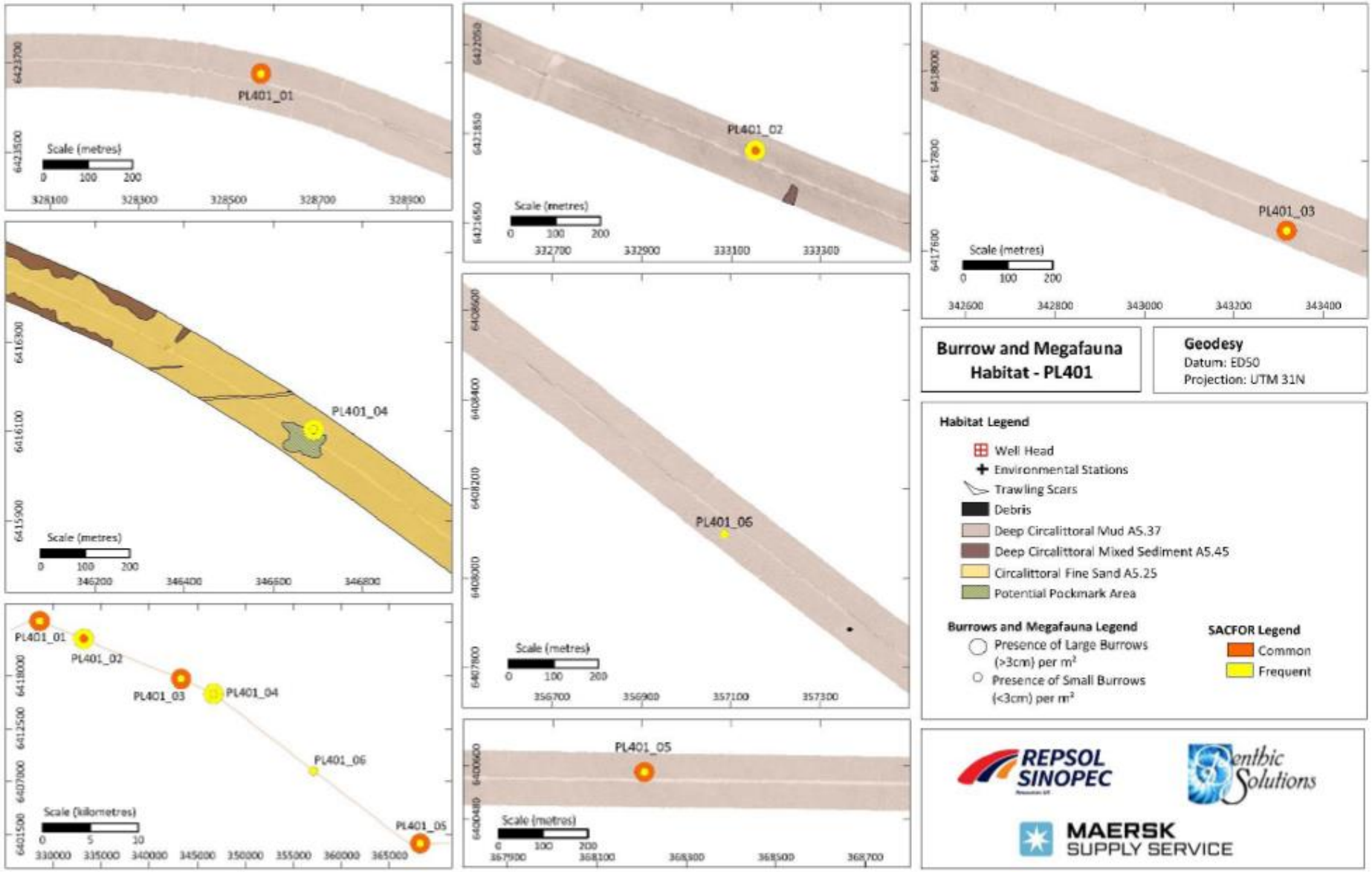


Figure 5-12: Distribution of habitat types along the export pipeline route (Benthic Solutions Ltd, 2019b).

The environmentally sensitive habitat of burrowing megafauna communities (Figure 5-13) was present at the Hannay field location, around the remote Buchan wells and along the export pipeline route, but was less evident within the Buchan template samples, expected to be due to the increasingly coarse nature of the sediment. Most stations were classified as either having 'common' or 'frequent' burrows on the SACFOR (super abundant, abundant, common, frequent, occasional, rare and present) scale and could therefore be considered as UK Habitat Feature of Conservation Importance of 'mud habitats in deep water'. The densities for large burrows were 3 per m^2 and 13 per m^2 for smaller burrows (< 3 cm). However, the survey report concluded that it was likely that the burrowing densities were over estimated due to inclusion of non-megafaunal species (polychaetes) and by counting multiple burrow openings made by the same individuals. Figure 5-10 to Figure 5-12 show the distribution of burrows observed. In order to align with assessing the 'worst case' impact of the proposed activities, the EA assumes that those areas with 'common' or 'frequent' burrows are representative of 'mud habitats in deep water'.

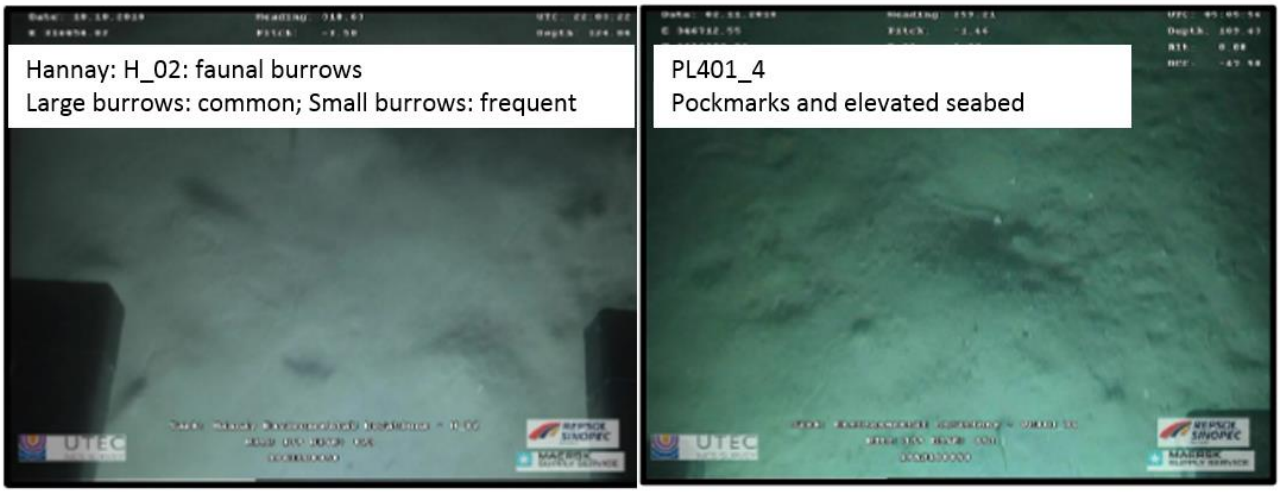


Figure 5-13: Photographs of faunal burrows at Hannay and pockmarks on the export pipeline route (Benthic Solutions Ltd, 2019b).

Pockmarks or depressions were observed at one of the stations along PL401 pipeline route (PL401_04), however there was no evidence of Methane Derived Authigenic Carbonates (MDAC) such that the pockmarks were not considered to represent the Annex I habitat 'Submarine structures made by leaking gases' (Figure 5-13).

5.6.2.2 Benthic Communities

Bacteria, plants and animals living on or within the seabed sediments are collectively referred to as benthos. Species living on top of the sea floor may be sessile (e.g. seaweeds) or freely moving (e.g. starfish) and collectively are referred to as epibenthic or epifaunal organisms. Animals living within the sediment are termed infaunal species (e.g. tubeworms and burrowing crabs) while animals living on the surface are termed epifaunal (e.g. crabs and starfish). Semi-infaunal animals, including sea pens and some bivalves, lie partially buried in the seabed.

The dominant epifauna taxa found distributed across this mud habitat included sea pen species such as *Virgularia mirabilis* and *Pennatula phosphorea*. sand smelts (*Atherina presbyter*), starfish (*Asterias rubens*), and species of the family *Gobiidae* such as *lesueurigobius friesii* were all commonly observed throughout the site (Benthic Solutions Ltd., 2019b). Buchan and Hannay infrastructure was seen to be colonised by sessile fauna species such as anemones (particularly *Metridium senile* and *Urticina felina*) and the octocoral dead men's finger (*Alcyonium digitatum*).

Within the mixed sediment areas the drop-stones were colonised by a wide range of epifauna with observed species including the Devonshire cup coral (*Caryophyllia smithii*), hydroids (*Hydrozoa sp.*) and anemones (*Urticina felina*). The sediment was characterised by hermit crabs (*Paguridae sp.*) and urchins (*Gracilechinus acutus* and *Spatangus raschi*). No live specimens of *Arctica islandica* were observed either through the video or grab sampling campaign, however evidence off *A. islandica (*juvenile shells) were returned in the grab samples indicating they occur in the area.

Figure 5-14 and Figure 5-15 show photographs of some of the fauna observed on the seabed and on the subsea infrastructure.

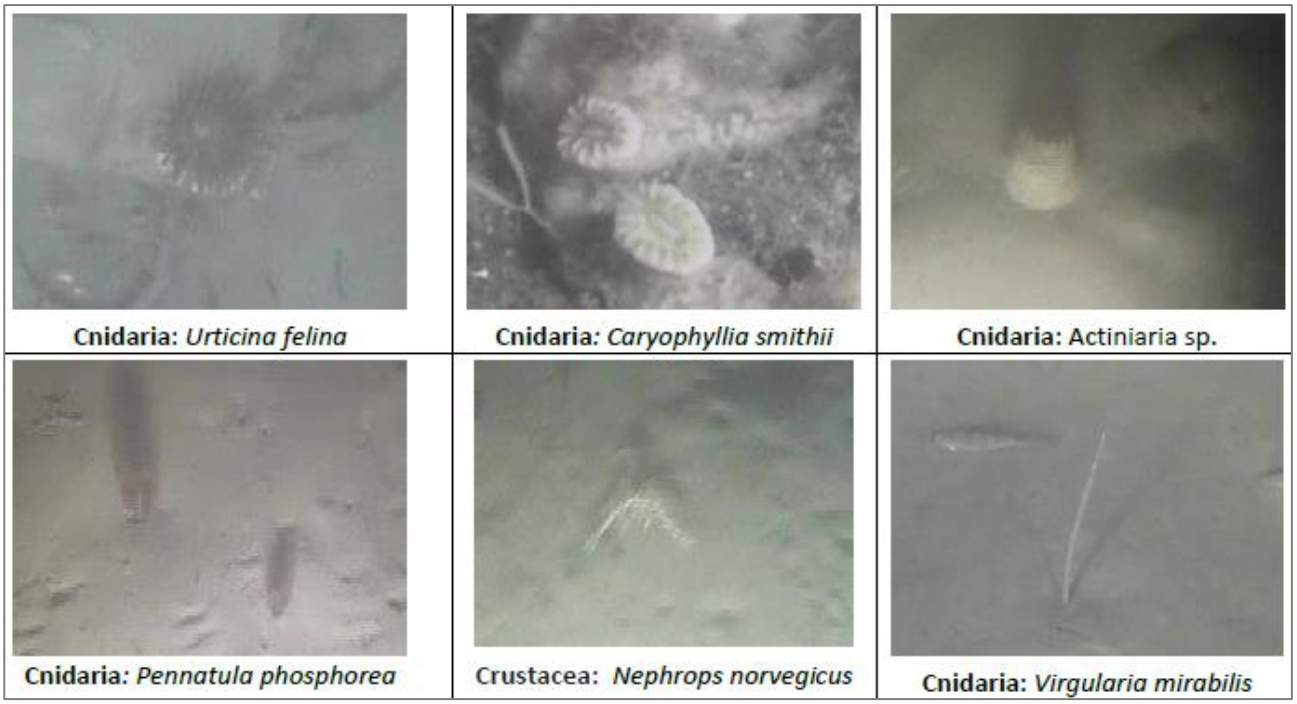


Figure 5-14: Photographs of different fauna associated with the area.

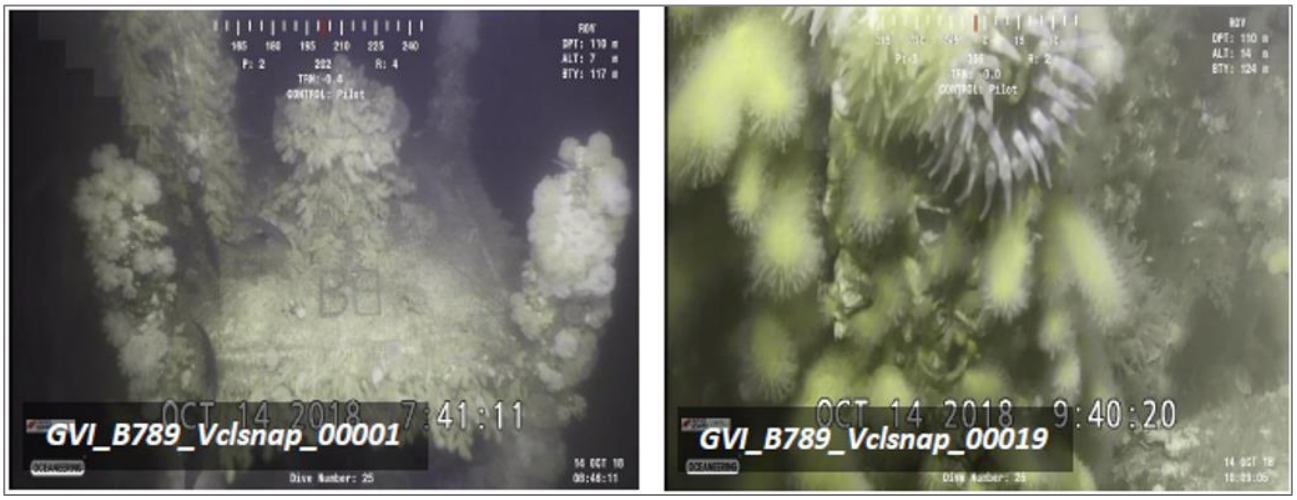


Figure 5-15: Examples of colonised infrastructure (Benthic Solutions Limited, 2019b).

The benthic communities within the areas of seabed covered with drill cuttings were generally dominated by annelids, which reflected the generally muddy sand/ sandy mud habitat. Shifts in population abundance and species richness relating to the distance of the stations from the wellheads were observed. For example, a reduced abundance of certain species such as the polychaete *Paramphinome jeffreysii*, the annelids *Galathowenia, Ampharete falcata*, *Eclysippe vanelli* and the molluscs *Mendicula ferruginosa* and *Adontorhina similis* was recorded within the area impacted by cuttings suggesting sensitivity to drilling-related contamination.

5.6.3 Fish and Shellfish

More than 330 fish species are thought to inhabit the shelf seas of the UKCS (Pinnegar *et al.*, 2010).

Table 5-5 shows the approximate spawning and nursery times of some of the fish species known to occur in the vicinity of the Buchan and Hannay infrastructure (Coull *et al.*, 1998; Ellis *et al.,* 2012) and Figure 5-16 shows the probability of juvenile fish for some species occurring in the area (Aires *et al.*, 2014).

Table 5-5 Summary of spawning and nursery activity for species known to occur in the vicinity.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Herring	N	N	N	N	N	N	N	SN	SN	N	N	N
Whiting	NJ	SNJ	SNJ	SNJ	SNJ	SNJ	NJ	NJ	NJ	NJ	NJ	NJ
Lemon sole	N	N	N	SN	SN	SN	SN	SN	SN	N	N	N
Norway pout	SNJ	S*NJ	S*NJ	SNJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ
Sandeels	SN	SN	N	N	N	N	N	N	N	N	SN	SN
Hake	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ
Nephrops	SN	SN	SN	S*N	S*N	S*N	SN	SN	SN	SN	SN	SN
Anglerfish	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ
Blue whiting	N	N	N	N	N	N	N	N	N	N	N	N
Haddock	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ
Sprat	N	N	N	N	S*N	S*N	SN	SN	N	N	N	N
Cod	SN	S*N	S*N	SN	N	N	N	N	N	N	N	N
Spurdog	N	N	N	N	N	N	N	N	N	N	N	N
Spotted ray	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
Plaice	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

Key: S = Spawning; S* = Peak Spawning; N = Nursery; J = Juveniles (i.e. 0 group fish)
Orange highlight indicates higher egg concentrations
Source: Coull *et al.* (1998); Ellis *et al.* (2012); Aires *et al.* (2014).

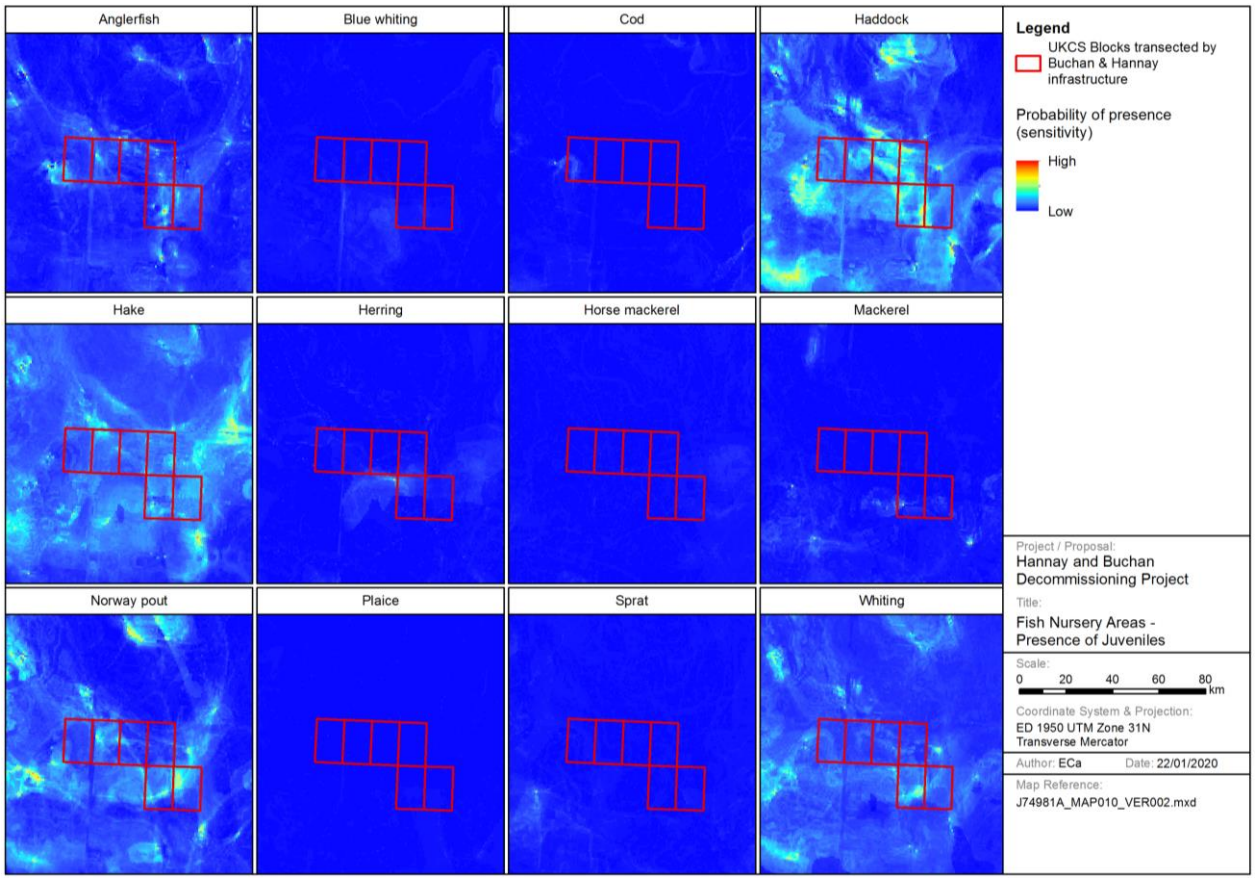


Figure 5-16 Probability of juvenile fish presence in vicinity of Buchan and Hannay (Aries et al., 2014)[3].

Of the fish species identified in the area, anglerfish, herring, mackerel, ling, blue whiting, cod, horse mackerel, ling, saithe, sandeels, whiting and spurdog have been assessed by Scottish Natural Heritage (SNH) and JNCC as Priority Marine Features (PMFs) in Scotland (SNH, 2016).

5.6.4 Marine Mammals

5.6.4.1 Pinnipeds

Two species of seal live and breed in UK waters: the grey seal (*Halichoerus grypus*) and the harbour (also called common) seal (*Phoca vitulina*). Both species are listed as Annex II species under the European Union (EU) Habitats Directive.

The foraging range of the harbour seal is typically within 40 – 50 km of their haul out site. Tracking of individual grey seals has shown that they can feed up to several hundred kilometres offshore, although most foraging tends to be within approximately 100 km (SCOS, 2013). Telemetry data (1991-2012) and count data (1988-2012) indicate that seals are very unlikely to be present in the vicinity of the Buchan and Hannay infrastructure.

5.6.4.2 Cetaceans

The JNCC has compiled an Atlas of Cetacean Distribution in Northwest European Waters (Reid *et al.,* 2003) which gives an indication of the annual distribution and abundance of cetacean species in the North Sea. Table 5-6 presents the annual abundance of cetacean species likely to occur in the Buchan and Hannay area. The data suggests that moderate to low densities of minke whale, harbour porpoise, and Atlantic white-sided dolphin and

[3] The data presented in Figure 5-16 uses Species Distribution Modelling (SDM) to predict where aggregations of 'Group 0' fish (fish in the first year of their life) may be found based on environmental information and catch records.

high to low densities of white-beaked dolphin have been sighted in the immediate vicinity of the Buchan and Hannay infrastructure (Reid *et al.*, 2003).

Table 5-6 Marine mammal seasonal abundance in the vicinity of the Blocks (Reid et al., 2003) (blue- species seen).

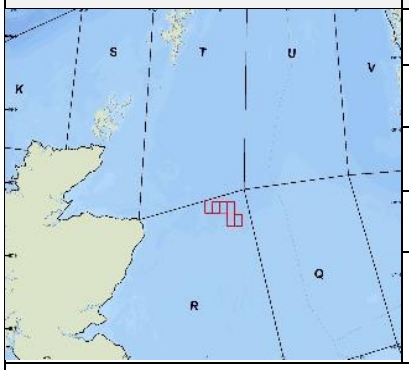
Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minke whale												
Harbour porpoise												
Atlantic white-sided dolphin												
White-beaked dolphin												

A series of Small Cetacean Abundance in the North Sea (SCANS) surveys have been conducted to obtain an estimate of cetacean abundance in North Sea and adjacent waters, the most recent of which is SCANS-III (Hammond *et al.*, 2017).

The proposed Buchan and Hannay operations are located within SCANS-III Block 'R'. Aerial survey estimates of animal abundance and densities (animals per km^2) within this area are provided in Table 5-7. The data confirm that some of those species identified by Reid *et al.* (2003), frequent Block R (Hammond *et al.*, 2017).

The JNCC have published the 'regional' population estimates for the seven most common species of cetacean occurring in UK waters (IAMMWG, 2015). Divided into Management Units (MU), these provide an indication of the spatial scale and the relevant populations at which potential impacts should be assessed. The relevant MU population estimates are also presented in Table 5-7.

Table 5-7 Cetacean Abundance in SCANS-III Survey Block R (Hammond et al., 2017).

SCANS-III Block R	Species	Animal Abundance[1]	Density (animials/km^2)[1]	MU Population[2]
	Harbour porpoise	38,646	0.599	227,298
	Minke whale	2,498	0.039	23,528
	Bottlenose dolphin	1,924	0.030	0*
	White-sided dolphin	644	0.010	69,293
	White-beaked dolphin	15,694	0.243	15,895

[1] Hammond *et al.*, (2017) [2] IAMMWG (2015)
* The relevant MU area for bottlenose dolphin for the proposed survey area is the Greater North Sea MU area, which has an MU population of 0 (IAMMWG, 2015). The SCANS-III density estimate of bottlenose dolphin for Survey Block R is non-zero since it includes dolphins from the Central East Scotland MU population (IAMMWG, 2015).

5.6.5 Seabirds

The North Sea is an internationally important area for breeding and feeding seabirds. Using seabird density maps from European Seabirds at Sea (ESAS) data collected over 30 years, Table 5-8 identifies a number of the bird species (and their predicted maximum monthly abundance) known to occur in the Buchan and Hannay area (Kober *et al.*, 2010).

The data indicates that a number of seabird species are likely to occur in the area over the summer breeding season and winter months. For all species combined, a maximum of 10 seabirds are predicted to occur per km^2 during the

breeding season (April to September), whilst during the winter months (November to March) a maximum of 15 seabirds are predicted to occur per km^2.

Table 5-8 Predicted monthly seabird surface density in the Buchan and Hannay area (Kober et al., 2010).

Species	Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern gannet	Breeding												
	Winter												
Northern fulmar	Breeding												
	Winter												
Black-legged kittiwake	Breeding												
	Winter												
European storm-petrel	Breeding												
Lesser black-backed gull	Breeding												
Great black-backed gull	Breeding												
	Winter												
Razorbill	Breeding												
	Winter												
	Additional												
Great skua	Breeding												
	Winter												
Little auk	Winter												
Herring gull	Winter												
Arctic skua	Breeding												
Common guillemot	Breeding												
	Additional												
	Winter												
Atlantic puffin	Breeding												
	Winter												
All species combined	Breeding												
	Summer												
	Winter												

KEY: maximum number of individuals per km^2	Not recorded	≤ 1.0	1.0 – 5.0	5.0 – 10.0	10.0 - 15.0	15.0 - > 20.0

5.7 Marine Protected Areas

A network of Marine Protected Areas (MPAs) are in place to aid the protection of vulnerable and endangered species and habitats, through structured legislation and policies. These sites include Special Areas of Conservation (SAC) and Special Protection Areas (SPA), designated under the EC Habitats Directive (92/43/EEC) and EC Birds Directive (2009/147/EC) respectively, along with Nature Conservation Marine Protected Areas (NCMPAs) designated under the Marine (Scotland) Act 2010 or the Marine and Coastal Access Act 2009. The protected sites in closest proximity to the Buchan and Hannay fields are shown in Figure 5-17. The nearest are the Scanner Pockmark SAC *c.* 36 km north east of Block 21/3 and the East of Gannet and Montrose Fields NCMPA, which is located *c.* 35 km from Block 21/9. Given the distance of the Buchan and Hannay infrastructure from the nearest designated sites, the proposed activities will not impact on any protected areas.

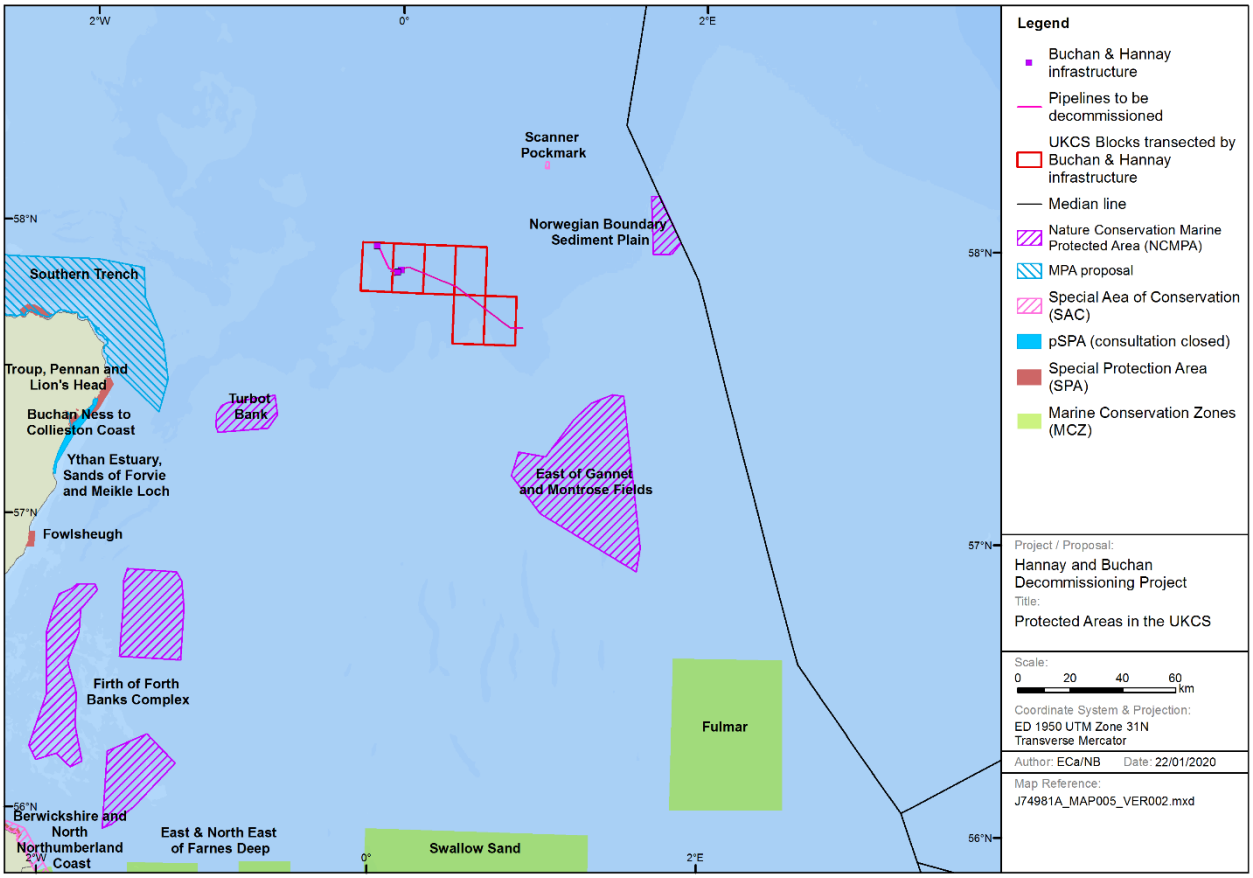


Figure 5-17 Location of the Buchan and Hannay Field in relation to protected areas.

5.8 Sensitive Habitats and Species in the Area

As discussed in Section 5.6.2.1 megafauna burrowing communities were initially considered to be present at a density considered to be representative of the UK Habitat Feature of Conservation Importance of 'mud habitats in deep water'. However, the survey report concluded that it was likely that the burrowing densities were over estimated due to inclusion of non-megafaunal species (polychaetes) and by counting multiple burrow openings made by the same individuals. As mentioned previously, to ensure that the EA is assessing the 'worst case' impact of the proposed activities, those areas with 'common' or 'frequent' burrows were considered to be representative of 'mud habitats in deep water'.

Though no live samples were found, shells from juvenile specimens of the OSPAR protected species *A. Islandica* were observed in a number of samples.

As described in Section 5.6.4 a number of cetacean species occur in the area. All cetaceans in UK waters are considered to be European Protected Species (EPS). Under the Habitats Regulations, it is an offence to deliberately disturb any EPS, or to capture, injure or kill an EPS at any time.

In addition to the list of features of nature conservation importance for which it is deemed appropriate to use area-based mechanisms (i.e. designated areas) as a means of affording protection, as part of the Scottish Marine Protection Area Project, SNH and JNCC have compiled a separate list of 80 habitats and species, termed Priority Marine Features (PMFs) which are considered to be of particular importance in Scotland's seas. The purpose of this list is to guide policy decisions regarding conservation in Scottish waters.

The following PMF species occur in the Buchan and Hannay area (Tyler-Walters, 2016):

- Anglerfish (*Lophiiformes spp.*)
- Herring (*Clupeidae* spp.)
- Mackerel (*S. scombrus*)
- Ling (*M. molva)*
- Blue whiting (*M. poutassou*)
- Cod *(G. morhua)*
- Norway pout *(Trisopterus esmarkii)*
- Atlantic white-sided dolphin *(Lagenorhynchus acutus)*
- Harbour porpoise *(Phocoena phocoena)*
- Killer whale *(Orcinus orca);*
- Minke whale *(Balaenoptera acutorostrata)*
- White-beaked dolphin *(Lagenorhynchus albirostris)*
- Saithe *(Pollachius virens)*
- Sandeels *(Ammodytes spp.)*
- Whiting *(Merlangius merlangus)*
- Basking shark *(C. maximus)*
- Spurdog *(S. acanthias)*
- Porbeagle shark *(Lamna nasus)*
- Ocean quahog *(A. islandica)*

5.9 National Marine Plan (NMP)

The Buchan and Hannay fields fall within the Scottish NMP area, which comprises plans for Scotland's inshore (out to 12 nm) and offshore waters (12 to 200 nm) as set out under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009. The plan represents a framework of Scottish Government policies for the sustainable development of marine resources and is underpinned by strategic objectives:

- Achieving a sustainable marine economy;
- Ensuring a strong, healthy and just society;
- Living within environmental limits;
- Promoting good governance;
- Using sound science responsibly.

These objectives are to be achieved through the application of 21 'General Planning Principles'. Table 5-9 identifies which of these 21 Principles are considered relevant to the proposed decommissioning activities.

Table 5-9 Scottish NMP's General Planning Principles.

Scotland's National Marine Plan Principles
GEN 1 General planning principle: There is a presumption in favour of sustainable development and use of the marine environment when consistent with the policies and objectives of this Plan.
GEN 4 Co-existence: Proposals which enable coexistence with other development sectors and activities within the Scottish marine area are encouraged in planning and decision making processes, when consistent with policies and objectives of this Plan.
GEN 5 Climate change: Marine planners and decision makers must act in the way best calculated to mitigate, and adapt to, climate change.
GEN 9 Natural heritage: Development and use of the marine environment must: a) Comply with legal requirements for protected areas and protected species. b) Not result in significant impact on the national status of Priority Marine Features. Protect and, where appropriate, enhance the health of the marine area.
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 apply.
GEN 13 Noise: Development and use in the marine environment should avoid significant adverse effects of man-made noise and vibration, especially on species sensitive to such effects.
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.
GEN 21 Cumulative impacts: Cumulative impacts affecting the ecosystem of the marine plan area should be addressed in decision making and plan implementation.

5.10 Oil and Gas Sector Specific Policies

In addition to the above general policies, the Buchan and Hannay Decommissioning Project will align with the relevant specific oil and gas Marine Planning Policies

Table 5-10: Oil and Gas Marine Planning Policies.

Oil and Gas Marine Planning Policies
Oil and Gas 1 – Environmental Risks & Impacts (noise, discharges and habitat change): The Scottish Government will work with BEIS, the Oil and Gas Authority and the industry to maximise and prolong oil and gas exploration and production whilst ensuring that the level of environmental risks associated with these activities are regulated. Activity should be carried out using the principles of Best Available Technology (BAT) and Best Environmental Practice (BEP). Consideration will be given to key environmental risks including the impacts of noise, oil and chemical contamination and habitat change.
Oil and Gas 2 – Decommissioning (re-use or removal of decommissioned assets): 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.
Oil and Gas 3 – Other Users of the Sea (environmental and socio-economic constraints): 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.
Oil and Gas 5 – Potential Environmental Risks & Hazards: Consenting and licensing authorities should have regard to the potential risks, both now and under future climates, to oil and gas operations in Scottish waters, and be satisfied that installations are appropriately sited and designed to take account of current and future conditions.
Oil and Gas 6 – Risk Reduction Measures: 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.

6. SOCIO-ECONOMIC BASELINE

6.1 Introduction

This section describes the socio-economic activities in the vicinity of the Buchan and Hannay fields, which primarily include fishing, shipping and oil and gas operations.

6.2 Fishing

The Buchan and Hannay fields occur within ICES rectangles 44F0 and 44E9. Data provided by the Scottish Government indicate that seine nets, bottom trawl gear and mid-water trawl gear are used in both these rectangles, whilst dredges are also used in rectangle 44E9. Species target in the area include herring, mackerel, haddock, whiting, anglerfish, cod, saithe, *Nephrops* etc.

Using data provided by the Scottish Government (Scottish Government, 2019), fishing effort (vessel days), value and quantity data have been plotted for UK vessels ≥ 10 m in length (Figure 6-1 and Figure 6-2). The data suggests that these ICES rectangles encompass an area that is relatively important to the UK fishing industry such that fishing activity in the area can be considered moderate. In addition, it demonstrates that bottom trawl gear is used emphasising the importance of ensuring a safe seabed as part of the proposed decommissioning project.

Figure 6-1: Annual fishing effort per ICES rectangle, 2014-2018 (Scottish Government, 2019).

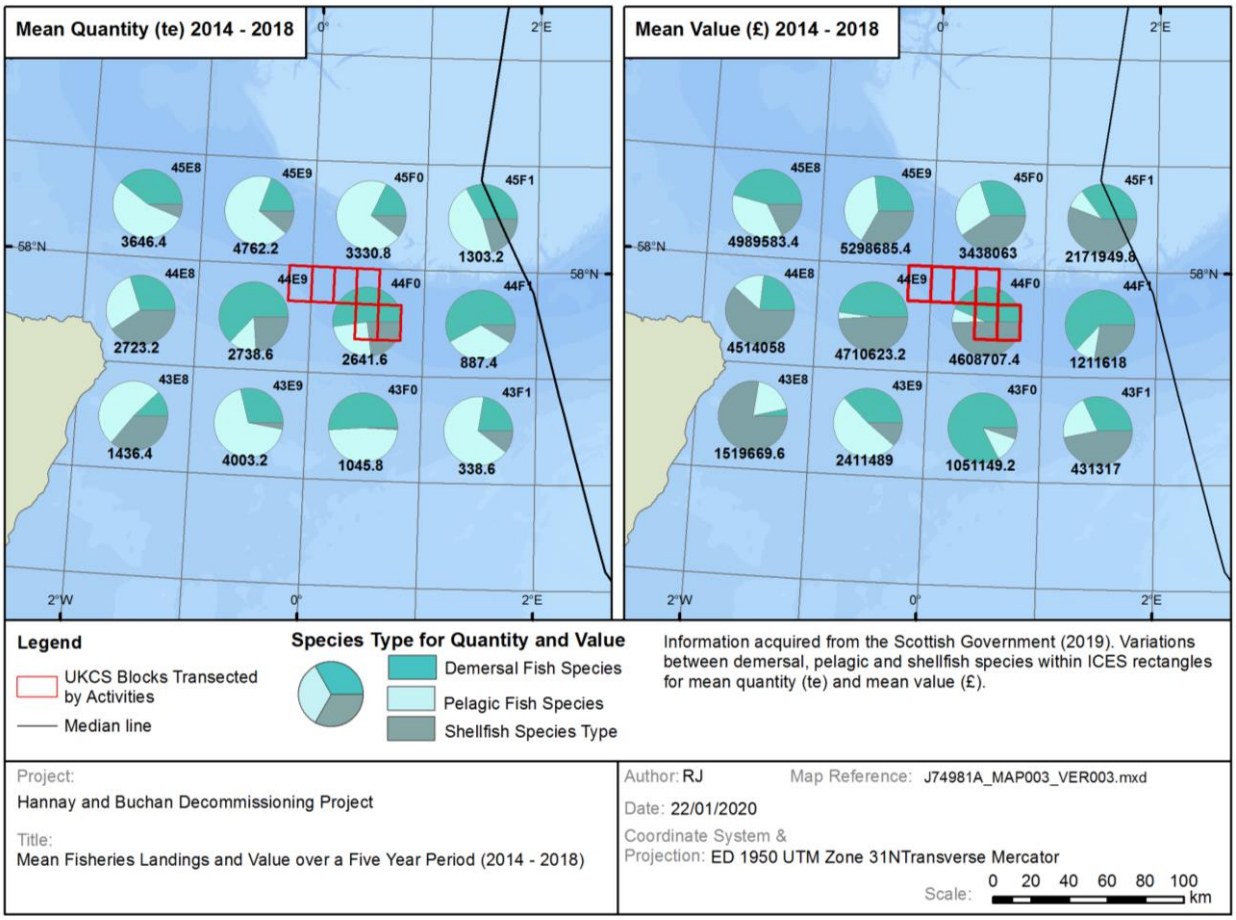


Figure 6-2: Annual fish landings by quantity (te) and by value (£) per ICES rectangle, 2014-2018 (Scottish Government, 2019).

6.3 Shipping Activity

Shipping densities in the North Sea are categorised by the Oil and Gas Authority (OGA) to be either: negligible; very low; low; moderate; high; or very high. As can be seen in Figure 6-3 the shipping activity around the Buchan and Hannay fields is considered very low to low, whilst at the Forties end of the export pipeline it is considered moderate. This moderate activity is likely associated with vessels supporting the Forties field.

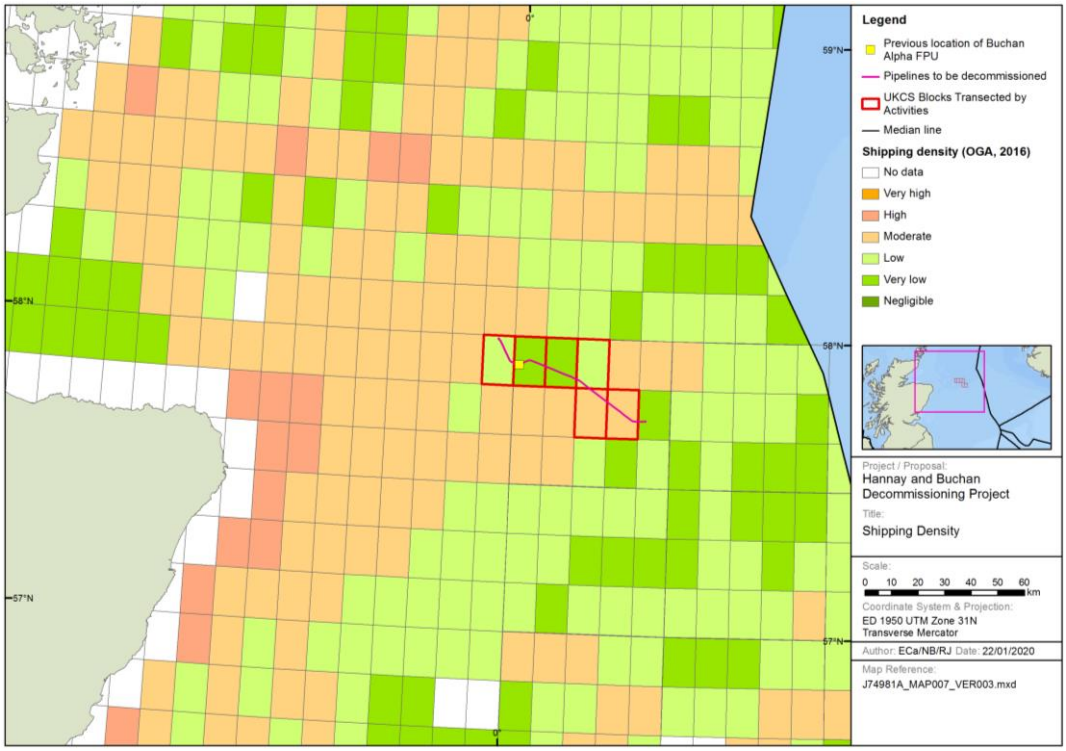


Figure 6-3 Shipping density in the vicinity of the Buchan and Hannay area as categorised by OGA (OGA, 2016).

6.4 Surrounding Oil and Gas Infrastructure

The Buchan and Hannay fields are situated in a well-developed area of the North Sea. Figure 6-4 shows those installations in closest proximity to the Buchan and Hannay infrastructure and corresponding distances are provided in Table 6-1.

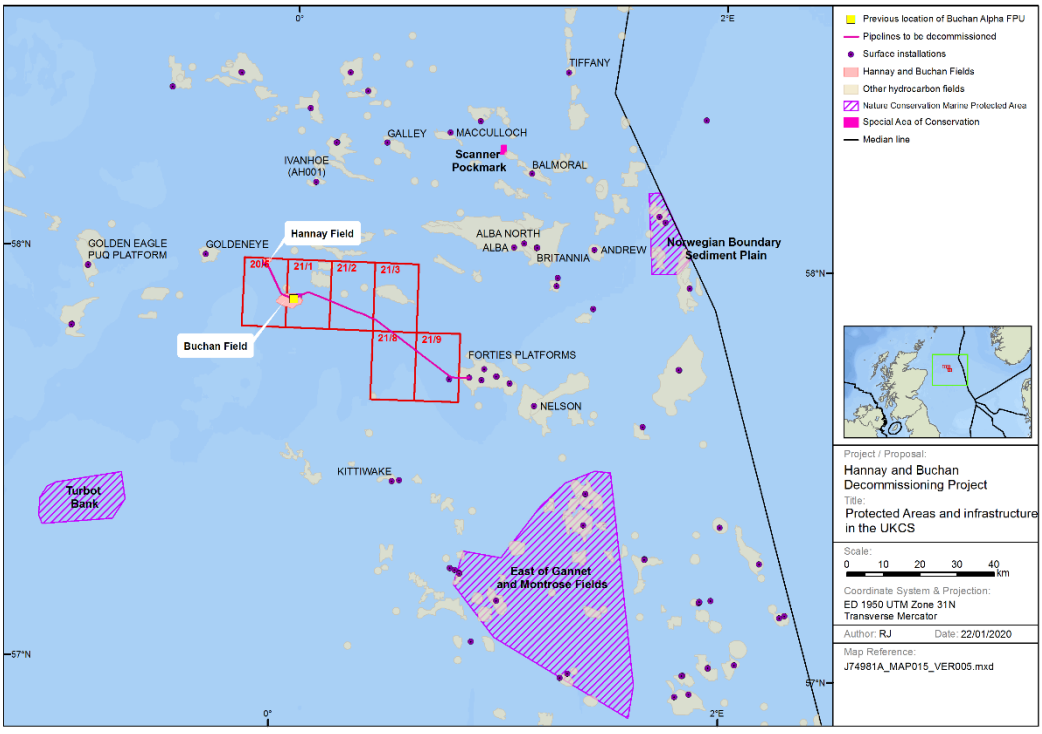


Figure 6-4 Oil and gas installations within the vicinity of the Buchan and Hannay fields.

Table 6-1: Approximate distance from neighbouring installations.

Installation	Approximate distance from the Buchan and Hannay infrastructure (km)
Forties C	0 m from PL401
Forties Unity	800 m from PL401
Goldeneye	15 km from the Hannay drill centre
Nelson	19 km from PL401
Ivanhoe	24 km from the Hannay drill centre
Kittiwake	32 km from PL401
Britannia	40 km from PL401

6.5 Other

There are no offshore windfarm developments within the vicinity of the Buchan and Hannay fields.

The closest telecommunications cable is the CNS fibre optic cable which passes through Blocks 21/8 and 21/9 via the Forties field. It is not crossed by any of the Buchan and Hannay infrastructure (Figure 6-5).

There are no military exercise areas in the vicinity of the Buchan and Hannay fields. The nearest wreck is *c.* 650 m south from PL402.

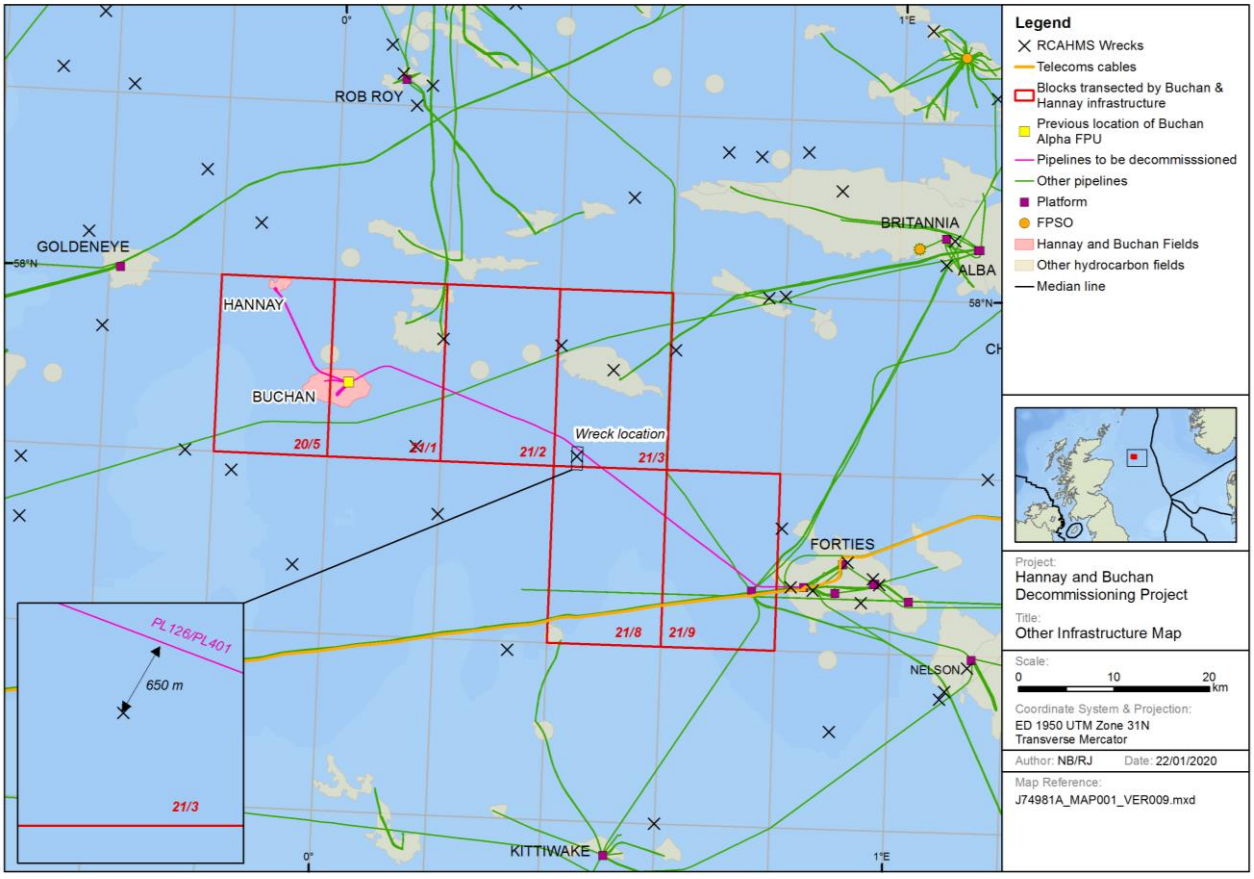


Figure 6-5: Location of wrecks and telecommunications cables.

7. SCOPING OF POTENTIAL ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

7.1 Methodology

To determine the significance of the potential impacts associated with the proposed decommissioning activities an ENVID Workshop was undertaken following a structured methodology as described in Appendix A and summarised here.

The workshop identified the key environmental and societal sensitivities, discussed all the sources of potential impact and ultimately highlighted those impacts which required further assessment within the EA. The decision on which impacts required further assessment was reinforced by a review of industry experience of decommissioning impact assessment and on an assessment of wider stakeholder interest (informed in part by the stakeholder engagement described in Section 2).

Where relevant the aspects considered in the ENVID for the different activities (e.g. recovery of structures) included:

- Physical presence/interaction with other sea users;
- Seabed and habitat disturbance;
- Under water noise impacts;
- Discharges to sea;
- Atmospheric emissions;
- Waste; and
- Accidental events.

Where relevant the following environmental receptors were considered in the ENVID for each activity:

- Air quality;
- Water quality;
- Plankton;
- Fish;
- Seabirds;
- Resource availability e.g. landfill, fuel etc;
- Shipping;
- Cultural heritage (e.g. wrecks).
- Climate;
- Sediment quality;
- Benthic communities;
- Marine mammals;
- Designated areas;
- Fisheries;
- Local communities (e.g. yard activities etc.);

During the ENVID, the significance of the environmental/social impact of planned activities on each of the susceptible receptors was derived by considering the 'Receptor Sensitivity' in relation to the 'Magnitude of Effect' of the aspect. This was carried out by applying the Environmental and Socio-Economic Impact Assessment (ESIA) methodology described in Appendix A.

Worst case accidental events were also identified and assessed in the ENVID. To determine the environmental and social risk of an unplanned event, firstly the significance of the environmental impact of the event was determined. The likelihood of the unplanned event was then considered. Finally, a level of environmental risk (low, medium or high) was assigned by combining the impact significance and the likelihood of the event occurring using the Environmental and Socio-Economic Risk Assessment (ESRA) matrix presented in Appendix A.

7.2 Scoping

The results from the ENVID Workshop are presented in Table 7-1. Applying the industry standard mitigation measures, the significance of impact of each of the planned activities was considered to be Low such that any environmental and social impacts are considered to be negligible. Table 7-1 provides a justification for not assessing further the majority of the aspects identified in the EA, with the exception of:

- Seabed disturbance (Section 8); and

- Legacy impacts on the environment and on other sea users (Section 9).

The potential impact of a loss of diesel inventory resulting for example from a vessel collision or fire was also considered in the ENVID. The significance of impact of a release of diesel inventory from one of the vessels was considered to be moderate, such that it could result in discernible environmental and social risks. The likelihood of such an event was considered to be Remote, in that it was recognised that a similar event has occurred elsewhere but is unlikely to occur during this project with the application of current industry standard practices. Combining the significance of impact with the likelihood, results in an overall Low environmental risk. In line with Subsection 12.4 of the OPRED Decommissioning Guidance (BEIS, 2018), the impacts of accidental events are not assessed further in the EA.

Table 7-1 ENVID results and justification for selecting / deselecting the impact for further assessment in the EA.

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental
Vessel use								
1	Emissions to air. Power generation.	Receptor: Air quality. Fuel combustion emissions (CO2, CO, SOx, NOx, etc.) from vessels DSVs, ROVSV, reel lay vessels, rock dump and survey vessels. UK and EU Air Quality Standards not exceeded.	Minimise use of vessels through efficient journey planning and use of relevant vessels for each activity. Prior to contract award Repsol Sinopec Resource UK will review vessel Common Marine Inspection Documents (CMID) as part of vessel assurance (evidence of maintenance). All vessels will be in compliance with Repsol Sinopec Resources UK Limited's Marine Assurance Standards (MAS). Vessels will be MARPOL compliant.	A	2	L	Total fuel use by vessels required to complete the proposed decommissioning activities is *c.* 3,510 te (Table 3.5) resulting in *c.* 11,232 te of CO_2. When compared against total CO_2 shipping emissions on the UKCS in 2017 (13,800,000 te) (Committee on Climate Change, 2019), this equates to 0.08 %. In addition, between 2009 and 2016 total CO_2 emissions at the Buchan Alpha FPU ranged from *c.* 39, 700 te per annum to *c.* 55,000 te per annum (EEMS returns). The emissions associated with the proposed decommissioning activities are therefore significantly less than those previously associated with production from the two fields. Due to the offshore location of the project area, the sensitivity of air quality is considered low given the distance from any populated areas whilst the magnitude level is considered minor such that the overall impact significance on air quality is considered Low. As discussed in Section 2.1.1 of Appendix A, the assessment methodology does not easily lend itself to assessing climate change. Repsol Sinopec Resources UK Limited, acknowledges that the atmospheric emissions associated with the use of vessels will contribute to climate change, however the relatively short duration of the vessel campaign, means the incremental increase in emissions to the atmosphere as a result of the proposed activities is not considered significant. As the impacts on air quality or climate change are not considered significant this aspect is not considered further in the EA.	No
2	Physical presence. Vessels.	Receptor: Other sea users. Presence of vessels will have the potential to impact on other sea users for example through collision with towed fishing gear.	Minimise use of vessels, through efficient journey planning. Notify other sea users - e.g. Kingfisher and SFF. Ongoing collaboration with SFF.	A	1	L	Vessels associated with the proposed decommissioning activities have the potential to displace fishing vessels and potentially cause ships to avoid an area normally traversed. Though fishing effort in the area is considered relatively	No

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental
			All vessels engaged in the project operations will have markings and lightings as per the International Regulations for the Prevention of Collisions at Sea (COLREGS) (International Maritime Organisation, 1972). Navigational aids including radar, lighting and Automatic Identification Systems (AIS) will be used. A vessel Collision Risk Assessment (CRA) will be produced if required.				important to the UK fishing industry (see Section 6.2) , taking account of the mitigation measures identified, the relatively short duration of the activities and the fact that a number of the activities will take place within existing 500 m zones, the impact significance of the presence of vessels on fishing activity during the proposed activities is considered Low and is not considered further in the EA. In the vicinity of the Buchan and Hannay fields (Blocks 20/5 and 21/1), shipping is considered very low/low whilst at the Forties end of the export pipeline (Blocks 21/8 and 21/9) it is considered moderate (see Section 6.3). As most of the decommissioning activities will take place in Blocks 20/5 and 21/1 and for similar reasons provided above, the impact significance of the presence of vessels on shipping activity during the proposed activities is considered Low and is not considered further in the EA.	
3	Physical presence. Vessels.	Receptors: marine mammals and birds. Receptor sensitivity is considered Medium given the presence of marine mammals and potential presence of birds from coastal SPAs. Possible behavioural changes in marine mammals e.g. could be attracted to the vessel or may move away from the area. Migrating birds could be attracted to the lights on the vessels.	Minimise use of vessels, through efficient journey planning.	B	1	L	In addition to being a busy shipping area, the North Sea has well developed fishing and oil and gas industries, such that marine mammals in the region are habituated to the presence of vessels. In addition, the evidence for lethal injury from boat collisions with marine mammals suggests that collisions with vessels are very rare (Cetacean Stranding Investigation Programme, 2011). Out of 478 post mortem examinations of harbour porpoise in the UK carried out between 2005 and 2010, only four (0.8 %) were attributed to boat collisions. The impact significance of the proposed vessel use on marine mammals is therefore considered to be Low and is not discussed further in the EA. The vessels have the potential to cause displacement of seabirds from foraging habitat and may cause flying birds to detour from their flight routes. For example, auk species (e.g. guillemot and little auk) are believed to avoid vessels by up to 200 to 300 m but gull species (e.g. kittiwake, herring gull and great black-backed gull) are attracted to the presence of them (Furness and Wade, 2012 and Weise *et al.* 2001). Though evidence suggests that the presence of the vessels could cause some bird species to be displaced from their	No

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental
							foraging area, the very small proportion of their overall available habitat that will be occupied by the vessels means the impact is not considered to be noticeable. In addition, given the existing oil and gas vessel activity in the area, it is expected that the impact of the vessels on bird migration routes (e.g. they could be attracted to the vessel lights at night) is not expected to be significant. The impact significance on birds is therefore considered to be Low and is not discussed further in the EA.	
4	Discharges to sea. Vessel sewage, ballast water and biofouling.	Receptors: water quality and fauna associated with the water column. Sensitivity is considered to be Medium (B) based on presence of marine mammals and those fish species considered to be PMFs (see Section 5.6.3) Discharge of sewage; grey and black water macerated to <6 mm prior to discharge and discharge of food waste to sea. Water quality in the immediate vicinity of discharges of vessel sewage or ballast water may be reduced, but effects are usually minimised by rapid dilution in the receiving body of water and non-continuous discharge. May result in organic enrichment and chemical contaminant effects in water column and seabed sediments. Ballast water could introduce invasive species depending on vessel routes. Bioinvasions as a result of biofouling (accumulation of organisms including plants, algae, or animals such as barnacles) on vessels could also occur.	Minimise use of vessels, through efficient journey planning. Repsol Sinopec Resources UK Limited will review vessel CMID as part of vessel assurance and all vessels will be compliant with the Company's MAS. Vessels will be MARPOL compliant. All contracted vessels will originate from countries adhering to the International Maritime Organisation (IMO) Convention. The Company's audit procedures will ensure that the contracted vessels ballasting procedures are in line with IMO Convention aimed at preventing associated harmful effects. All discharges of ballast water will be monitored and records maintained. As part of the Company's auditing process, only vessels adhering to the IMO 2011 Guidelines for the Control and Management of Ships' Biofouling to Minimize the Transfer of Invasive Species will be used. All member states of IMO are signed up to these guidelines.	B	1	L	All vessels will be IMO and MARPOL compliant such that impact significance of any vessel sewage, ballast water or biofouling is considered Low and is not discussed further in the EA.	No

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental
5	Underwater noise.	Receptors: marine mammals and fish. Vessels will use dynamic positioning and will have the potential to cause disturbance to marine mammals and fish in the form of temporary displacement from the area. Marine mammals and fish are expected to return once the vessel(s) has left the area.	Minimise use of vessels, through efficient journey planning.	B	2	L	In addition to being a busy shipping area, the North Sea has well developed fishing and oil and gas industries, such that marine mammals and fish in the region are habituated to the underwater noise associated with vessels. Over the duration of the recovery and survey activities the total vessel days associated with the proposed activities is estimated to be *c.* 177 (see Section 3.2.7). Any impacts from vessel noise will be behavioural rather than physical, such that they may cause marine mammals or fish to vacate the area, however they would be expected to return once the vessels have left the field. The impact significance of underwater noise on marine mammals and fish is therefore considered to be Low and is not discussed further in the EA.	No
6	Waste production. General waste from vessels.	Receptor: use of landfill. In addition, there is the potential for impact on communities located in proximity to the landfill site (e.g. from traffic, noise and odour). Following application of the waste hierarchy, minimal quantities of materials will go to landfill.	Prior to contract award Repsol Sinopec Resources UK Limited will review the vessels Waste Management Plans (WMP) which will adhere to the waste hierarchy principle. The Company will ensure vessels are compliant with MARPOL and, as such, meet Repsol Sinopec Resources UK Limited 's MAS. As part of their auditing procedures, Repsol Sinopec Resources UK Limited will ensure the contractor adheres to the Waste Duty of Care Code of Practice. Only landfill sites with approved Pollution Prevention and Control (PPC) permits will be used.	B	1	L	MARPOL Annex V applies to all ships/vessels and generally prohibits the discharge of all garbage into the sea (there are some exceptions which relate for example to food waste and cleaning agents). As vessels will be compliant with MARPOL, there will be no significant impact offshore. Repsol Sinopec Resources UK Limited recognise landfill sites as a finite resource, however as the vessels will have WMPs in place that will adhere to the waste hierarchy principle of reduce, reuse recycle, the impact significance on the availability of landfill sites is considered Low. Similarly, as only permitted sites will be used, the impact significance on local communities is also considered Low. As the impact significance of any waste from the vessels is considered Low and given that Section 12.8 of OPRED's Guidance Notes (BEIS, 2018) advises that an assessment of wastes returned to shore is not required in the EA (as it is not relevant to the impacts in the marine environment), the onshore impacts associated with vessel waste is not discussed further in the EA.	No

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental
7	Resource use.	Receptor: fuel	Scheduling/design to optimise opportunities to use vessels more efficiently (i.e. minimise transits, ensure vehicles are fully loaded). Under MARPOL Annex VI, all vessels will adhere to the Ship Energy Efficiency Management Plan (SEEMP) such that the vessels will have best practices for fuel efficiency in place.	A	1	L	Repsol Sinopec Resources UK Limited recognise that hydrocarbon based fuel is a finite resource, however given the relatively short duration of the proposed decommissioning activities and the use of MARPOL compliant vessels the impact significance of the use of fuel is considered Low and is not discussed further in the EA.	No
8	Unplanned event: diesel spill. Unforeseen event during operations for example a collision or fire resulting in a loss of fuel inventory	Receptors: water quality, sediment quality, fisheries, marine mammals, birds, fish, plankton, benthic communities. Given the nature of diesel, a large volume of any diesel spill would be expected to evaporate. Modelling of a diesel spill (3,550 m^3) carried out to support the Buchan Oil Pollution Emergency Plan (OPEP) (Repsol Sinopec Resources UK Limited, 2018) suggests the probability of diesel crossing any median lines is between 1-5 % whilst probability of any beaching is also between 1-5 %. Probability of any surface oiling above 3µm is less than 30 %. The results also suggest it is unlikely that a surface oiling above 0.3 µm would cross any transboundary lines or impact on any designated areas.	Vessel assurance inspections. Pre-hire vessel audits. Emergency response plans in place including the OPEP (Oil Pollution Emergency Plan) SOPEPs (Shipboard Oil Pollution Emergency Plan). SIMOPS (simultaneous operations) will be managed through bridging documents and communications. All vessels engaged in the project operations will have markings and lightings as per the COLREGS whilst the navigational aids will include radar, lighting and AIS.	C	2	M	Given the results of the modelling previously carried out, the magnitude of effect of a loss of diesel inventory is considered minor. As marine mammals do occur in the area, receptor sensitivity to a spill is considered high such that the overall impact significance of such an event is considered Moderate. With the application of the mitigation measures the likelihood of a total loss of fuel inventory from a vessel is considered Remote such that the environmental risk is considered Low. In line with Subsection 12.4 of the OPRED Decommissioning Guidance (BEIS, 2018), the impacts of accidental events are not assessed in the EA.	No
Decommissioning of pipelines and umbilicals (including spools, mattresses and grout bags) and subsea structures								
9	Disturbance to the seabed. Recovery of spools, mattresses, grout bags, surface laid pipelines and umbilicals and subsea structures.	Receptors: sediment quality and benthic communities. All activities will take place out with any designated areas. In some areas the environmental survey identified the potential presence of megafauna burrowing communities at a density considered to be representative of the UK Habitat Feature of Conservation	Cutting/dredging/jetting work plans will be in place. Internal cutting of piles where possible. Dredging/jetting will be minimised. Lifting procedures in place.	B	2	L	Though the cuttings pile will be disturbed, modelling suggests the impact associated with such disturbance is not significant (Genesis, 2019a). The magnitude of effect of the activities associated with recovery of the items identified is therefore considered Minor given that recovery of the seabed (including area impacted by disturbance to the cuttings pile) and associated benthic communities is expected to occur naturally without Company intervention. In addition, there will be no	Yes

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental
		Importance of 'mud habitats in deep water'. However, the survey report did indicate that it was likely that the burrowing densities were over estimated due to the inclusion of non-megafaunal species (polychaetes) and by counting multiple burrow openings made by the same individuals. Due to the uncertainty, the receptor sensitivity is conservatively considered to be Medium. Some disturbance to the drill cuttings at the Buchan template during recovery of the template, spools, mattresses etc. which may cause contaminated cuttings to resettle over a wider area.					transboundary impacts. The overall impact significance is therefore considered to be Low. However, to allow an assessment of the cumulative seabed disturbance across all activities, the impact of seabed disturbance resulting from these activities is discussed further in the EA.	
10	Disturbance to the seabed. Remediation of exposed pipeline / umbilical ends using trench and bury or cut and recover options.			B	2	L	The magnitude of effect of the activities associated with either trenching and burying or cutting and recovering the exposed pipeline and umbilical ends is considered Minor given that recovery of the seabed and associated benthic communities is expected to occur naturally without Company intervention. The overall impact significance is therefore considered to be Low. However, this impact will be considered further in the EA, in order allow an assessment of the cumulative seabed disturbance across all activities.	Yes
11	Disturbance to the seabed. Remediation of exposed pipeline / umbilical ends and mid-line sections using rockdump.	Receptors: sediment quality and benthic communities. Addition of rockdump would result in a change in habitat type. Some mortality of benthic animals belonging to species which are generally considered widespread throughout the CNS.	Alternative remediation options i.e. trench and bury or cut and recover will be prioritised. Minimise use of rock cover. Consultation with SFF regarding rock cover profile. Over-trawlability survey. Post decommissioning survey strategy. Location of rock added to FishSafe.	B	2	L	Seabed habitat in the area is relatively homogenous and comprised three main habitats: sublittoral mud, deep circalittoral mixed sediment and circalittoral fine sands (see Section 5.6.2), such that the addition of rock cover would result in a long-term habitat change. If this remediate *in situ* option was selected during the C&P phase, *c.* 11,857 te of rock would be required to remediate the exposed sections of pipelines and umbilical to be decommissioned *in situ*. Total length of exposed sections of pipeline and umbilical to be remediated is 1,054 m. Given the minimal footprint the overall impact significance is considered to be Low. However, this impact will be considered further in the EA, to allow an assessment of the cumulative seabed disturbance across all activities.	Yes
12	Physical presence. Pipelines, umbilical and any associated rockdump left *in situ*.	Receptor: other sea users. Potential for access to seabed area being impeded due infrastructure/stabilisation features decommissioned *in situ*.	All surface laid infrastructure will be recovered. Seabed clearance surveys. Over trawl trials to be carried out if considered necessary. Additional rockdump will be minimised and if used it will be laid in profiles aligned with industry standards.	A	1	L	Pipeline status reports have found the seabed to be stable over the trenched and buried pipelines and umbilical such that the potential for additional exposures to occur along these lines is considered low. Repsol Sinopec Resources UK Limited recognise that demersal trawl gear is used in the area (see Section 6.2), however given the stability of the seabed in the area and with the application of the mitigation	Yes

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental
			Post decommissioning survey strategy.				measures identified, the impact significance with respect to impact on fishing activities is considered Low. However, given stakeholder interests with respect to a clear seabed, the decommissioning of the buried pipelines and umbilical, and rockdump (existing and any potential rock added to remediate exposed sections) will be considered further in the EA.	
13	Discharges to sea. Discharges from surface laid spools, pipelines and umbilicals during recovery and discharges from cut ends of trenched and buried pipelines and umbilical.	Receptor: water quality which subsequently could impact on fauna. Discharge of flushing fluids (inhibited seawater containing a corrosion inhibitor: PRESERVAN 5500 at 30 ppm) from a number of the pipelines during cutting and/or recovery operations. Gas lift line PL597B and water injection line PL597A both contain produced water reinjection fluids to which a scale inhibitor (SI-4i4N) has been added. Some of these fluids will be released during recovery operations. The Buchan umbilical cores contain either seawater or Aqualink 300F (a water glycerol hydraulic fluid with a Cefas ranking of 'D'). The Hannay umbilical cores contain either seawater or Transaqua or Aquaglycol 24 (both hydraulic fluids).	All pipelines used to transport oil have been flushed and cleaned in line with BAT/BEP procedures to minimise oil concentrations Chemical use meets the registration requirements of the Registration, Evaluation, Authorisation and restriction of Chemicals (REACH) regulation. Hydraulic fluids in the umbilicals are all water based.	B	1	L	Given that the lines have been flushed and cleaned to BAT/BEP such that hydrocarbon content has been reduced to ALARP and given the current contents of the pipelines and umbilicals, the impact significance of any discharges during cutting/recovery activities is considered Low and is not considered further in the EA.	No
14	Discharges to sea/sediment. Degradation of pipelines and umbilical decommissioned *in situ*.	Receptor: sediment quality and benthic communities. Over time the trenched and buried pipelines decommissioned *in situ* will degrade. Following degradation, there is the potential that any hydrocarbons that may have remained in the pipelines following the flushing and cleaning activities may become exposed to the	All pipelines used to transport oil have been flushed and cleaned in line with BAT/BEP procedures to minimise oil concentrations remaining. The pipelines and umbilical will be trenched and buried under sediment *c.* 0.6 m deep.	B	1	L	All infrastructure decommissioned *in situ* will be trenched and buried such that impacts of degradation will be contained within a limited area around the pipelines and umbilical. As the lines corrode the contents will 'seep' into surrounding sediments, however the impacts on biota impacted is considered to be negligible given that only permitted chemicals were used. During the gradual breakdown there will be a release of metals and plastics into the sediment. As degradation will take place over decadal or centurial timescales it is not	Yes

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental
		surrounding sediment.					expected that metal concentrations in the sediment will accumulate significantly. Degradation of plastics is expected to take place over many decades or possibly centuries. As the lines are buried, it is expected that the broken down products will remain contained within the area of the lines. The concrete associated with the export pipeline is relatively inert and the degraded products will primarily comprise sand, gravel and calcium carbonate. The impact from these products on the benthic fauna in the vicinity of the pipeline is not expected to be significant. Given the current contents of the pipelines and umbilical and the fact that all infrastructure decommissioned *in situ* is trenched and buried, the impact significance of pipeline and umbilical degradation over time is considered Low. However, given public concern with respect to the impact of plastics in the environment the legacy impact of decommissioning the buried pipelines and umbilical *in situ* is considered further in the EA.	
15	Surrendering of 500 m exclusion zones	Receptor: other sea users. Shipping and fishing vessels will get access to the Buchan and Hannay exclusion areas.		A	0	P	To assess total impact on other sea users with respect to materials (pipelines, umbilical and rock cover) decommissioned *in situ*, the impact on other users with respect to 'clear seabed' will also be considered further in the EA.	Yes
16	Waste processing. Treatment of recovered materials.	Receptor: use of landfill. In addition, there is the potential for impact on communities located in proximity to the landfill site (e.g. from traffic, noise and odour). Following application of the waste hierarchy, minimal quantities of materials will go to landfill.	As part of Repsol Sinopec Resources UK Limited's Duty of Care, contract award will be to an established yard with appropriate experience, capability, licences and consents in place. As part of this the sites must demonstrate waste stream management throughout the deconstruction process. Waste management will follow the waste hierarchy: reduce, reuse, recycle. All waste will be handled and disposed of in line with regulations which will be detailed in the Waste Management Plan (WMP)..	B	2	L	Repsol Sinopec Resources UK Limited recognise landfill sites as a finite resource, however applying the mitigation measures identified and considering the relatively small volumes of material to be returned (see Section 3.8 of the draft DPs) the impact significance on the availability of landfill sites is considered Low. Similarly, as only permitted sites will be used, the impact significance on local communities is also considered Low. Section 12.8 of OPRED's Guidance Notes (OPRED, 2018) advises that an assessment of wastes or waste management returned to shore for treatment or disposal is not required in the EA as it is not relevant to the impacts in the marine environment. For this reason, the processing of waste	No

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental
							returned to shore and any onshore impacts associated with the returned material is not discussed further in the EA.	
Post decommissioning surveys								
17	Seabed disturbance. Clear seabed surveys and over trawl trials.	Receptor: benthic communities. Potential for trawl sweeps (chain mats) to be carried out to demonstrate a clear seabed and/or over trawl trials. Will result in disturbance to the seabed habitats in the area.	Preference will be given to the use of side scan sonar surveys (SSS,or similar) to determine a clear seabed. Possible that SSS surveys would also negate requirement for an over trawl trial.	B	2	L	As a worst case a trawl sweep using a chain mat will be required to demonstrate a clear seabed. As fishing in the area is considered moderate, the impact of a trawl sweep or over trawl trial is not expected to be more significant that the impact of the demersal trawl gear associated with the wider area such that the impact significance is considered Low. However, this impact will be considered further in the EA, in order to allow an assessment of the cumulative seabed disturbance across all activities.	Yes

8 SEABED DISTURBANCE

When assessing the impact of the proposed activities during the ENVID Workshop (Section 7), none of the seabed impacts were considered to result in a significant environmental impact. However, it is acknowledged that the activities were considered separately and therefore those activities resulting in seabed disturbance are considered further here to allow for a cumulative assessment to be completed.

8.1 Activities (Cause of Impact)

Activities that will result in an impact to the seabed include:

- Recovery of the subsea structures, surface laid pipelines and umbilicals, spools, umbilical jumpers, mattresses and grout bags;
- Trenching and burying of the exposed ends of the trenched and buried pipelines and umbilical to be decommissioned *in situ* (considered a larger impact than cutting and recovering of these sections);
- Use of rock cover to remediate exposed ends of pipelines and umbilical to be decommissioned *in situ*; and
- Over trawl sweeps and over trawl trials.

Note: it is recognised that not all these activities will necessarily be undertaken (e.g. rockdump or over trawl trials), however, they have been fully assessed in this section to ensure the potential 'worst case' impact is assessed.

Table 8-1 presents the anticipated total area of temporary disturbance associated with all the potential decommissioning activities (estimated at 0.092 km^2), other than those associated with the over trawl trials/sweeps.

With regards to the exposed end sections of the pipelines and umbilical to be decommissioned *in situ* (total length of 1.446 km) preference will be given to trench and bury or cut and recover. However, if following C&P, the option to rock cover is selected, *c.* 11,857 te of rock will be required to remediate these pipeline and umbilical ends. Assuming a maximum berm width of 7 m this would equate to a maximum seabed footprint of 0.01 km^2.

Should over trawl trials/ sweeps be carried to demonstrate 'a clear seabed' the disturbance footprint for the activities captured within Table 8-1 would fall within the area impacted by the over trawl trial which is estimated to be *c.* 9.50 km^2 (Figure 8-1). Table 8-2 shows the worst case assumptions made to calculate this footprint.

Repsol Sinopec Resources UK Limited will explore the use of a side scan sonar survey or similar to demonstrate a clear seabed, and therefore minimise the area of temporary seabed disturbance to that estimated in Table 8-1.

Table 8-1: Anticipated area of temporary seabed disturbance associated with the proposed activities.

Activity	Assumptions made	Temporary area of disturbance (km^2)
Recovery of subsea installations*	Buchan template: 18.1 m (L) x 13.8 m (W) SSIV: 6.65 m (L) x 4.65 m (W) PLEM: 9.9 m (L) x 5.0 m (W) Manifold/WHPS: 13.0 m (L) x 13.0 m (W) Six anode skids: 2 m (L) x 3 m (W) Two anode skids: 0.8 m (L) x 1 m (W) As a worst case calculation of the seabed disturbance around each structure assumes temporary disturbance out to 5 m on each side of each structure (note this will possibly be less for the anode skids and could be more for the Buchan template, however this assumption is expected to be representative across all structures).	0.003
Recovery of surface laid pipelines and umbilicals	Using information provided in Table 3-2 the total length of surface laid pipelines and umbilicals to be recovered is *c.* 29.347 km As a worst case calculation of the seabed disturbance assumes a corridor of temporary disturbance of 2 m along length of each pipeline and umbilical	0.059
Recovery of surface laid spools and umbilical jumpers	Using information provided in Table 3-2, the total length of surface laid spools and umbilical jumpers to be recovered is *c.* 2.424 km As a worst case calculation of the seabed disturbance assumes a corridor of temporary disturbance of 2 m along length of each spool and umbilical jumper.	0.005
Trenching and burying of exposed end sections	Using information provided in Table 3-2, the total length of exposed ends associated with the trenched and buried pipelines and umbilical to be decommissioned *in situ* is 1.446 km. As a worst case calculation of the seabed disturbance assumes a corridor of temporary disturbance of 10 m along length of each of the sections to be trenched and buried.	0.015
Recovery of mattresses	132 mattresses associated with the fields each measuring 6 m (L) x 3 m (W) As a worst case calculation of the seabed disturbance assumes temporary disturbance out to 2 m on each side of each mattress.	0.009
Recovery of grout bags	500 x 25 kg grout bags associated with the fields each measuring 0.5 m (L) x 0.3 m (W). As a worst case calculation of seabed disturbance assumes temporary disturbance of 1 m^2 for each grout bag.	0.0005
Total area of temporary disturbance		0.092km^2
Note: area of disturbance calculated for each line item will overlap with other line items in a number of instances such that the area calculated is worst case estimate.		

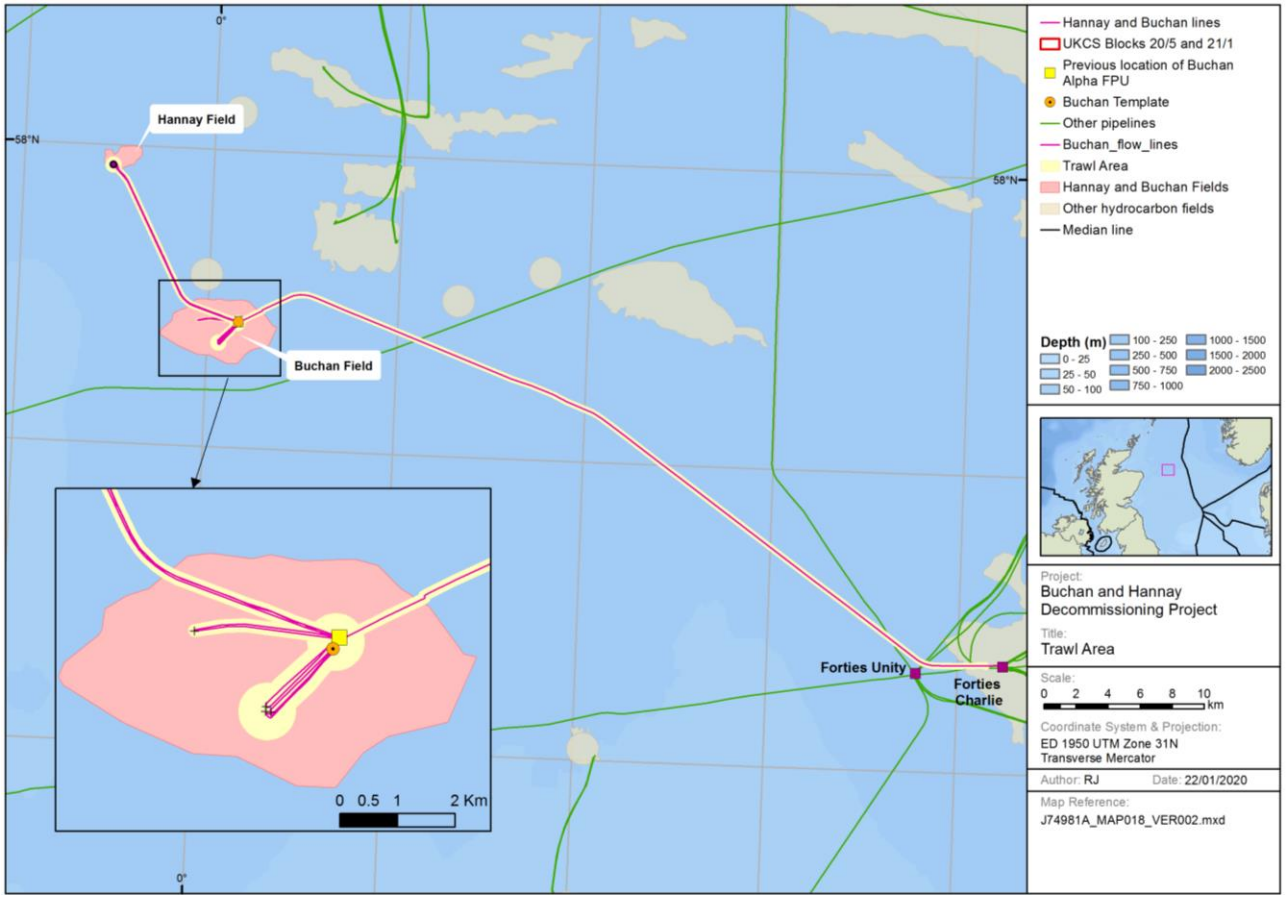


Figure 8-1: Maximum area expected to be covered by the over trawl trials.

Table 8-2: Estimate of area impacted by over trawl trials.

Row No.	Activity	Assumptions made	Area impacted by Overtrawl activities (km²)
1	Existing 500 m exclusion zones	There are currently 2 x 500 m safety zones in place at the fields: one at the previous Alpha Buchan FPU location and one at the Hannay field. The assessment assumes both these areas will be over trawled.	1.57
2	B6, B7 and B8 well location	There is no 500 m safety zone at this location, however as a worst case the assessment assumes an area equivalent to the area of an exclusion zone (i.e. 500 m radius) will be over trawled to ensure a clear seabed.	0.78
3	Export pipeline route	Assume total pipeline length of 55,740 m (1,697 m (PL126) + 54,04 m (PL401)). Area calculated assumes a 100 m corridor along 55,240 m (500 m length at Buchan end captured within the area covered by over trawl of the 500 m exclusion described in Row 1).	5.52
4	Lines from the Hannay field	Maximum line length is 13,408 m (PL1866). Area calculated assumes a 100 m corridor along 12,408 m (500 m length at each end captured within the area covered by over trawl of the 500 m exclusion described in Row 1).	1.24
5	Lines from the B4A well	Maximum line length is 2,519 m (PL170). Area calculated assumes a 100 m corridor along 2,019 m (500 m length at FPU end captured within the area covered by over trawl of the 500 m exclusion described in Row 1).	0.20
6	Lines to the B6, B7 and B8 wells	Maximum line length is 1,960 m (PL597A). Area calculated assumes a 200 m corridor along 960 m (500 m length at FPU end captured within the area covered by over trawl of one of the 500 m exclusion zones described in Row 1 and a second 500 m length at the well end captured within the area covered in Row 2). Note given the number of lines a worst case corridor width of impact of 200 m is assumed along these lines.	0.19
Total			**9.50**

8.2. Impact on Receptors

The maximum area of temporary seabed disturbance associated with the worst case proposed decommissioning activities is 9.50 km². However, this relates to an area impacted by the over trawl trials and would be significantly less if side scan sonar surveys are used to obtain evidence of a clear seabed. Impacts on this seabed area are considered temporary because, following completion of activities, the seabed will begin to recover.

The seabed area considered to be impacted permanently is limited to the areas where rock cover could be deposited. For this assessment, it includes the potential worst-case scenario of rock cover over a total length of 1.446 km of exposed pipeline and umbilical end sections with a maximum seabed footprint of 0.01 km²

Trenching physically disturbs the benthic communities and their habitat within the area impacted and may cause some smothering in the wider region due to the re-deposition of excavated material. In addition, trenching can create a temporary plume of suspended solids. While some, mostly epifaunal, organisms may be killed by the passage of the trenching machinery, the majority will be displaced, and are likely to survive. Some of the exposed organisms may not be able to re-bury before being predated upon while others may be relocated by water movements.

Given the nature of the sediment in the area it is possible that disturbed sediment particles may be transported via tidal currents for re-settlement over adjacent seabed areas. Sessile epifaunal species may be particularly affected by increases in suspended sediment concentrations as a result of potential clogging or abrasion of sensitive feeding and respiratory apparatus (Nicholls *et al.*, 2003). In the case of filter feeders, such as the juvenile *A. islandica*, an increased suspended sediment concentration could impact the ability to feed. Larger, more mobile animals, such as crabs and fish, are expected to be able to avoid areas of deposition and elevated suspended solid concentrations.

As described in Section 5.6.2, the pre-decommissioning surveys identified the potential presence of the environmentally sensitive habitat of burrowing megafauna communities and the EA assumes that the habitat is representative of the UK Habitat Feature of Conservation Importance of 'mud habitats in deep water'. The proposed decommissioning activities will impact on areas captured under this habitat type, however given the widespread distribution of the habitat across the survey area, the impact is not considered significant.

Any impacts from compression (caused for example by remedial rockdump) and sediment re-suspension are expected to be short lived since most of the smaller sedentary species associated with the area (such as polychaete worms) have short lifecycles and recruitment of new individuals from outside the disturbed area will be rapid. Recolonisation of the impacted areas can take place in a number of ways, including mobile species moving in from the edges of the area (immigration), juvenile recruitment from the plankton and burrowing species digging back to the surface. Recovery times for soft sediment faunal communities are difficult to predict, although some recent studies have attempted to quantify timescales. Collie *et al.* (2000) examined impacts on benthic communities from bottom towed fishing gear and concluded that, in general, sandy sediment communities were able to recover rapidly, although this was dependent upon the spatial scale of the impact. It was estimated that recovery from a small-scale impact, such as a fishing trawl, could occur within about 100 days assuming that recolonisation was through immigration into the disturbed area rather than from settlement or reproduction within the area. Recovery through immigration would be expected to take longer for the more extensive trawled areas, and larval recruitment or local reproduction by surviving individuals may be more important determining factors. Therefore, given the relatively small area of impact and the evidence for recovery from small scale impacts, the impact significance of the proposed activities on benthic communities is considered Low.

The loss of habitat and smothering of the benthos associated with the placement of rockdump, creates habitats for benthic organisms that live on hard substrates leading to a change in the local seabed community and an increase in local habitat and community diversity. As described in Section 5.6.2 there are glacial drop stones in the area such that addition of limited volumes of rockdump to the area will not be introducing a new hard substrate, rather than increasing the footprint of existing hard substrate. The environmental impact significance of any additional rock is therefore considered to be Low.

Evidence suggests that the sensitivity of fish to suspended sediments varies greatly between species and their life history stages, and depends on sediment composition (particle size and angularity), concentration and the duration of exposure (Newcombe and Jensen, 1996). Being the major organ for respiration and osmoregulation, gills are directly exposed to, and affected by, suspended solids in the water. If sediment particles are caught in or on the gills, gas exchange with the water may be reduced leading to oxygen deprivation (Essink 1999; Clarke and Wilber, 2000). This effect is greatest for juvenile fish as they have small easily clogged gills and higher oxygen demand (FeBEC 2010). As described in Section 5.6.3, a number of fish species recognised as PMFs occur in the area, and it is possible that suspended sediments in the water column resulting from the recovery, and/or trench and bury activities, could impact on individual fish including PMFs. However, given the short duration of the activities, any impacts on fish in the area will be at an individual level such that the impact significance is considered Low.

It should be noted the Buchan and Hannay infrastructure lies in an area that is targeted by demersal fishing gear and the temporary impacts of the decommissioning activities are considered to be minor compared to the impacts associated with these gear types.

8.2.1 Disturbance to the Drill Cuttings

The base case will be to cut the piles internally when recovering the Buchan template. Internal cutting of the piles is considered highly likely and would result in around 5-10 % of the cuttings pile being disturbed. However, if it is found that internal cutting is not technically feasible approximately 28.3% of the pile could be disturbed. This larger volume of disturbance is required to allow access to the piles approximately 3 m below the seabed. It is expected that a suction dredger would be used to 'relocate' the cuttings. A typical set up is shown in Figure 8-2 and Figure 8-3.

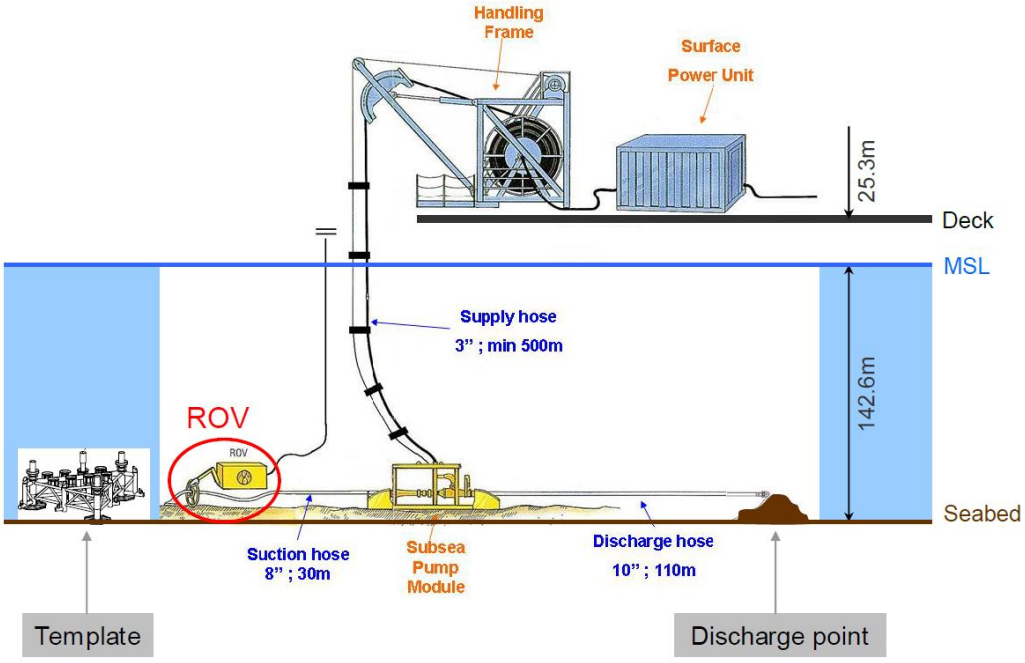


Figure 8-2: Schematic representation of redistribution of a cuttings pile using a dredger.

Figure 8-3: Photos of hose discharge and accumulation of cuttings at discharge point (DNV, 2017).

The total volume of cuttings at the Buchan template was estimated to be 828 m^3 covering an area of 3,731 m^2 (see Section 5.5). Modelling of the disturbance to 28.3% of the cuttings pile (234 m^3) was undertaken to determine the environmental impact of relocating it to within 50 m of the current template location. The modelling assumed a suction dredger will be used.

The modelling was carried out using the Dose-related Risk and Effect Assessment Model (DREAM, Sintef), part of the Marine Environmental Modelling Workbench (MEMW) suite of models which incorporates the ParTrack sub-model used for modelling the dispersion and settlement of solids (Genesis, 2019a).

A single pumping regime was modelled to represent the pile being pumped to three separate locations, approximately 50 m from the template. A pumping rate of 10 m^3/hr was chosen based on pumping rates achieved during the Joint Industry Project (JIP) trial cuttings pile removal undertaken on the North West Hutton platform cuttings pile (UKOOA, 2002). Although design flow rates of 100 m^3/hr were described, only 10 m^3/hr flow rates were achieved during the trials. This appears to be borne out by work done by BP at Valhall (Norwegian Environment Agency, 2013) where pumping rates varied between 7 and 32 m^3/hr.

During the NW Hutton trials (UKOOA, 2002) the water to solids ratios varied between 10:1 and 20:1, very occasionally reaching 6:1. During modelling work undertaken at Murchison (Genesis, 2013), runs were

undertaken using three different water to solids ratios (6:1, 15:1 and 20:1) but the model was found not to be particularly sensitive to the selected water to solids ratio. Therefore, for the Buchan model a single water to solids ratio of 10:1 was selected. This was considered representative of ratios previously achieved.

Based on the volume of cuttings needing to be moved, the pumping rate and the water to solids ratio, the duration of each discharge was calculated. Each discharge would take just under 4 days (12 days total). The model was run for 16 days to allow a few days for dispersion following the end of the final discharge.

The discharge was assumed to be approximately 2 m above the seabed. This would ensure that in practice the hose did not become blocked with cuttings piling up in front of the hose.

8.2.1.1 *Summary of Modelling Results*

Cuttings redeposition resulted in 3,200 m^2 where cuttings thickness exceeded 6.5 mm (thickness considered to cause a potential risk to more than 5% of the most sensitive species in the sediment) (Figure 8-4). Very fine particles (< 0.5 mm) are deposited at distances of up to 800 m from the discharge points along the north-south axis, but only out to 100 m along the east-west axis. Even finer particles (< 0.05 mm) are deposited over a wider area, extending several kilometres from the discharge points.

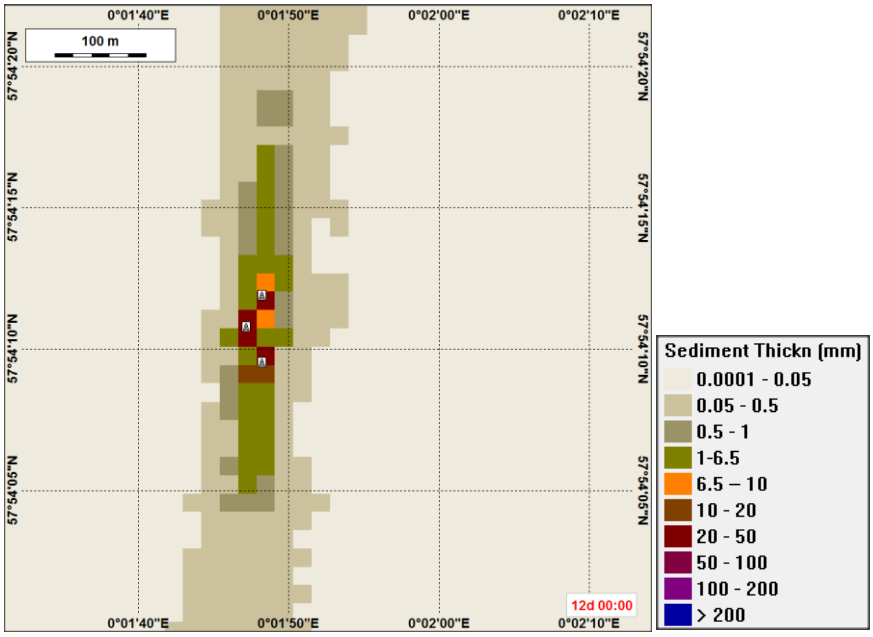


Figure 8-4: Deposition thickness – 12 days.

Grain size change was limited to the close proximity of the release locations with surrounding sediments remaining unaffected (a median grain size change greater than 52 µm, equivalent to a 108 % change, is likely to result in a risk to more than 5% of sensitive species in the sediments) (Figure 8-5).

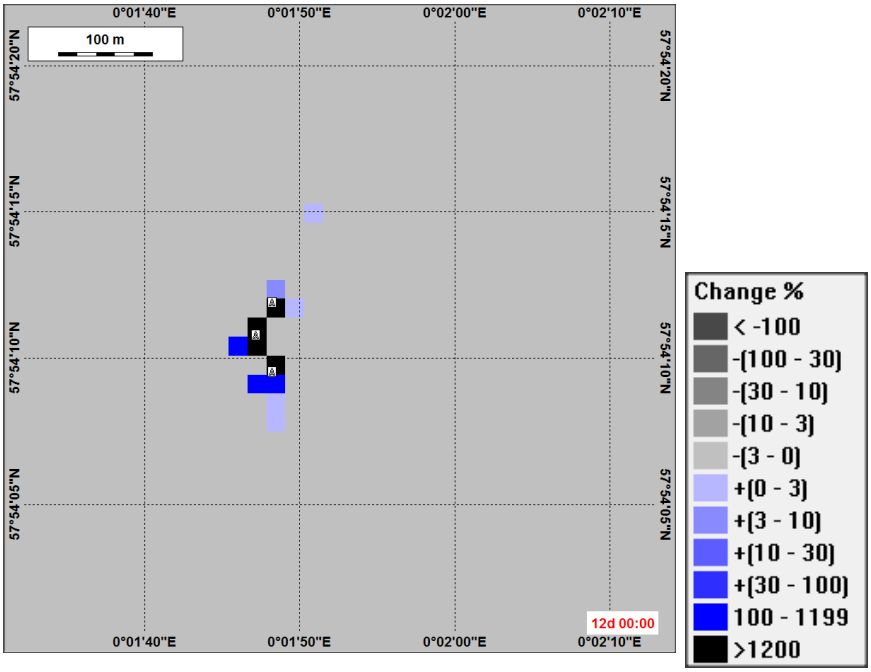


Figure 8-5: Grain size change - 12 days.

The total risk to seabed sediments is the sum of risks from chemicals (where Predicted No Effect Concentration (PNEC) is exceeded), burial thickness (> 6.5 mm), median grain size change (> 52 µm) and oxygen depletion (> 20%). A risk < 5% is considered tolerable. The total risk to seabed sediments is shown in Figure 8-6.

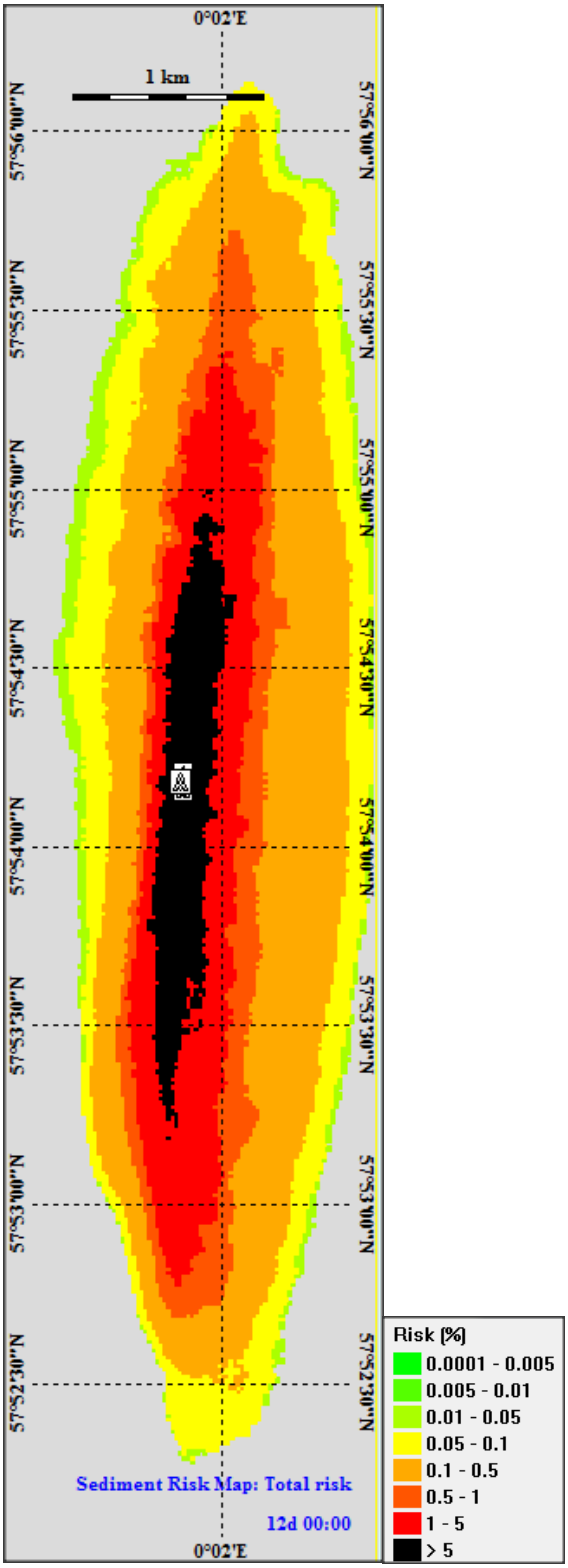


Figure 8-6: Total risk 12 days

The key contributor to risk is from the chemicals contained in the cuttings pile (84.8%). Grain size change (8.4%), oxygen depletion (4.3%) and burial thickness (2.5%) had a more limited effect. Within the chemical risk, the key contributing chemical groups were polyaromatic hydrocarbons (PAHs, 49.1% of total risk) and the unresolved complex mixture (UCM, 35.5% of total risk). Naphthalenes, phenanthrenes and dibenzothiophenes (NPDs) and dispersed oil accounted for < 1 % of total risk.

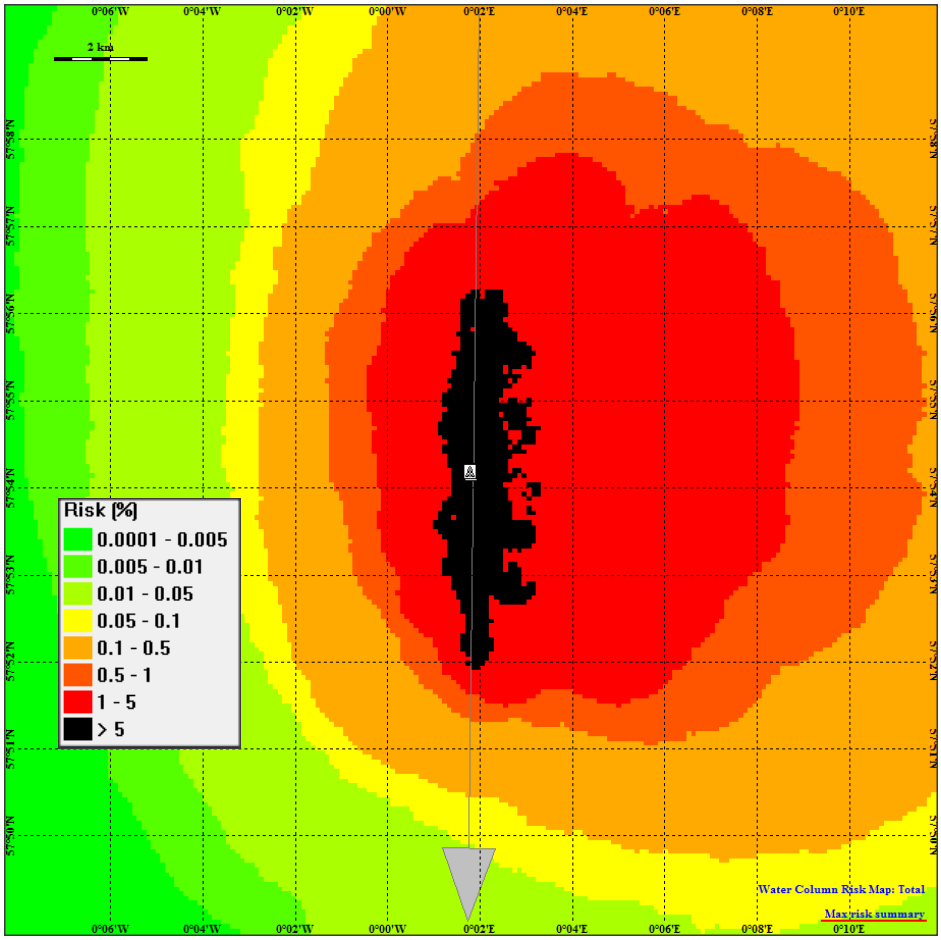
The area of seabed affected by drill cuttings redeposition reduces significantly over time (Table 8-8-3). The footprint of the existing cuttings pile is estimated at 0.068 km^2, based on the area where THCs exceed 50 mg/kg. The model suggests that within two years the area where risk exceeds 5 % around the relocated cuttings would be smaller than the existing footprint. It is also worth stressing that the model used very conservative concentrations of chemicals in the cuttings pile as these were based on the maximum concentration measured around Buchan. Therefore, the area of risk is likely to be considerably smaller than modelled.

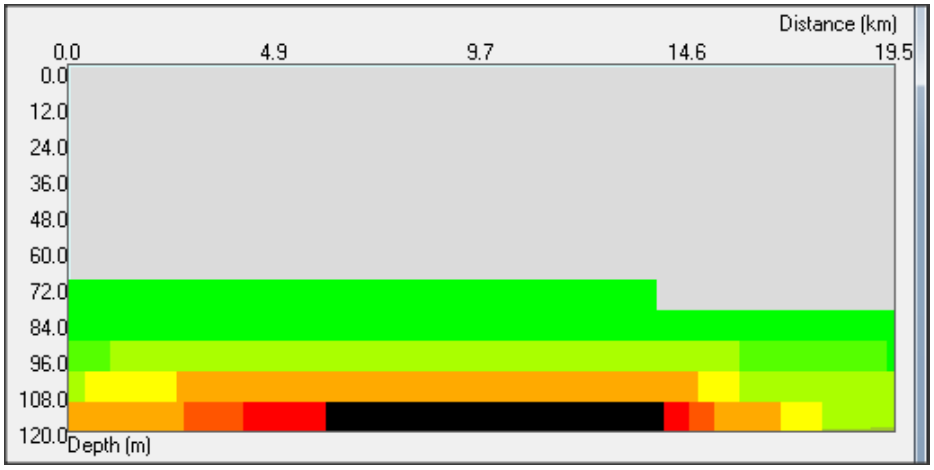
Table 8-8-3: Area of modelled risk > 5 %.

Time period	Area (km^2)
12 days	0.6796*
1 year	0.1324
Existing footprint (based on 50 mg/kg TPH)	*0.0680*
2 years	0.0532
5 years	0.0084
10 years	0.0024
*Note: area is equivalent to the area coloured in black on Figure 8-6.	

The total risk to the water column is shown in Figure 8-7. The volume of water where the risk is greater than 5% is approximately 1.43 km^3, however, it is important to note that this plot shows the swept path (i.e. all areas where risk is greater than 5% at any point in time during the entire model run). In practice the area where risk exceeds 5% is very transient and at any point in time would be much smaller than that shown in Figure 8-7 and would typically dissipate within 24 hours. The plots shown in Figure 8-6 show snapshots of risk to the water at day 3 (very limited volume with a risk > 5%) and day at 12 (no areas where there is a risk > 5%).

To put this further into context, the estimated volume of water where risk >5% is of a similar order of magnitude to risk estimates from consented produced water discharges. However, it should be noted that in the case of the cuttings the impacts are short lived (typically less than 24 hours after activities are completed), whilst for produced water, the impacts are typically associated with a continuous discharge.





Volume water where risk >5% = 1.43 km^3

Figure 8-7: Maximum risk to the water column (swept path).

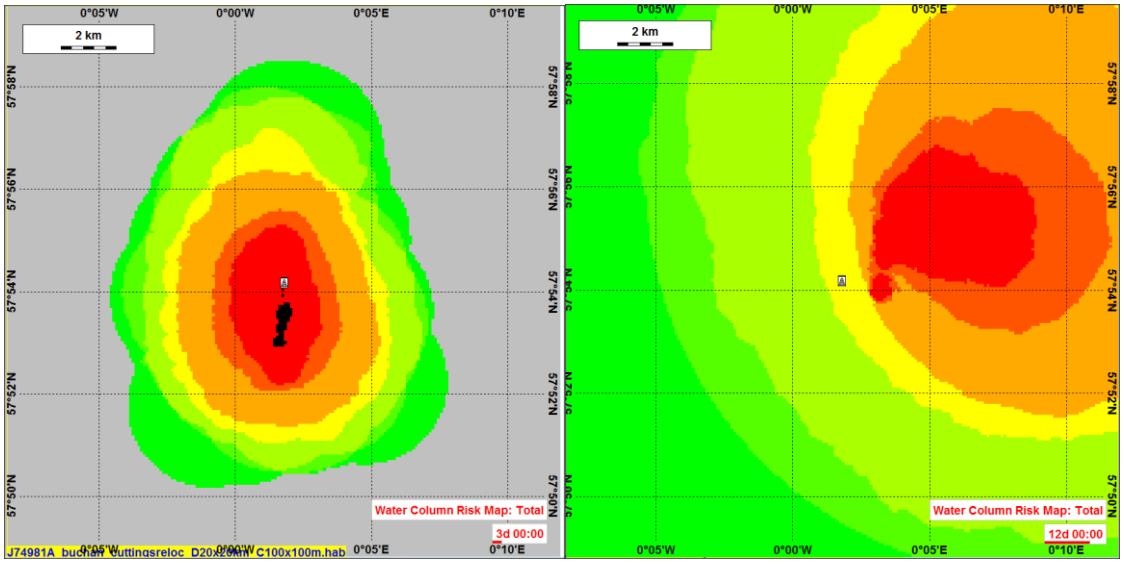


Figure 8-8: Risk to the water column at day 3 (left, 0.0066 km³) and at day 12 (right, 0 km³).

The main contributors to risk in the water column are suspended particles of barite (26.0%) and bentonite (51.15%). Chromium (13.1%) and lead (7.3%) are also important contributors to risk due to their high toxicity (and therefore low PNEC). A summary of contributing agents to risk in the water column are shown in Figure 8-8-9.

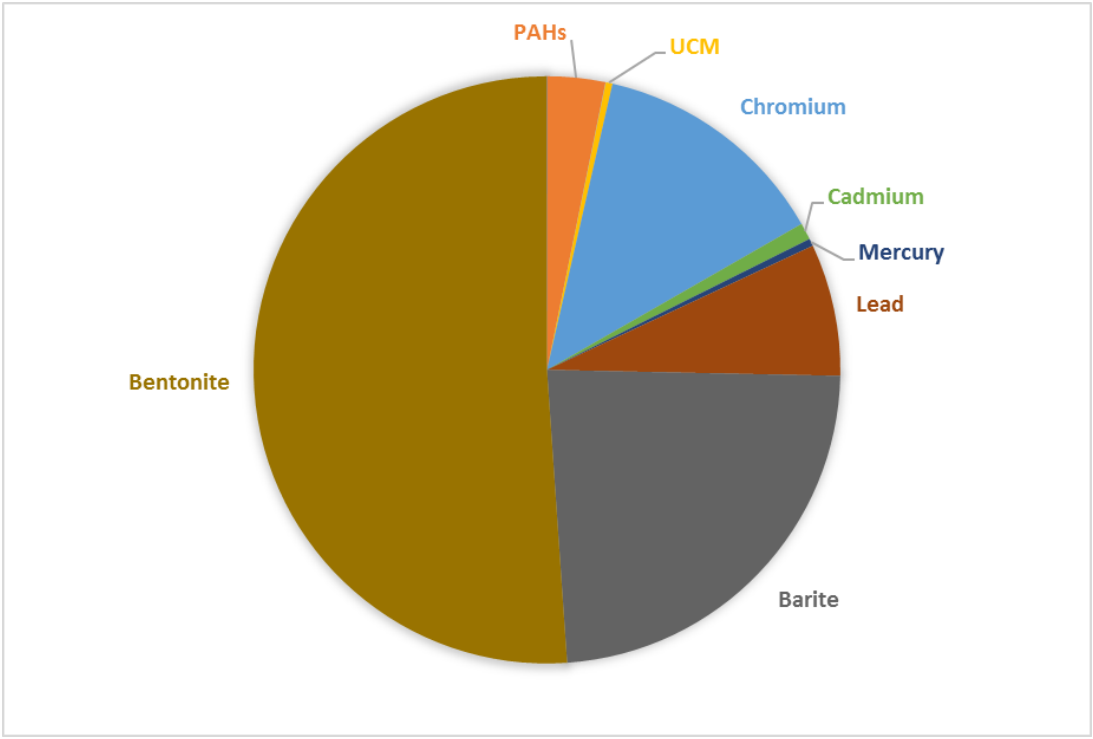


Figure 8-8-9: Contributions to risk in the water column

8.2.2 Impact on Receptors

The direct effects on benthic animals of disturbing the cuttings pile to facilitate recovery of the Buchan template could include mortality as a result of smothering, and possibly as result of suspended material (e.g. filter feeders) or habitat modification due to changed physio-chemical characteristics (such as sediment porosity and oxygenation). Disturbance could lead to leaching of hydrocarbon contaminants into the water column along with

the suspension of particle bound contaminants that could assimilate in the gut of suspension feeders (Breuer *et al.* 2004).

However, given the small volume of the cuttings pile and associated hydrocarbon content (estimated at < 1 te) and the modelling results suggesting that the relatively small of impact and subsequent reduction over time, the impact significance of disturbing the cuttings pile to recover the Buchan template is considered Low.

Decommissioning activities in the vicinity of the tie-back wells will result in some disturbance to the cuttings found at each of these locations. Given the small volumes of cuttings at each of the tie-back wells (see Section 5.5), the impact significance is considered to be less than the impact of disturbance to the cuttings pile at the Buchan template (discussed in Section 8.2.1) and is therefore considered Low.

8.3. Transboundary and Cumulative Impacts

Given the distance from the nearest transboundary line (*c.* 103 km) there are no transboundary impacts anticipated as a result of the activities captured in this Chapter.

The cumulative impacts associated with the temporary seabed disturbance is negligible when seabed disturbance associated with demersal fishing in the area is taken into account.

With respect to the potential for adding rockdump to the exposed pipeline and umbilical ends, the additional quantities of rock are expected to have a maximum seabed footprint of 0.01 km^2 and will be laid out with any designated areas. The seabed in the area has rocks (glacial drop stones) and cobbles associated with it such that the addition of this rock is adding to existing habitat to the area. Therefore, if this worst case option for remediating the exposed pipeline and umbilical ends is selected during the C&P process, the impact significance of any cumulative impacts is still considered Low.

8.4. Mitigation Measures

The following mitigation measures are proposed to minimise the environmental impacts related to the planned seabed disturbance associated with Buchan and Hannay Decommissioning Project.

Proposed Mitigation Measures

- Cutting/jetting/dredging and lifting procedures will be in place.
- With respect to remediation on the exposed ends of the buried pipelines and umbilical, trench and bury or cut and recover will be prioritised over rockdump.
- If rockdump is used, volumes will be minimised, and a fallpipe will be used to lay it on the seabed.
- Rockdump profiles will align with industry standards with respect to size of rock.
- Internal cutting of the Buchan template piles will be prioritised over external cutting.
- Location of the cuttings pile will be marked on FishSafe.
- Preference will be given to the use of side scan sonar surveys (or similar) to determine a clear seabed.

8.5. Conclusions

The decommissioning activities associated with the Buchan and Hannay Decommissioning Project will result in localised short term disturbance to the seabed, including disturbance to drill cuttings at the different well locations.

Should internal pile cutting not be possible, disturbance to the Buchan cuttings pile to allow recovery of the Buchan template is expected to represent the worst case impact. It is predicted that this disturbance will extend the footprint where hydrocarbon concentrations are above 50 mg/kg. However, this increased area of risk is expected to reduce rapidly over time.

Overtrawl trials used to confirm a clear seabed will result in the largest area of impact, and Repsol Sinopec Resources UK Limited will investigate the use of side scan sonar to determine a clear seabed and therefore remove this impact.

Should rockdump be added to mitigate the exposed pipeline and umbilicals ends, it is estimated that a total of 11,857 te would be required. As described previously there are glacial drop stones in the area such that addition of this rockdump to the area can be considered to be increasing the footprint of existing hard substrate.

Considering the scope of activities and the receptors in the area, the impact significance of disturbing the seabed is considered Low. In addition, the activities assessed in this Chapter will not contradict the NMP objectives (see Section 5.9) and as the project progresses Repsol Sinopec Resources UK Limited will aim to comply with the NMP policies. In addition, the Project will aim to comply with the oil and gas marine planning policies (see Section 5.10).

9. LEGACY IMPACTS

When assessing the impact of the proposed activities during the ENVID Workshop (Section 7), none of the legacy impacts were considered to result in a significant environmental impact. However, given that the legacy impacts could change over time, they are considered further here.

9.1 Activities (Cause of Impact)

Proposed activities that could result in a legacy impact include:

- Decommissioning of the buried pipelines and umbilical *in situ*;
- Decommissioning of the existing rockdump *in situ* and additional rock to mitigate exposed pipeline ends; and
- Decommissioning of the cuttings pile *in situ*.

In line with the results of the CA, Repsol Sinopec Resources UK Limited propose to decommission the trenched and buried pipelines and umbilical *in situ*. As described in Section 4.3, the preference is that the exposed pipeline and umbilical ends will be trenched and buried or cut and removed. However, the contingency of rockdump is being carried forward which could result in *c.* 11,857 te of rock being placed on the seabed.

The environmental and socio-economic legacy impacts of decommissioning the buried pipelines and umbilical and rockdump are discussed here.

9.2 Environmental Impact of Infrastructure to be Decommissioned In-Situ

9.2.1 Buried Pipelines and Umbilical

Over time the buried pipelines and umbilical will breakdown. Analysis by Atkins indicates that the process of deterioration of rigid steel pipelines in salt water environments may take from 220 to 600 years (Atkins, 2012) and OGUK suggest that steel structures below the seabed will corrode at rates in the region of 0.01 to 0.02 mm/year (OGUK, 2013). During this long-term process, the degraded components of the pipelines and umbilical and their contents could potentially become bioavailable to benthic fauna in the immediate vicinity of the lines.

The pipelines to be decommissioned *in situ* contain inhibited seawater dosed with a corrosion inhibitor (PRESERVAN 5500 dosed at 30 ppm) whilst the umbilical cores contain either seawater or water based hydraulic fluids. As the lines corrode, their contents will be slowly released into the surrounding sediments. Given that:

- the release will be gradual;
- the chemicals contained within the pipelines are approved chemicals; and
- the hydraulic fluids are water based,

the impact significance of these discharges is considered Low.

The steel (*c.* 8,339 te), aluminium (*c.* 54 te), copper (*c.* 5.7 te) and zinc (*c.* 20.1 te) associated with the pipelines and umbilical to be decommissioned *in situ* will over time become exposed to the surrounding sediment as the pipelines and umbilical degrade. Some metals have the potential to exert toxic effects in biota and can bioaccumulate through the food web (Neff, 2002). Within benthic animals, accumulated metals may act as enzyme inhibitors, adversely affect cell membranes, damage reproductive and nervous systems, cause changes in metabolic and respiratory efficiency, affect growth and behaviour or act as carcinogens (Kennish, 1997; and Ansari *et al.*, 2004). Aluminium, copper and zinc are all trace metals, few of which have been seen to significantly bioaccumulate in marine organisms. Taking account of:

- the buried nature of the lines;
- the slow anticipated rate of degradation; and
- the fact that trace metals have not been found to significantly accumulate in marine organisms,

the long term environmental impact significance of the metals associated with the lines decommissioned *in situ* is considered Low.

PL401 has *c.* 7,492 te of concrete associated with it. As the line is buried any concrete is expected to degrade over centuries. The degradation products will be the aggregates (sand and gravel) used in the concrete and the reacted cement compounds, predominantly calcium carbonate. These degradation products are relatively chemically inert

and are likely to result only in a slight increase in the coarse sediment in the area of the pipeline. Impacts on benthic fauna are therefore expected to be negligible, whilst there are no anticipated impacts on the water column. Therefore, the potential impact significance of the degraded concrete associated with PL401 is considered Low.

The pipelines and umbilical to be decommissioned *in situ* have *c.* 665 te of plastic[1] associated with them (the majority of which is associated with the umbilical (*c.* 594 te). It is thought the deterioration of plastics within the pipelines and umbilical will take significantly longer than the time expected for the steel pipelines to degrade (Dames *et al.*, 1999).

The sea is a very complicated environment for the degradation of plastics because microorganisms, animals, salt, sunlight, fluctuations of water, etc. all play a part in the degradation process (Krasowska *et al.*, 2015). Degradation can therefore be impeded by cold temperatures and a lack of ultra violet (UV) light. As the Buchan and Hannay pipelines and umbilical to be decommissioned *in situ* are buried it can be expected that the majority of these degradation sources, such as UV light and high temperatures will not be relevant.

Physical forces such as heating/cooling or seabed movements can cause mechanical damage such as the cracking of polymeric materials, and these physical forces are more likely to occur, however again these are not expected to impact on the pipelines and umbilical. The growth of microorganisms within the sediment can cause small-scale swelling and bursting (Krasowska *et al.*, 2015), leading to fragmentation and the eventual breakdown into microplastics (1 µm to 5 mm) or nanoplastics (1 nm to 1 µm).

The potential ecological and human health risks of microplastics/nanoplastics are relatively new areas of research, and there is currently a large degree of uncertainty surrounding this issue (GESAMP, 2015). Adverse effects of plastics on marine organisms have been observed through the physical obstruction or damage of feeding appendages/digestive tracts/breathing tubes has been frequently observed (GESAMP, 2015).

Due to the buried nature of the pipelines and umbilicals within this project it is expected that the timescale of degradation will be considerably slower than it is for plastic in the water column or at the surface. The impacts of mechanical forces acting on the plastic pipelines are predicted to be low, and it is expected that much of the eventual plastic contaminants produced will be contained within the sediment and prevented from reaching the water column. The long term environmental impact significance of the plastics associated with the pipelines and umbilical to be decommissioned *in situ* is therefore considered Low.

9.2.2 Existing and Additional Rockdump

Approximately 43,270 te of rockdump has previously been deposited at various locations across the Buchan and Hannay fields. Some of this rock has been in place for over 25 years creating a habitat for benthic organisms that live on hard substrate. If the option to rock cover the exposed sections of the pipelines and umbilical (to be decommissioned *in situ*) is selected, *c.* 11,857 te of rock will be required.

As for the existing rock, this additional rock will create a habitat for benthic organisms that live on hard substrate. As described in Section 5.6.2, there are areas of gravel, cobbles and boulders across the fields that will also form a habitat for these species. Therefore, it is unlikely that the decommissioning of existing rock or the introduction of any additional rock will have a significant impact on the benthic species that occur in the area. The environmental impact of decommissioning existing rock *in situ* or adding new rock to mitigate the exposed ends of the pipelines and umbilical is therefore considered Low.

9.3 Socio-Economic Impacts of Infrastructure to be Decommissioned *In-Situ*

As described in Section 6.2, demersal trawl gear is used in the area of the Buchan and Hannay fields and therefore has the potential to interact with any infrastructure or rock remaining on the seabed. The buried pipelines and umbilical to be decommissioned *in situ* have a depth of lowering / cover in general of over 0.6 m and occur in an area where the seabed is stable. Trawl gear currently working in the area, have regularly traversed the buried sections of the pipelines and umbilical without any interaction.

Assuming a worst case whereby rock is used to mitigate the exposed ends of the trenched and buried pipelines and umbilical, *c.* 11,857 te of rock will be required. In the event that any rock cover is laid, the rock size and profiles

[1] The 665 te comprises a number of different plastics including coal tar enamel, polypropylene, fusion bonded epoxy, polyethylene, nylon and Hard Polyvinyl Chloride (HPVC).

selected will be in accordance with industry best practice and SFF recommended practice such that demersal trawl gear would be expected to be able to access the area.

Following decommissioning activities independent verification of the seabed state will be obtained and evidence of clearance will be provided to all relevant governmental and non-governmental organisations.

As part of the DP, Repsol Sinopec Resources UK Limited will commit to a post decommissioning survey strategy (agreed with OPRED) to monitor the burial status of the lines and stability of the rock profiles.

Therefore taking:

- the current buried condition of the lines into account;
- the stability of the seabed;
- the used of industry preferred rock size and profiles;
- demonstration of a clear seabed; and
- a post decommissioning survey strategy,

the socio-economic impact significance of these lines and rock being decommissioned *in situ* is considered Low.

9.4 Legacy Impacts of the Buchan Cuttings Pile Decommissioned *In Situ*

As described in Section 3.2.6, following removal of the Buchan template the cuttings pile will be decommissioned *in situ*. The small Buchan pile (828 m^3) with its low hydrocarbon content (< 1 te) falls well below the OSPAR thresholds considered to be of environmental significance (see Section 3.2.6), and on this basis, the environmental impact of decommissioning the pile *in situ* is considered Low.

The current 500m safety exclusion zone in place at Buchan will be removed following the proposed decommissioning activities. This will allow access to areas that have been excluded to other sea users over the operational life of the field. This also opens the potential for interactions between demersal trawl gear and the drill cuttings pile, which potentially could cause some oil contamination to gear, catch tainting and result in the spread of the small residual contamination over the seabed. It is important to note that the hydrocarbon content of the cuttings pile will continue to decline over time, and the potential for impact on the fisheries will also decline. The removal of the 500m safety exclusion zone in the Buchan area and opening access to this area is seen as a positive and the location of the cuttings pile will be marked on FishSafe, informing other users of its location. Therefore, the socio-economic impact significance of decommissioning the cuttings pile in-situ is considered Low.

9.5 Transboundary and Cumulative Impacts

Given the distance from the nearest transboundary line (*c.* 103 km), there are no transboundary impacts anticipated as a result of the activities captured in this Chapter.

As all surface laid infrastructure will be recovered and any additional rockdump will be minimised the cumulative impact of the proposed activities in relation to other activities in the area is not considered significant.

9.6 Mitigation Measures

The following mitigation measures are proposed to minimise the environmental and socio-economic impacts associated with the infrastructure to be decommissioned *in situ* and any additional rockdump.

Proposed Mitigation Measures

- All surface laid infrastructure will be recovered.
- A clean seabed will be achieved as part of the decommissioning activities.
- Preference will be given to trenching and burying or cutting and recovering the exposed pipeline and umbilical ends.
- Lines decommissioned *in situ* have been flushed to reduce hydrocarbons and chemicals to ALARP.
- If used, rockdump will be optimised and carefully managed. A fall pipe will be used to ensure accuracy of the rock dumping. Size of rock and rock profiles will be in accordance with industry practice which is also the preferred SFF / industry best practices.
- Locations of remaining materials (including the cuttings pile) will be marked on FishSafe.
- Adherence to a post decommissioning survey strategy agreed with OPRED.

Repsol Sinopec Resources UK Limited's commitment to adhering to the mitigation measures identified means that the environmental and socio-economic impact significance of decommissioning the buried pipelines, umbilical, existing rock and any new rock *in situ* is considered Low.

The activities assessed in this chapter will not contradict the NMP objectives (see Section 5.9) and as the project progresses Repsol Sinopec Resources UK Limited will aim to comply with the NMP policies. In addition, the Project will aim to comply with the oil and gas marine planning policies (see Section 5.10).

10. ENVIRONMENTAL MANAGEMENT

Repsol Sinopec Resources UK Limited are committed to conducting activities in compliance with all applicable legislation and in a manner that will minimise impacts on the environment. Environmental and social impacts identified through the impact identification processes will be input to the projects risk register. A summary of key environmental and social impacts and risks shall be included within the projects decision documentation throughout all phases of the project.

Repsol Sinopec Resources UK Limited has established a clear framework for the effective management of Health, Safety and Environmental (HSE) issues involving their oil and gas activities in the UK. The Company regards environmental management as being an integral part of its overall management responsibility, the fundamental aims being to support environmental protection, prevent pollution and comply with legislation and regulations. The principles of the International Standard for Environmental Management Systems (ISO14001) are incorporated within the Company's Safety and Environmental Management System (SEMS) which is an integral part of the company's overall management system.

Repsol Sinopec Resources UK Limited's structure, roles and responsibilities are outlined in the SEMS. In addition, the SEMS provides the framework for a 'Plan-Do-Check-Act' approach to HSE management, which actively promotes continual improvement in all aspects of the organisation's activities.

Repsol Sinopec Resources UK Limited's HSE Policy is a public declaration of the Company's commitment to create a working environment such that no harm is caused to people and where environmental impact is minimised. The Company's HSE Policy is shown in Figure 10-1.

REPSOL SINOPEC
Resources UK

HEALTH, SAFETY & ENVIRONMENT POLICY

The Company Policy is to conduct our business in a manner that ensures we:

- cause no harm to people;
- minimise our impact on the environment;
- comply with regulatory requirements;
- choose safety over operational results;
- maintain a state of emergency preparedness.

The objectives of this Policy are to ensure we:

- always comply with the law or Company standards, whichever is of a higher standard;
- operate our business to ensure proactive risk mitigation and continuous improvement;
- set goals and targets, and measure performance against them;
- communicate openly with those who may be affected by our activities;
- strive to prevent all accidents and incidents, prevent pollution, use resources sustainably and capitalise on lessons learned;
- are able to respond to any foreseeable emergency.

SAFE OPERATIONS IN ALL COMPANY ACTIVITIES IS A CORE VALUE

If operational results ever conflict with this Policy, we all have a responsibility to choose compliance with this Policy over operational results and Repsol Sinopec Resources UK Limited will support that choice.

Bill Dunnett
Managing Director

Produced in-house by Document & Records Team
RSR-HSE-00-POL-COM-001.A01, Summary Extract of Company HS&E Policy
Effective January 2018

Figure 10-1: Repsol Sinopec Resources UK Limited HSE Policy.

11. CONCLUSIONS

The Buchan and Hannay fields are to be decommissioned by Repsol Sinopec Resources UK Limited. Included in the decommissioning activities is the recovery of all subsea structures, and surface laid pipelines, umbilicals, spools, umbilical jumpers, mattresses and grout bags. The trenched and buried pipelines and umbilical will be decommissioned *in situ* whilst the exposed ends will be remediated. Preference will be given to trench and bury or cut and recovering the exposed ends however the CA did also identify the use of rockdump as a suitable remediation option.

Following a detailed review of the project activities, the environmental sensitivities of the project area, industry experience with decommissioning activities and of stakeholder concerns, it was determined that further assessment of the following issues was required in order to properly define the potential impact of the proposed decommissioning activities for the Buchan and Hannay fields:

- Seabed disturbance impacts – during recovery of infrastructure, trench and bury activities, potential rock cover and over-trawl sweeps/trials.
- Legacy impacts:
    - The release of hydrocarbons, chemicals, metals, NORM, plastic etc. as material (including the cuttings pile) decommissioned *in situ* degrades.
    - The physical presence of infrastructure (including the small cuttings pile with a hydrocarbon content of < 1 te) decommissioned *in situ* on other sea users, both in terms of physical exclusion and risk of snagging.

A review of each of these potentially significant environmental interactions has been completed and, considering the mitigation measures that will be built into the decommissioning project activities, there is expected to be no significant impact on receptors. As part of this review, cumulative and transboundary impacts were assessed and determined to be not significant.

The potential impact on protected sites in the wider vicinity has been considered in the assessment. The protected sites in closest proximity to the Buchan and Hannay fields are the East of Gannet and Montrose Fields NCMPA and the Scanner Pockmark SAC which are located *c.* 35 km and *c.* 36 km respectively from the fields. Having assessed the impact of the decommissioning activities, there is not expected to be a significant impact on any protected sites.

The EA has considered the objectives and marine planning policies of the Scottish NMP across the range of policy topics including biodiversity, natural heritage, cumulative impacts and oil and gas. Repsol Sinopec Resources UK Limited considers that the proposed decommissioning activities are in broad alignment with such objectives and policies. Similarly, Repsol Sinopec Resources UK Limited considers that the proposed activities are aligned with the oil and gas specific marine planning policies.

Based on the findings of this EA and the identification and subsequent application of the mitigation measures identified for each potentially significant environmental and societal impact, it is concluded that the proposed Buchan and Hannay fields decommissioning activities will result in no significant environmental or societal impacts.

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12. REFERENCES

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APPENDIX A – IMPACT AND RISK ASSESSMENT METHODOLOGIES

This appendix presents the Environmental and Socio-Economic Impact Assessment (ESIA) and the Environmental and Socio-Economic Risk Assessment (ESRA) matrices used to determine the impact of the planned and accidental activities (respectively) associated with the project.

A.1. Receptors and Aspects

Prior to carrying out the ESIA / ESRA the potential receptors likely to be impacted were identified (Chapters 5 and 6), and the ways in which the activities may interact with the environment, i.e. the ''aspects''(Chapter 3) were ascertained.

A.1.1 Environmental and Socio-Economic Receptors

Receptors to be considered in the ESIA and ESRA include:

Environmental receptors:

- Air quality;
- Climate;
- Water quality;
- Sediment quality;
- Plankton;
- Benthic communities (including flora and fauna);
- Fish;
- Marine mammals;
- Seabirds;
- Coastal marine communities;
- Designated areas.

Social receptors:

- Resource availability (e.g. diesel, landfill sites etc.);
- Fisheries;
- Shipping;
- Local communities (including other users e.g. tourism and persons living/working near the decommissioning yards, ports etc.);
- Cultural heritage (e.g. wrecks).

A.1.2 Identification of Aspects

Aspects to be considered include:

- Energy use and emissions to air;
- Physical presence of infrastructure decommissioned *in situ;*
- Disturbance to the seabed (including disturbance to the cuttings piles);
- Waste generation;
- Unplanned events;
- Physical presence of vessels;
- Discharges to sea;
- Underwater noise;
- Resource use;
- Yard activities e.g. noise, odour etc.

The aspects associated with each activity were assessed in terms of their impact on the receptors in the area. For example, the use of vessels will result in emissions to air, discharges to sea, underwater noise, physical use of space and, if anchored, disturbance to the seabed. Receptors potentially impacted by these aspects include air quality, climate, marine mammals, seabirds, other users of the sea, seascape and benthic communities (if anchored).

A.2. ESIA for Planned Activities

The significance of the environmental/social impact of planned activities on each of the susceptible receptors is derived by considering the 'Receptor Sensitivity' in relation to the 'Magnitude of Effect' of the aspect.

A.2.1 Receptor Sensitivity

Four categories of Receptor Sensitivity are applied ranging from 'Low' to 'Very High' as shown in Table A-1.

Table A-1: Receptor Sensitivity.

Category	Environmental Definition
(a) Low	**Flora/Fauna/Habitats - within the impacted area** • Population sizes are considered to be of little to no geographical importance. • Species do not have designated conservation status and are of IUCN 'Least Concern'. • No designated habitat/sites. • Impacted species are widespread in the North East Atlantic region. **Air quality:** Emissions may impact on other nearby installations. **Water quality**: Open offshore water body. **Cultural heritage sites**: Site integrity is already compromised. **Resource availability:** (e.g. landfill sites, diesel use) Renewable and/or abundant. **Third party users:** have capacity to absorb change without impact.
(b) Medium	**Flora/Fauna/Habitats – within the impacted area** • Significant numbers of at least one receptor of national importance (e.g. PMFs). • Significant numbers of a species which is listed as IUCN 'Near Threatened'. • Nationally designated habitat/sites (e.g. PMFs). • Species may be of regional value. **Air quality**: Populated areas nearby. **Water quality**: Semi-enclosed water body with good flushing. **Cultural heritage sites:** Site is of local heritage importance. **Resource availability**: (e.g. landfill sites, diesel use) Renewable and/or available. **Third party users:** have capacity to absorb change without significant impact.
(c) High	**Flora/Fauna/Habitats – within the impacted area** • Significant numbers of at least one receptor of regional (European) importance (e.g. Annex II / IV species and OSPAR designations). • Significant numbers of a species which are listed as IUCN 'Vulnerable'. • Regionally designated habitats/sites (e.g. OSPAR designations and Annex I habitats: SACs and SPAs). • Locally distinct sub-populations of some species may occur. **Air quality:** Densely populated areas nearby. **Water quality:** Semi-enclosed water body with limited flushing. **Cultural heritage sites:** Site is of regional heritage importance. **Resource availability:** (e.g. landfill sites, diesel use) Not renewable and/or limited availability. **Third party users:** have low capacity to absorb change and significant impact is likely to occur.
(d) Very High	**Flora/Fauna/Habitat – within the impacted area** • Significant numbers of at least one receptor of international importance. • Significant numbers of a species which are listed as IUCN 'Endangered' or 'Critically Endangered'. • Internationally designated habitats/sites (e.g. Ramsar sites). • At least one receptor is endemic (unique) to the area. **Air quality:** Very densely populated area with sensitive receptors such as schools and hospitals. **Water quality:** Enclosed water body with no flushing. **Cultural heritage sites:** Site is of international heritage importance. **Resource availability:** (e.g. landfill sites, diesel use) Not renewable and/or scarce availability. **Third party users:** have no capacity to absorb change e.g. unemployment due to long term closure of fisheries.

A.2.1.1 Climate Change

With respect to the emission of greenhouse gases, climate is considered a global receptor rather than a local receptor. The categories identified in Table A-1 do not capture definitions for climate change. This is because the sensitivity status of climate is considered to be 'Very High' in line with the 2014 Climate Change Report produced by the Intergovernmental Panel on Climate Change (IPCC, 2014).

A.2.2 Magnitude of Effect

Definitions for the Magnitude of Effect on the receptors are presented in Table A-2. Prior to determining the Magnitude of Effect, industry recognised 'base case' mitigation measures were assumed to be applied e.g. on mobilisation of vessels to carry out the work Repsol Sinopec Resources UK Limited will notify other sea users such as SFF. Additional Repsol Sinopec Resources UK Limited or Project specific measures would include having a fisheries liaison officer on board any reel lay vessels that may be mobilised. These additional mitigations are considered prior to identifying the residual impact.

Table A-2: Magnitude of Effect.

Magnitude Level		Description	
		Environmental Impact	**Social Impact**
0	**Positive/No effect** *Regulatory compliance or Company goals are not a concern.*	**No environmental concerns** • Positive environmental impact e.g. retaining a 500 m zone resulting in a 'protected area'. • No significantly negative environmental effects.	**No public concerns** • Possible enhancement in the availability of a resource benefitting the persons utilising the area e.g. removal of 500 m zones results in return of access to fishing grounds. • No impacts on sites or features of cultural heritage. • No impact on resource or landfill availability.
1	**Negligible** *Regulatory compliance or Company goals are not breached.*	**Negligible environmental effects** • Any effects are unlikely to be discernible or measurable and will reverse naturally. • No beaching or transboundary impacts.	**Limited local public awareness and no concerns** • An intermittent short-term decrease in the availability of a resource which is unlikely to be noticed e.g. vessels working out-with existing 500 m exclusion zones could temporarily impact on a shipping route or fishing area. • Undiscernible changes to a site or feature of cultural heritage that do not affect key characteristics and are not above background changes. • Undiscernible use of a resource (e.g. diesel, rockcover or landfill).

Magnitude Level		Description	
		Environmental Impact	**Social Impact**
2	**Minor** *Regulatory compliance is not breached.*	**Minor, localised, short term, reversible effect** • Any change to the receptor is considered low, would be barely detectable and at same scale as existing variability. • Recover naturally with no Company intervention required. • No beaching or transboundary impacts	**Some local public awareness and concern** • A temporary (<1 year) decrease in the availability or quality of a resource e.g. access to fishing grounds may temporarily be inhibited due to presence of vessels. • Minor changes to a site or feature of cultural heritage that do not affect key characteristics. • Minor use of a resource (e.g. diesel, rockcover or landfill).
3	**Serious** *Possible minor breach of regulatory compliance.*	**Detectable environmental effect within the project area** • Medium localised changes to the receptor are possible. • Localised Company response may be required. • No beaching or transboundary impacts.	**Regional / local concerns at the community or stakeholder level which could lead to complaints** • Medium decrease in the short-term (1-2 years) availability or quality of a resource affecting usage e.g. bring a rig on site for 1-2 years. • Nuisance impacts e.g. marine growth odour coming from yards. • Partial loss of a site or feature of cultural heritage. • Moderate use of a resource (e.g. diesel, rockcover or landfill).
4	**Major effect** *Possible major breach of regulatory compliance.*	**Severe environmental damage extending beyond the project area** • High, widespread mid-term (2-5 years) degradation of the receptor. • Company response (with Corporate support) required to restore the environment. • Possible beaching and / or transboundary impacts.	**National stakeholder concerns leading to campaigns affecting the Company's reputation** • High mid-term (2-5 year) decrease in the availability or quality of a resource affecting usage e.g. closure of fishing grounds. • Substantial loss or damage to a site or feature of cultural heritage. • High use of a resource (e.g. diesel, rockcover or landfill).
5	**Critical effect** *Major breach of regulatory compliance resulting in project delays and prosecution.*	**Persistent severe environmental damage** • Very high, widespread long-term (>5 years) degradation to the receptor that cannot be readily rectified. • Major impact on the conservation objectives of internationally/nationally protected sites. • Full Corporate response required. • Major beaching and/or transboundary impacts.	**International public concern and media interest affecting the Company's reputation** • Very high decrease in availability of a resource and potentially livelihood of users for > 5 years e.g. *hydrocarbons on beaches affecting tourism or tainting of fish resulting in the long-term closure of fishing grounds.* • Total loss of a site or feature of cultural heritage. • Significant use of a resource (e.g. diesel, rock cover or landfill).

A.2.3 Cumulative Impacts

The EA sets the activities and potential impacts in the context of all other activities taking place in the Buchan and Hannay Field area to determine the additional cumulative effects of the new activities. The potential cumulative effects are discussed in the impact assessment chapters e.g. cumulative impacts on climate change.

A.2.4 Environmental / Socio-Economic Impact Significance

The 'Receptor Sensitivity' and the 'Magnitude of Effect' were combined using the matrix presented in Table A-3 to determine the level of impact for planned activities.

Table A-3: ESIA matrix for planned activities.

		Receptor Sensitivity			
		(a) Low	(b) Medium	(c) High	(d) Very high
Magnitude of Effect	(0) Positive/No effect				
	(1) Negligible				
	(2) Minor				
	(3) Serious				
	(4) Major				
	(5) Critical				

(i) Positive / No effect significance	• Positive or no environmental or social impact. • No public interest or positive public support.
(ii) Low significance	• No/negligible environmental and social impact. • No concerns from consultees.
(iii)Moderate significance	• Discernible environmental and social impacts. • Requirement to identify project specific mitigation measures. • Concerns by consultees which can be adequately addressed by the Company.
(iv)High significance	• Substantial environmental and social impacts. • Serious concerns by consultees requiring Corporate support. • Alternative approaches should be identified.

A.2.5 Transboundary Impacts

Where relevant, transboundary impacts of each aspect on the receptors is discussed in the impact assessment chapters e.g. the impact of emissions on climate change.

A.3. ESRA for Unplanned Events

To determine the environmental and social risk of an unplanned event, the following approach considers firstly the significance of the environmental impact of an event should it occur and secondly the likelihood of the event occurring.

A.3.1 Environmental and Social Significance of an Unplanned Event

The ESIA approach described in Section A.2 for determining the environmental and social impacts of planned activities was also used to determine the significance of impacts that may result from unplanned events.

A.3.2 Likelihood of an Unplanned Event

Five categories of 'likelihood' have been identified as presented in Table A-4.

Table A-4: Likelihood of an unplanned event.

Likelihood Category	Definition
Extremely Remote	Has never occurred within industry or similar industry but theoretically possible.
Remote	Similar event has occurred elsewhere but unlikely to occur with current practices
Unlikely	Event has occurred in the industry during similar activities.
Possible	Event could occur during project activities.
Likely	Event is likely to occur more than once during the project.

A.3.3 Environmental Risk of an Unplanned Event

Combining the significance of the environmental/social impact with the 'likelihood of the unplanned event occurring' allows the level of environmental risk to be determined using the matrix presented in Table A-5. Note the potential for a beneficial impact significance has been removed as it is not expected that an unplanned event would lead to a beneficial environmental or social impact.

Table A-5: ESRA matrix for unplanned activities.

		Environmental significance of unplanned event*		
		(ii) Low	(iii) Moderate	(iv) High
Likelihood of event	Extremely remote	Low	Low	Low
	Remote	Low	Low	Medium
	Unlikely	Low	Medium	Medium
	Possible	Low	Medium	High
	Likely	Low	High	High

*Note the numbers associated with each significance level range from (ii) to (iv) in keeping with assignment in Table A-3.

Low risk	• Negligible environmental and social risks. • Mitigation measures are industry standard and no project specific mitigation required. • No consultee concerns.
Medium risk	• Discernible environmental and social risks. • Consultee concerns can be adequately resolved. • Local public interest.
High risk	• Significant environmental and social risks. • Serious consultee concerns. • Media interest and reputational impacts.

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