Tyne Pipelines Decommissioning

Comparative Assessment Report

For Perenco UK

200605-S-REP-0008 Rev 3

16/06/2025

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ABBREVIATIONS

Abbreviation	Description
BEIS	Business, Energy, and Industrial Strategy (Formerly Department of Climate Change)
CA	Comparative Assessment
CO_2	Carbon dioxide
DP	Decommissioning Programme
e.g.	For Example
EA	Environmental Appraisal
EU	European Union
FCS	Favourable Conservation Status
FAR	Fatal Accident Rate
HCS	Hydrocarbon Safe
HIRA	Hazard Identification and Risk Assessment
ICES	International Council for the Exploration of the Sea
k	Thousand
km	Kilometre
km^2	Square kilometre
m	Metre
MCZ	Marine Conservation Zone
mil	Million
mm	Millimetre
MOAB	Mobile Offshore Application Barge
MOD	Ministry of Defence
MS	Microsoft
ND	No Data
NSTA	North Sea Transition Authority (Formerly Oil and Gas Authority)
N/A	Not Applicable
OEUK	Offshore Energies UK (Formerly Oil and Gas UK)
OPRED	Offshore Petroleum Regulator for the Environment and Decommissioning
OSPAR	Oslo Paris Agreement
PL	Pipeline
PLL	Personal Loss of Life
PUK	Perenco UK Limited
PWA	Pipeline Works Authorisation
RAG	Red Amber Green
SAC	Special Area of Conservation
SNS	Southern North Sea

Abbreviation	Description
SPA	Special Protection Area
te	Ton (UK)
UK	United Kingdom
UKCS	United Kingdom Continental Shelf
"	Inch
>	Greater than
<	Less than
£	Pound sterling
°	Degrees
′	Minutes
″	Seconds
%	Percentage

HOLDS

Section	Hold

1 EXECUTIVE SUMMARY

Perenco UK Limited (PUK) has conducted a Comparative Assessment (CA) for the decommissioning of Pipelines (PL) 1220/ PL 1221 and associated stabilisation materials. The CA was completed with reference to published guidance from the Offshore Petroleum Regulator for the Environment and Decommissioning (OPRED) [3] and Offshore Energies UK (OEUK) guidance [16] and included the following steps:

This CA report presents the methodology, decision context, and preparation work carried out, as well as the assessment analysis and outcomes resulting in the preferred option for the decommissioning of PL 1220 and PL 1221 and associated stabilisation materials to be leave in situ with rock placement of the scour basin (Option 3b).

An Assessment of the potential impacts associated with the preferred option is presented in the Tyne pipelines Environmental Appraisal (EA), which will be submitted alongside this CA with the Decommissioning Programme (DP) to OPRED for review.

2 PURPOSE

In accordance with OPRED [3] and OEUK guidance [16], the objective of this report is to detail the CA of the available decommissioning options for the Tyne Pipelines (PL 1220 and PL 1221) and associated stabilisation materials.

3 PROJECT OVERVIEW

3.1 Introduction

There are currently an estimated 45,000km of pipeline, cable and umbilical and a significant amount of stabilisation materials in the North Sea. To date, approximately 2% of this infrastructure has been decommissioned [17]. With such a large volume of material currently in situ, the decommissioning of this infrastructure represents a significant challenge to both operators and the United Kingdom (UK) government.

Within the Southern North Sea (SNS) lies the Dogger Bank Special Area of Conservation (SAC), currently classified as being in unfavourable condition [9]. Its designation was given on account of its 'Annex I sandbanks which are slightly covered by sea water all the time'. There is 457.7km of oil and gas pipeline within the SAC, some with piggy-backed umbilicals and fibre optic cables. It is recognised that decommissioning activities that have the potential to cause a likely significant effect could occur on the qualifying features of the Dogger Bank SAC. To this effect, the Department of Business, Energy and Industrial Strategy (BEIS) has undertaken a Habitats Regulations Assessment in respect of the Conservation Objectives of the Dogger Bank SAC to determine whether future oil and gas decommissioning projects, either alone or in combination with other plans and projects will have an adverse effect upon the integrity of the relevant sites [4]. It was subsequently decided that the future decommissioning activities would not have a significant adverse effect on the functioning of the SAC [4].

Any decision to either remove, remediate, or leave pipeline infrastructure in place requires a detailed assessment to be made considering the variables involved, with an inevitable balance being made between competing priorities. For example, while a decision to remove infrastructure may appear to bring reduced liability concerns, this must be balanced against the potential environmental and safety impacts of removing such materials.

This review of sometimes competing priorities is carried out as part of a CA process, where a decision on a preferred option is derived based on a balanced assessment comparing various decommissioning options against key criteria.

The following report details the CA process that has been carried out for the Tyne pipelines and stabilisation materials situated within the SNS. The report details the decisions that have been made from early scoping through to the selection of the preferred option, with details of the technical reviews and assessments that have been carried out to arrive at that option. It has been produced in line with government advice and industry best practice with the purpose of supporting the Tyne pipelines DP and EA. A full assessment of the environmental and societal impacts associated with the preferred option is presented within the EA document [25].

3.2 Regulatory Context and Published Guidance

The decommissioning of offshore oil and gas installations and pipelines on the United Kingdom Continental Shelf (UKCS) is principally governed through the Petroleum Act 1998 and is amended by the Energy Act 2008.

The UK's international obligations in relation to offshore decommissioning is principally governed by the 1992 Convention for the Protection of the Marine Environment of the Northeast Atlantic (Oslo-Paris Agreement (OSPAR) convention). Agreement in relation to the offshore decommissioning regime was reached at a meeting of the OSPAR commission in 1998 (OSPAR Decision 98/3). As a result, OPRED guidance in relation to offshore decommissioning is aligned.

The primary objective of OSPAR decision 98/3 remains to prevent the dumping of offshore installations at sea, with the default position of full removal. However, the decision allows the granting of derogations to leave all or part of a structure in place, subject to a CA process and regulatory approval.

The decision does not apply to pipelines or stabilisation materials; however, in line with a pre-cautionary approach, OPRED requires operators to apply the same framework to pipeline decommissioning projects **"A comparative assessment is a mandatory requirement for any potential OSPAR derogation candidate or for all pipeline decommissioning."** [3].

Guidance published by the OEUK provides details on regulatory expectations regarding the decommissioning of pipelines and stabilisation materials.

"Any removal or partial removal of a pipeline should be performed in such a way as to cause no significant adverse effects upon the marine environment and any decision that a pipeline may be left in place should have regard to the likely deterioration of the material involved and its present and possible future effect on the marine environment.

While each case will be considered on its merits and in the light of a comparative assessment of the alternative options the following have been identified as possible candidates for in situ decommissioning:

- **Those [pipelines] which are adequately buried or trenched, and which are not subject to development of spans and are expected to remain so;**
- **Those which were not buried or trenched at installation, but which are expected to self-bury over a sufficient length within a reasonable time and remain so buried;**
- **Those where burial or trenching of the exposed sections is undertaken to a sufficient depth and it is expected to be permanent;**
- **Those which are not trenched or buried but which nevertheless are candidates for leaving in place if the comparative assessment shows that to be the preferred option (e.g. trunk lines);**
- **Those where exceptional and unforeseen circumstances due to structural damage or deterioration or other cause means they cannot be recovered safely and efficiently"** [16].

3.3 Field and Infrastructure Description

The Tyne field is located in block 44/18a in the SNS, 57km east northeast of the Trent field and 122km north of the Inde field, approximately 188km off the coast of Norfolk and 184km off East Yorkshire (Figure 3-2). The Tyne platform was located at Latitude: 54° 26′ 57″ north, Longitude: 02° 28′ 52″ east, situated within the Dogger Bank SAC with a water depth of 17.5m.

The Tyne pipelines and stabilisation materials fall within six UKCS blocks 43/24, 43/25, 43/20, 44/16, 44/17 and 44/18 (Figure 3-1).

PL 1220/ PL 1221 and associated stabilisation materials were installed in 1996. Wet gas was exported through a 20" line to the Trent Platform Mobile Offshore Application Barge (MOAB). On Trent MOAB, gas was processed, and water separated, cleaned and discharged. After compression the gas was exported to Bacton on the Norfolk coast via the EAGLES pipeline system. In 2016, as part of the Tyne Hydrocarbon Safe (HCS) campaign, PL 1220/ PL 1221 pipelines were flushed clean and cut from the topsides of the Tyne and Trent platforms. Both pipelines were left in situ and filled with seawater. Following approval of the Tyne installation DP, the topside and jacket were disassembled and removed in December 2019. During this campaign, both PL 1220 and PL 1221 were cut at the base of the risers at the Tyne and Trent locations and left open to the sea approved under Pipeline Works Authorisation (PWA) Variations PA/2120 and PA/2584. The Tyne subsea template was removed in June 2020. Recent geotechnical surveys indicates that PL 1220/ PL 1221 are mainly buried, with an average burial depth of 0.9m along the pipeline route.

Areas of pipeline exposures within the Tyne 500m exclusion zone were identified at the previously located Tyne jacket location. The scour basis was predicted to infill by natural remediation post-removal of the Tyne jacket in 2019; however, recent geophysical survey and associated PUK scour basin analysis over the 10-year period [21] has identified that the seabed infilling rate is not following the predicted pattern. In addition, three other exposure locations along the pipeline length were identified, one between two parallel crossings and two surrounded by areas of scour, totalling 196.1m in length. These are however non-reportable exposures with no free spans.

A total of 32 concrete mattresses were installed within the Tyne 500m exclusion zone; Surveys have indicated that 26 of these mattresses are exposed, while six are completely buried.

There are historical records of 50 grout bags (size unknown) being used on PL 1220/ PL 1221 to support the riser at the Tyne end; however, these have not been observed in any subsequent surveys of the pipelines and are therefore assumed to be fully buried.

Figure 3-1: Tyne pipeline UKCS location plan in SNS

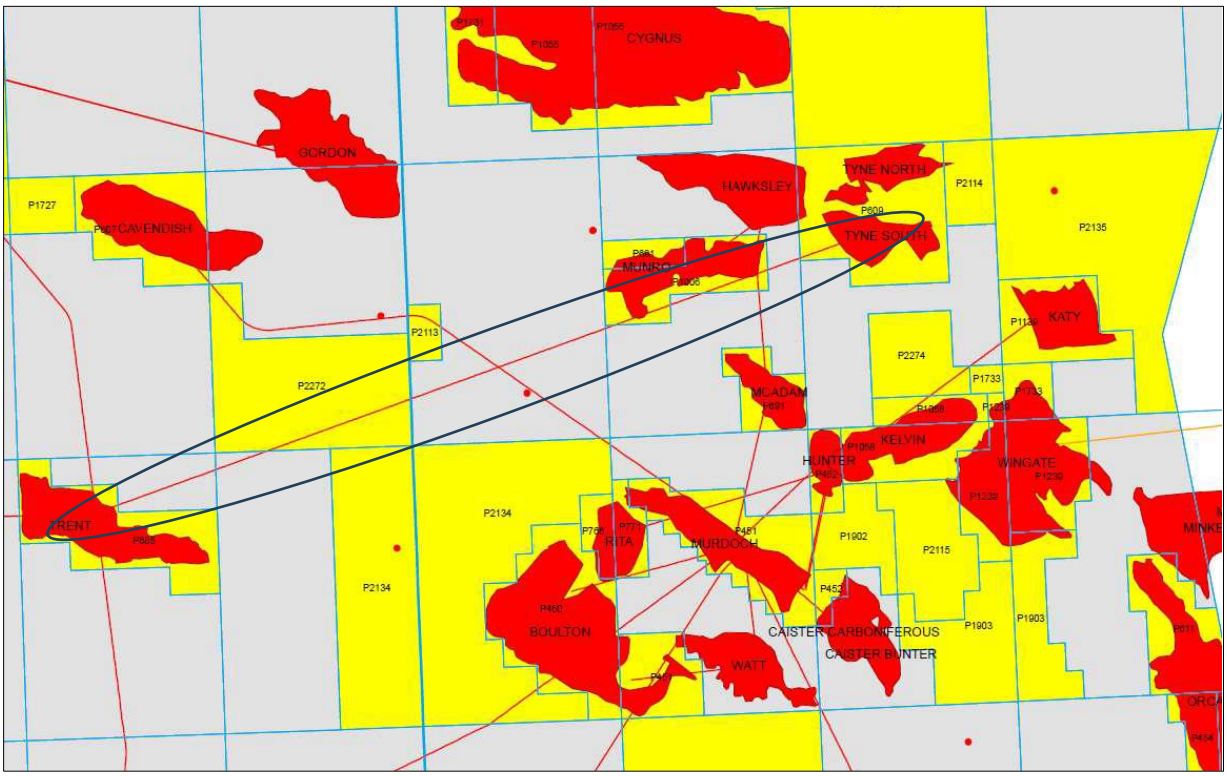


Figure 3-2: Tyne Pipelines and surrounding PUK assets

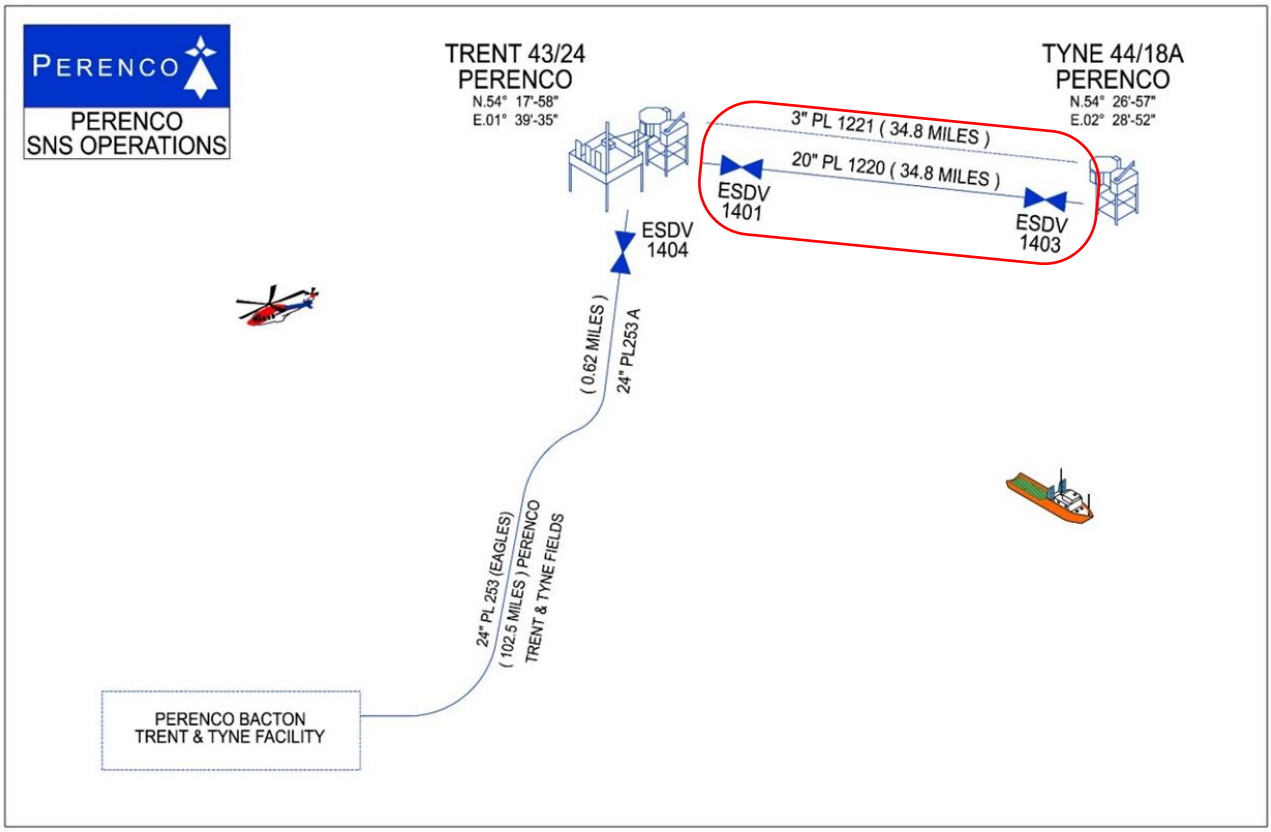


Table 3-1: Pipeline Infrastructure subject to Tyne pipelines DP

Pipeline no.	Type	Size	Length (km)	Components	From-To End Points	Status	In scope of CA
PL 1220	Hydrocarbon export	20"	56.08	X65 steel with coal tar enamel and concrete weight coating	PL1220 Tyne Subsea Pipeline Cut Location #2 at EL-18.700 to Trent Platform Pig Trap	Trenched and buried, except for 52m of exposure within the 500m exclusion zone scour basin and non-reportable exposures outside the Tyne 500m exclusion zone. Flushed clean, cut subsea and filled with seawater at Tyne. HCS verification December 2019	Yes

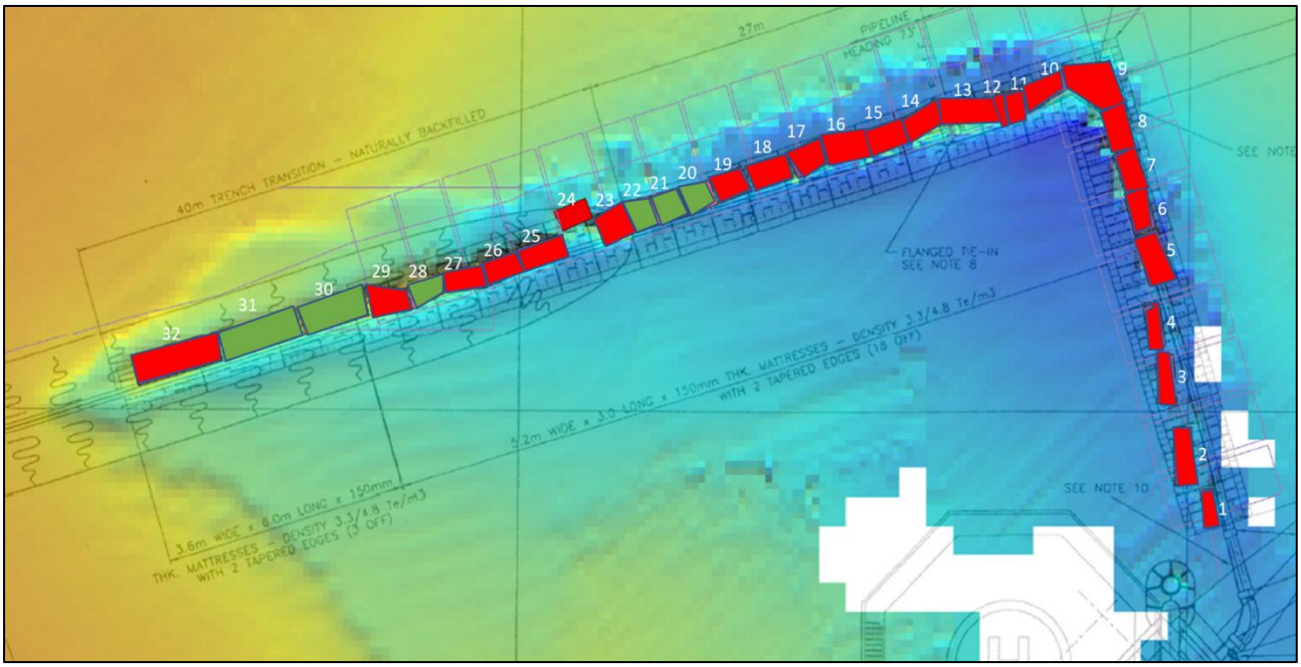
Pipeline no.	Type	Size	Length (km)	Components	From-To End Points	Status	In scope of CA
PL 1221	Mono Ethylene Glycol import	3"	56.156	X52 steel with Fusion Bonded Epoxy coating	PL1221 Trent Platform 3" Ball Valve to Tyne Subsea Pipeline Cut Location #2 at EL-18.700	Trenched and buried, except for 52m of exposure within the 500m exclusion zone scour basin and non-reportable exposures outside Tyne 500m exclusion zone. Flushed clean, cut subsea and filled with seawater at Tyne. HCS verification December 2019	Yes

Note 1: Pipeline length is original length as per PWA 2/W/96 minus the Tyne pipeline riser and the section of the pipelines within the Trent 500m exclusion zone

Table 3-2: Stabilisation materials Infrastructure subject to Tyne Pipelines DP

Stabilisation feature	Total no.	Weight (te)	Location	Exposure/condition	In scope of CA
Mattresses	32	743.136 (total)	Tyne 500m exclusion zone (Figure 3-3)	Concrete Armorflex (steel wire) type with 2 tapered edges either 3.5m x 8.0m x 300mm, 3.6m x 6.m x 150mm or 4.2m x 6.0m x 750mm Weight: between 5 and 20te in air. Six mattresses are fully buried and five displaced from the original pipeline cover position.	Yes
Grout bags	50	Unknown	Tyne 500m exclusion zone	Fully buried.	No
Rock placement	Not Applicable (N/A)	Unknown (historical)	Tyne 500m exclusion zone	N/A.	No

Figure 3-3: Concrete mattress location within the Tyne 500m exclusion zone (green is buried, red is exposed)



3.4 Environmental and Social Overview

An environmental baseline assessment has been prepared to support the EA which focuses on the selected area. The baseline focuses on key sensitivities such as benthic habitat and commercial fisheries and relies heavily on environmental data PUK has collected to date via surveys in combination with published sources. A summary of the environmental and societal sensitivities in the vicinity of the infrastructure is presented in Table 3-3.

Table 3-3: Summary of environmental and societal sensitivities in the vicinity of the Tyne pipelines.

Site Overview		
The Tyne pipelines are located within UKCS blocks 43/24, 43/25, 43/20, 44/16, 44/17 and 44/18 in the SNS. There are two infield pipelines, PL 1220 and PL 1221 (approx. 56km in length, which connect the recently removed Tyne platform to the Trent installation. The closest landfall is 115km west of the Western extent of the pipelines.		
Environmental Receptor	**Distance**	**Description**
Conservation interests		
Offshore Annex I habitats		
Dogger Bank SAC (further information in section 3.5)	0km	The recently removed Tyne Platform and approximately 40km (75%) of the associated pipelines (PL 1220/ PL 1221) lie within the boundary of the Dogger Bank SAC. The site is designated for its Annex I habitat under the European Union (EU) Habitats Directive '*Sandbanks which are slightly covered by sea water all the time'* and is the largest single continuous expanse of shallow sandbank in UK waters, extending into both Dutch and German waters. The extensive sublittoral sandbank in the SNS was formed by glacial processes and later submerged by sea level rise.
Conservation sites		
SAC	0km	The Pipelines PL 1220/ PL 1221 are located within two SAC's: Dogger Bank and Southern North Sea. The conservation objective for the Southern North Sea SAC is "*To ensure that the integrity of the site is maintained and that it makes an appropriate contribution to maintaining Favourable Conservation Status (FCS) for Harbour Porpoise in UK waters*". The site features Annex II species of the EU Habitats Directive, such a Harbour porpoise (*Phocoena phocoena*).
Special Protection Area (SPA)	>40km	There are no inshore SPAs located <40km from the Tyne Pipelines.
Marine Conservation Zone (MCZ)	>40km	There are no MCZ's located <40km from the Tyne Pipelines.
Coastal and Offshore Annex II species		
Harbour porpoise (*Phocoena phocoena*)	The conservation objective for the Southern North Sea SAC is "*To ensure that the integrity of the site is maintained and that it makes an appropriate contribution to maintaining FCS for Harbour Porpoise in UK waters*". The Southern North Sea SAC lists Harbour porpoise as its protected feature making the reduction of noise in this environment a key objective. Harbour porpoise have been recorded in the vicinity of the project area for all months, with offshore sightings peaking in the early to late summer months between May – August.	

Bottlenose dolphin (*Tursiops truncates*)	Bottlenose dolphin are typically present in low abundance during November but have not been recorded in the area.
Grey seal (*Halichoerus grypus*)	The Trent platform is located 115km, and the Tyne platform is located 170km from the nearest coastline, and thus the distribution of grey seals in the vicinity of Tyne pipelines is low (up to 5 individuals per 25km^2) [19].
Harbour seal (*Phoca vitulina)*	Due to the considerable distance to shore, the harbour seal at-sea utilisation of waters surrounding Tyne is very low (less than one individual per 25km^2) [19].
Plankton	
The SNS is characterised by shallow, well-mixed waters, which undergo large seasonal temperature variations. The region is largely enclosed by land, and as a result, the marine environment is highly dynamic with considerable tidal mixing and nutrient-rich run-off from land (eutrophication). Under these conditions, nutrient availability is consistent throughout the year; therefore, organisms with high nutrient uptake that thrive in dynamic waters, such as diatoms, are particularly successful [10]. Plankton in the sea area surrounding the Tyne Pipelines is likely to be typical for the SNS. The phytoplankton community in the Regional Sea 2 is dominated by the dinoflagellate genus Ceratium (*C. fusus, C. furca, C. lineatum*), along with higher numbers of the diatom, Chaetoceros (subgenera Hyalochaete and Phaeoceros) than are typically found in the Northern North Sea. From November to May, when mixing is at its greatest, diatoms comprise a greater proportion of the phytoplankton community than dinoflagellates [6]. The zooplankton community is dominated by copepods, including *Calanus helgolandicus* and *C. finmarchicus* as well as *Paracalanus* spp., *Pseudocalanus* spp., *Acartia* spp., *Temora* spp. and cladocerans such as *Evadne* spp [6]. The planktonic assemblage in the vicinity of the Tyne pipelines is not considered unusual.	
Benthic environment	
Seabed sediments	The following European Union Nature Information system seabed classifications have been identified in the vicinity of the Tyne pipelines [5;7;15]: A5:15: Infralittoral coarse sediment; A5.14: Circalittoral coarse sediment; A5.23: Infralittoral fine sand; A5.24: Infralittoral muddy sand; A5.25: Circalittoral fine sand; A5.26: Circalittoral muddy sand; A5.43: Infralittoral mixed sediments; A5.44. Circalittoral mixed sediments.
Benthic fauna	A diverse macrobenthic assemblage was identified across the Tyne field with a total of 8,386 individuals and 264 taxa recorded in the 2022 survey. The polychaete *Lanice conchilega* was the most abundant taxon sampled accounting for 17.5% of all individuals recorded. Other key taxa included Nemertea and Owenia.
Fish/crustacean – *spawning and nursery grounds generalised for the International Council for the Exploration of the Sea (ICES) Rectangles 37F1 and 37F2 around the pipelines [22].*	
Spawning grounds	The following species spawn in the vicinity of the project (peak spawning months in brackets): Herring (August-October), Mackerel (May-July), Nephrops (April-June), Plaice (January-February), Sandeel (November-February), Sprat (May-June), and Whiting (February-June).
Nursery grounds	The following species have nursery grounds in the vicinity of the project: Hake, Herring, Ling, Mackerel, Nethrops, Sandeel, Sprat, Spiny Dogfish, Tope shark, Whiting.
Seabirds - generalised for the UKCS Blocks 43/24, 43/25, 43/20, 44/16, 44/17 and 44/18 [23]	
The most common species of seabird found in this area of the SNS include Northern fulmar, Great Skua, Black legged kittiwake, Great black backed gull, Common gull, Lesser black backed gull, Herring gull, Common guillemot, Razorbill, Little auk and Atlantic puffin.	

Month	January	February	March	April	May	June	July	August	September	October	November	December
Seabird Oil Sensitivity Index	3	5	5	5	5	5	4	5	5	5	3	3
Cetaceans' sightings in ICES Rectangle 37F2 [18].												
Harbour porpoise	ND	ND	ND	ND	Low	Low	Low	Low	ND	Low	ND	ND
White-beaked dolphin	ND	ND	ND	ND	ND	Low	Low	ND	ND	Low	Low	Low
Minke Whale	ND	ND	ND	ND	ND	ND	Low	Low	ND	ND	ND	ND

Societal Receptor	**Description**
Commercial fishing	
Fishing effort in ICES Rectangle 37F1 and 37F2 is moderate. Effort is highest in the summer months, peaking in June-August. Fishing activity in the vicinity of the Tyne pipelines is dominated by trawls. All activity is carried out by vessels over 10m in length. Landings (by weight) are dominated by demersal fisheries, which comprise 65% of landings, with shellfish contributing to the remaining 35%. However, fisheries value is split equally between demersal (50%) and shellfish (50%) species. Both species and Nephrops dominate fisheries landings and value [12,14].	
Other users	
Recreational vessels	Due to the distance between the project area and the nearest landfall, no recreational vessel use is known.
Shipping activity	The density of shipping traffic in the SNS is relatively high due to the presence of fishing vessels, ferries between the UK and the rest of Europe and cargo and offshore support vessels [6]. The waters surrounding the Tyne pipelines are described as having 'High' shipping activity [13]. A Navigational Risk Assessment commissioned by PUK in 2016 identified the area as having high shipping density, with an estimated 2,095 vessels per year passing within 10 nautical miles of the Tyne location. This corresponds to an average of 5 to 6 vessels per day. The majority of these vessels were defined as cargo vessels [1].
Oil and Gas	The Trent and Tyne fields lie in a collection of gas fields in the SNS, and therefore, oil and gas activity surrounding the Tyne pipelines is high. The nearest platforms are the Munro MH platform (12km west) and the KT platform (13km southeast). The Tyne to Trent (PL 1220/ PL 1221) pipelines traverse Block 44/18.
Telecommunications	There are two subsea cables within 40km of the pipelines, MCCS and Norsea Com 1 Seg 2, both operated by Tampnet. Located to the east of the project area, Running north/south, the shortest distance between the project area and the Tampnet cables is 11km at the previous Tyne platform location.
Military activities	UKCS Blocks 43/24, 43/25, 43/20, 44/16, 44/17 and 44/18 lie within a known Ministry of Defence (MoD) practice and exercise area [6]. However, there are no restrictions identified by the MoD for UKCS Blocks 43/24, 43/25, 43/20, 44/16, 44/17 and 44/18 [14].
Aggregate extractions	Several offshore aggregate areas are located to the south and southwest of the project area. The closest UK area, known as Humber 4 & 7, falls 65km south of the project area. A single aggregate extraction area called E1 is located 55km northeast of the previous Tyne platform location on the other side of the Netherlands/UK median line.
Windfarms	Four offshore windfarms are located north of the project area (Creyke Beck A, Creyke Beck B, Sofia and, Teesside A), the closest of which to the project area is the Creyke Beck A at a distance of 36km. To the south of the project area lies Hornsea 1, 2 & 3 offshore windfarms. The nearest carbon capture and storage lease site is located approximately 20km west of the Trent end of the PL 1220/ PL 1221 pipelines.
Wrecks	There are circa 38 wrecks recorded within 50km of the project area; however, none are recorded as protected [11].

Key:

Seabird vulnerability	5 = low	4 = medium	3 = high	2 = very high	1 = extremely high	ND = No data
Marine mammal sightings	L = low	M = medium	H = high	VH = very high	ND = no data	

3.5 Dogger Bank SAC

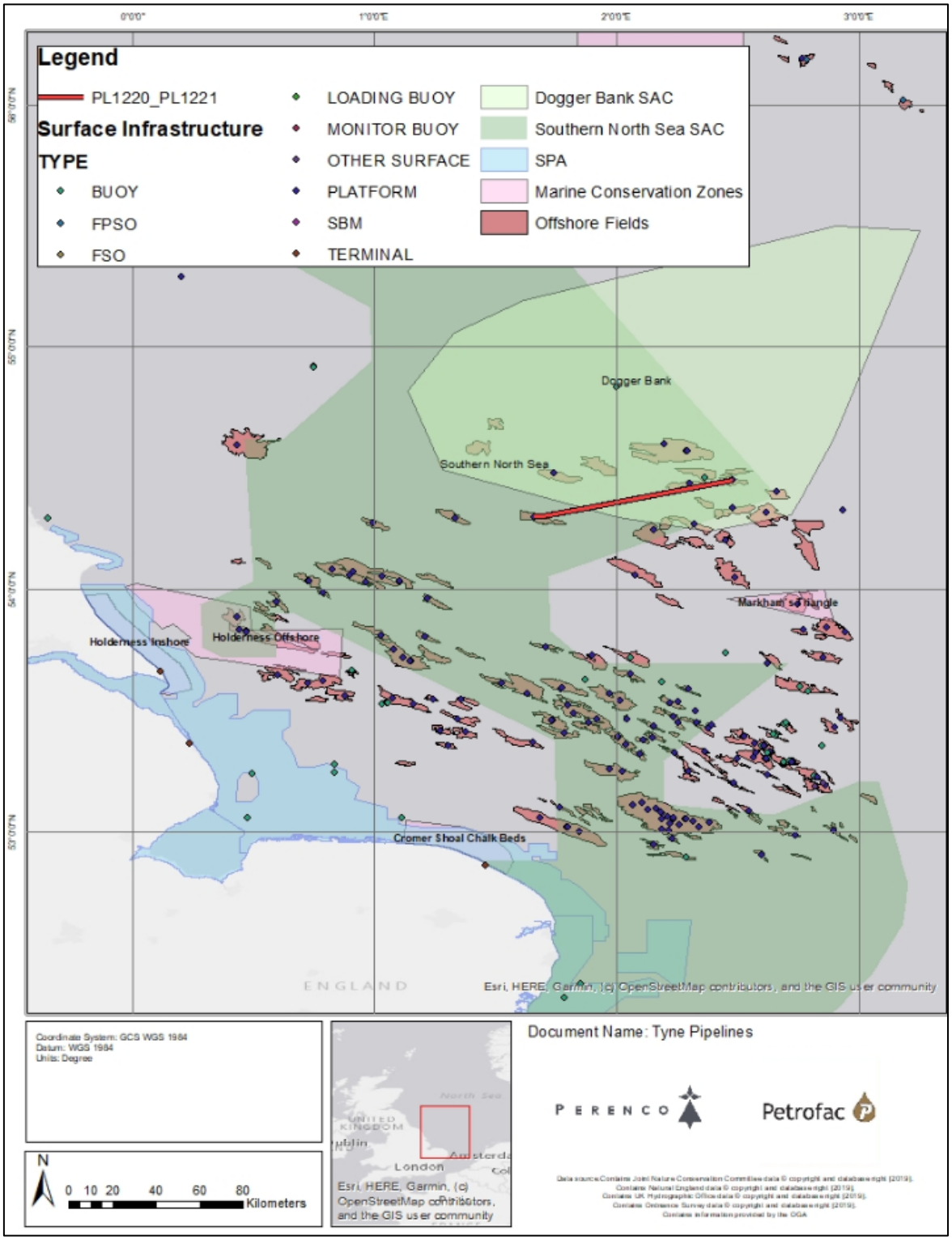
The Dogger Bank is the largest single continuous expanse of shallow sandbank in UK waters (12,331km^2). Located in the SNS, it is located approximately 150km northeast of the Humber Estuary. The area covered by the SAC (The Dogger Bank region) is an important area for the North Sea harbour porpoise population. Grey and common seals are also known to visit the area and along with the harbour porpoise are included as non-qualifying features of the SAC. The site is designated for its Annex I habitat under the EU Habitats Directive 'Sandbanks which are slightly covered by sea water all the time'.

The southern area of the bank is covered by shallow water around 20m deep with other areas reaching depths down to 35-40m. The bank structure slopes down to more than 50m deep in UK, Dutch and German waters. Its location in the open sea exposes the bank to substantial wave energy and prevents the colonisation of the sand by vegetation on the shallower parts of the bank. Sediments in the area range from fine sands containing many shell fragments on top of the bank to muddy sands at greater depths supporting invertebrate communities, characterised by polychaete worms, amphipods and small clams within the sediment, and hermit crabs, flatfish, starfish and brittlestars on the seabed. Sandeels are an important prey resource found at the bank supporting a variety of species including fish, seabirds and cetacean [8].

There are a number of oil and gas fields within (or immediately adjacent to) the Dogger Bank SAC, the majority of which have been present prior to the site being designated as an SAC in September 2017. Decommissioning of oil and gas industry related infrastructure in the SAC is predicted to increase in future years [4].

In total there is 457.7km of oil and gas pipeline within the SAC, some with piggy-backed umbilical's and fibre optic cables [4]. 41.88km of PL 1220 and PL 1221 lie within the boundary of the Dogger Bank SAC (Figure 3-4). As such, a detailed quantitative assessment of the seabed disturbance within the Dogger Bank SAC for each decommissioning option was used to support the CA workshop. The preferred option of leave in situ with remediation by rock placement of the scour basin, impacts the least on the Dogger Bank SAC with the exception of the leave in-situ without remediation option. The results of the seabed assessment are presented in Appendix 6 of this document.

Figure 3-4: Location of Tyne pipelines (PL 1220/ PL 1221) in relation to the UK coast and environmentally sensitive areas.



4 OVERVIEW OF CA PROCESS

The CA process was developed in line with OEUK [16] and OPRED Guidance notes [3]. Figure 4-1 presents the various stages of the CA process that was followed.

Figure 4-1: Phases of the CA process, adapted from the OEUK [16].

5 CA Scoping

5.1 CA Boundaries, Inclusions and Exclusions

5.1.1 Inclusions

The scope of the Tyne Pipelines DP will cover the pipelines (PL 1220 and PL 1221) located within UKCS blocks 43/24, 43/25, 43/20, 44/16, 44/17 and 44/18 from the previously located Tyne platform location to the edge of the 500m exclusion zone at the Trent installation. The remaining elements of PL 1220 and PL 1221 and associated stabilisation materials within the Trent 500m exclusion zone will be considered as part of the Trent decommissioning scope.

Details of infrastructure within scope of the CA are presented in Table 3-1 and Table 3-2.

5.1.2 Exclusions

Trent 500m Exclusion Zone

All infrastructure within the Trent 500m exclusion zone is excluded from the CA scope. This includes pipeline ends, spool pieces and stabilisation material. This infrastructure will be considered within the Trent DP when applicable.

Rock Placement and Underlying Materials

Recent geotechnical surveys indicates that a small section of the pipelines are covered by historical rock placement at the approaches of the Tyne platform.

Additionally, rock dump protection was observed at three crossings of third-party assets.

The Guidelines for CA in DP [16] state that ***"Where rock-dump that has been used to protect a pipeline, removal is recognised not to be practicable. It is assumed therefore that such rock-dump shall remain in place, unless there are special circumstances that would warrant consideration of removal".***

Additionally, OPRED's Decommissioning of Offshore Oil and Gas Installations and Pipelines Guidance Notes [3] states ***"Where rock-dump has previously been used to protect a pipeline it is recognised that removal of the pipeline is unlikely to be practicable and it is generally assumed that the rock-dump and the pipeline will remain in place. Where this occurs, it is expected that the rock-dump will remain undisturbed."***

In line with current guidance, the pipeline sections and any associated stabilisation materials which have been covered by historical rock placement have been excluded from the detailed CA process and will be left in situ.

Pipeline Crossings

Table 5-1 details the pipeline crossings along the length of pipelines from the previous Tyne to the Trent installation. These crossings have been excluded from the detailed CA assessment.

Should Tyne pipelines at the crossings be impacted by any proposals from a 3rd party operator, further discussions and agreements will be required with OPRED.

Table 5-1: Pipeline crossings on PL1220/ PL1221 excluded from the CA

Pipeline number	Pipeline description	Crossing cover	Crossing over or under PL 1220/1221	Status
PL 1925	Hawksley to Murdoch methanol pipeline	Rock	Over	Non-Operational
PL 1922	Hawksley to Murdoch gas pipeline	Rock	Over	Non-Operational
UM6 (PLU4685)	Hawksley to McAdam's manifold umbilical	Rock	Over	Non-Operational
PL 3088	Cygnus to Esmond Transportation System gas pipeline	Rock	Over	Operational
PL 2285	Cavendish methanol supply line	Rock	Over	Non-Operational

Fully Buried Stabilisation Materials (Grout bags)

Recent surveys have shown no evidence of the 50 grout bags installed in 1996. It is therefore assumed that these stabilisation materials are completely buried under the seabed substrate and are excluded from this CA assessment in accordance with OPRED guidance [3].

5.1.3 Evaluation Method

In line with section 7 of the OEUK guidelines [16], a combination of method A, B and C has been selected as a suitable assessment methodology for the CA. Using a Red/Amber/Green (RAG) system (Table 5-2), this method provides a combination of quantitative and qualitative assessment of the selected methods against the CA criteria and sub-criteria, focussing on key and significant differentiators and allowed further exploration of the outcome by way of sensitivity analysis.

Scores were assigned based on a RAG rating and used for analysis. Sensitivity analysis was performed by adjusting score weighting on each of the five main criteria to assess if any changes in the preferred method appeared.

Table 5-2: RAG performance indicators (Method A, OEUK)

Performance	Comparative impact
Most preferred	Lower impact (1)
Moderate	Moderate impact (2)
Least preferred	Higher impact (3)
No preference	No significant impact across options note 1

Note 1: The preferred option should be selected by focussing on the matters where the impacts of the options are significantly different. As a result, where there is no significant difference between options for a particular sub-criterion, this will be coloured grey.

5.1.4 Assessment Criteria

Table 5-3 provides further details on each of the main and sub criteria used in the assessment. Further details on scoring criteria are presented in Appendix 1 - CA Scoring Criteria.

Table 5-3: CA Assessment main and sub criteria

Main Criteria	Sub criteria	Description
Safety	Project personnel	Qualitative/Semi-Quantitative assessment of safety risk to offshore project personnel. For each decommissioning method, a calculation of Potential Loss of Life (PLL) was made based on the Fatal Accident Rate (FAR) x Hours of Exposure for each of the worker groups. This is considered a suitable metric for CA purposes. The FAR is taken from the summary report of the Joint Industry Project investigating the Risk Analysis into Decommissioning Activities issued by Safetec [20]. These figures were used to support the CA workshop during the Hazard Identification and Risk Assessment (HIRA) and scored according to the PUK risk assessment matrix. For each method, the values of the scores against each hazard were averaged and ranked based on these averages. A RAG category was assigned based on total value across methods (if within 20% lowest rank Green (1), if within 20% of highest rank Red (3), otherwise Amber (2)).
	Other users of the sea	Qualitative assessment of safety risk to other sea users including risks during operations and residual risks of any material left in situ. For each decommissioning method, a review of localised fishing effort, ship density and collision risk were made. These reviews were used to support the CA workshop during the HIRA and scored according to the PUK risk assessment matrix. For each method, the values of the scores against each hazard were averaged and ranked based on these averages. A RAG category was assigned based on total value across methods (if within 20% lowest rank Green (1), if within 20% of highest rank Red (3), otherwise Amber (2)).

Main Criteria	Sub criteria	Description
Environmental	Atmospheric emissions	Qualitative/Semi-Quantitative assessment of emissions to air during decommissioning activities. For each decommissioning method, total emissions were calculated. These figures were used to support the CA workshop during an Environmental section of the HIRA and scored according to the PUK risk assessment matrix. For each method, the values of the scores against each hazard were averaged and ranked based on these averages. A RAG category was assigned based on total value across methods (if within 20% lowest rank Green (1), if within 20% of highest rank Red (3), otherwise Amber (2)).
	Seabed disturbance/Loss of habitat	Qualitative/Semi-Quantitative assessment of seabed impact. For each decommissioning method, total area of seabed impacted was calculated. These figures were used to support the CA workshop during an Environmental section of the HIRA and scored according to the PUK risk assessment matrix. For each method, the values of the scores against each hazard were averaged and ranked based on these averages. A RAG category was assigned based on total value across methods (if within 20% lowest rank Green (1), if within 20% of highest rank Red (3), otherwise Amber (2)).
	Waste generation	Qualitative/Semi-Quantitative of waste generation. For each decommissioning method, total waste generated was calculated. These figures were used to support the CA workshop during an Environmental section of the HIRA and scored according to the PUK risk assessment matrix.

Main Criteria	Sub criteria	Description
		For each method, the values of the scores against each hazard were averaged and ranked based on these averages. A RAG category was assigned based on total value r across methods (if within 20% lowest rank Green (1), if within 20% of highest rank Red (3), otherwise Amber (2)).
	Legacy impacts	Qualitative assessment of impacts associated with any materials left in situ. For each decommissioning method, an assessment of legacy impacts was used to support the CA workshop during an Environmental section of the HIRA and scored according to the PUK risk assessment matrix. For each method, the values of the scores against each hazard were averaged and ranked based on these averages. A RAG category was assigned based on total value across methods (if within 20% lowest rank Green (1), if within 20% of highest rank Red (3), otherwise Amber (2)).
Technical	Risk of major project failure	Qualitative assessment of risk of major project failure. For each method, an assessment of technical feasibility against defined criteria was completed and a RAG category was assigned based on total value across methods (if within 20% lowest rank Green (1), if within 20% of highest rank Red (3), otherwise Amber (2)).
	Technical feasibility	Qualitative assessment of risk of technical feasibility. For each method, an assessment of technical feasibility against defined criteria was completed and a RAG category was assigned based on total value across methods (if within 20% lowest rank Green (1), if within 20% of highest rank Red (3), otherwise Amber (2)).
	Track record	Qualitative assessment of risk of methodology/technology track record. For each method, an assessment of technical feasibility against defined criteria was completed and a RAG category was assigned based on total value across methods (if within 20% lowest rank Green (1), if within 20% of highest rank Red (3), otherwise Amber (2)).

Main Criteria	Sub criteria	Description
Societal	Offshore users	Qualitative assessment of impacts on offshore societal use of the area, for example (e.g.) fishing/tourism. For each decommissioning method, an assessment of impacts of other offshore users was completed during the HIRA and scored according to the PUK risk assessment matrix. For each method, the values of the scores against each hazard were averaged and ranked based on these averages. A RAG category was assigned based on total value across methods (if within 20% lowest rank Green (1), if within 20% of highest rank Red (3), otherwise Amber (2)).
	Onshore communities	Qualitative assessment of impacts on onshore communities. For each decommissioning method, an assessment of impacts to onshore communities was completed during the HIRA and scored according to the PUK risk assessment matrix. For each method, the values of the scores against each hazard were averaged and ranked based on these averages. A RAG category was assigned based on total value across methods (if within 20% lowest rank Green (1), if within 20% of highest rank Red (3), otherwise Amber (2)).
Economic	Cost of decommissioning method	Quantitative assessment of decommissioning commercial (cost) estimation for each method. Commercial (cost) estimation for each method was calculated by PUK based on values from previous campaigns, this included estimates for vessel usage and equipment costs for both decommissioning work and surveys. For each method a RAG category was assigned based on total value across methods (if within 20% lowest rank Green (1), if within 20% of highest rank Red (3), otherwise Amber (2)).

Main Criteria	Sub criteria	Description
	Cost of long-term monitoring/remediation	Quantitative assessment of long-term commercial (cost) estimation for each method. Commercial (cost) estimation for each method was calculated by PUK based on costs from previous campaigns, this included estimates for vessel usage and equipment hire for surveys. For each method a RAG category was assigned based on total value across methods (if within 20% lowest rank Green (1), if within 20% of highest rank Red (3), otherwise Amber (2)).

6 CA Screening

6.1 CA Screening Workshop

A Screening workshop was held on 16th May 2023 to review potential decommissioning options and remove those which were not viable from further assessment. The workshop included Petrofac and PUK Engineers familiar with the project scope and decommissioning methods under review. Output from the assessment during the workshop and indication of the options selected for further assessment is presented in Table 6-1. In line with current guidance at least one option for full removal was carried forward for further assessment within the CA [16].

6.2 Reuse Options

No reuse options have been identified. Reuse options have been addressed within the Cessation Of Production document approved by the North Sea Transition Authority (NSTA) in November 2015.

Table 6-1: Output from the Tyne Pipelines CA screening workshop

	Safety	Environment	Technical	Societal	Economic	Comments	Selected for further assessment?
Option 1. Full removal							
a) Cut and lift (subsea cuts) (Combined lines)							Yes
b) S-Lay removal							Yes
c) Reverse reeling						Pipeline diameter is too large and concrete coated.	No
Option 2. Partial removal							
a) Cut and lift (subsea cuts) (Combined lines)						Non-reportable exposures excluded from CA	Yes
Option 3. Leave in situ with remediation							
a) Re-trench and backfill of snagging hazards						No snagging hazards. Non-reportable exposures excluded from CA	Yes
b) Rock placement of snagging hazards						No snagging hazards. Non-reportable exposures excluded from CA	Yes
c) Removal of Mattresses only. Rock placement of exposed pipeline sections						Not a suitable option.	No
Option 4. Leave in situ without remediation							
a) Leave in situ						Safety score relates to Scour basin only	Yes

Key:

Least preferred
Intermediate
Most preferred
Not technically feasible/No further assessment

7 CA Preparation

During the preparation phase of the CA several documents detailing information on the asset were reviewed and/or developed including:

- Tyne Waste Generation technical note 200605-S-REP-0011
- Tyne Emissions Generation technical note 200605-S-REP-0012
- Tyne Seabed disturbance technical note 200605-S-REP-0013
- Tyne Project personnel safety technical note 200605-S-REP-0014
- Tyne Technical note 200605-S-REP-0023
- Full Environmental Baseline Report, Bibby HydroMap Project No. 2016-004
- Pre-Decommissioning Environmental Baseline and Debris Survey Campaign N-LX-GX-RP-FD-000003
- Post Decommissioning MBES and Environmental Survey NSO-PJ00292-RR-DC-SUR-002
- Tyne Installation Decommissioning Programme Environmental Impact Assessment SN-LX-GX-AT-FD-000002
- Tyne pipeline (PL1220/PL1221) decommissioning project Environmental appraisal (EA) DECOM-2020-Tyne-QS-Q-016
- Tyne/Trent Pipelines (PL1220/PL1221) and stabilisation materials Comparative assessment report DECOM-2020-Tyne-QS-Q-001
- PERENCO UK Tyne Pipeline Draft Decommissioning Programme, Rev 3
- Ocean Ecology (2022). Tyne Platform Post-Decommissioning Seabed Environment Survey OEL_NSEPER0422_TYNE_TCR
- PWA 2/W/96

8 CA Evaluation

Confirmation of main and sub criteria, as detailed in 5.1.4, was completed internally within PUK prior to the full CA workshop.

Criteria were assessed by a combination of quantitative and qualitative means, with scores converted to a RAG categorisation to allow an assessment to be made across all sub-criteria in line with method A of the OEUK guidelines [16].

Sensitivity analysis was performed by adjusting score weighting on each criterion (see section 11.2).

9 CA Report and Recommendations

The assessment of feasible options and emerging recommendations of the CA workshop are detailed in section 11 of this report.

The outcome and recommendations of the CA are reflected in the decommissioning option presented in the DP and supporting EA, where a detailed assessment of any impacts (both positive and negative) has been carried out drawing on a substantial amount of published scientific literature and survey data collected by PUK.

10 CA Workshop

A CA workshop was held remotely via Microsoft (MS) Teams on 14/06/2023. Table 10-1 presents a list of attendees.

The CA workshop included a HIRA of the safety, environmental and social elements by reviewing a set of guidewords against each decommissioning option. After discussion and review of supporting information, each guideword was scored based on the modified PUK risk matrix. The final HIRA scores are presented in Appendix 2.

Technical and economic elements were scored against defined criteria (section 5.1.4).

Table 10-1: CA workshop attendees

Name	Role	Company	Location
Gareth MacGlennon	Consultant Environmental Engineer - Chair	Petrofac	MS teams
Martin Russell	Technical Safety Consultant	Petrofac	MS teams
Gorka Aguirre Giandinoto	Environmental Engineer - Scribe	Petrofac	MS teams
Joanne Turner	Decommissioning Compliance Advisor	PUK	Meeting Room
Wayne Smith	Sub-sea Decommissioning Engineer	PUK	Meeting Room
Julie Summerell	Decommissioning Manager	PUK	Meeting Room

11 CA Results

This section presents the outcomes of the CA evaluation process, describes how scores were achieved, and details the sensitivity analysis applied to the CA results.

A quantitative assessment using values derived from the HIRA was used to score three of the five main criteria (Safety, Environmental and Societal), with technical and economic criteria assessed separately (See Appendix 1). The HIRA was designed in a way that could be applied across all decommissioning options to allow balanced comparative scoring.

In order to allow comparison of decommissioning options across all criteria for each method, the value of the scores against each hazard in the HIRA was averaged and assigned a RAG category (if within 20% of lowest rank Green, if within 20% of highest rank Red, otherwise Amber). The same RAG categorisation was applied to the Technical and Economic criteria assessment resulting in a consistent scoring approach across all criteria that could be used in the CA process.

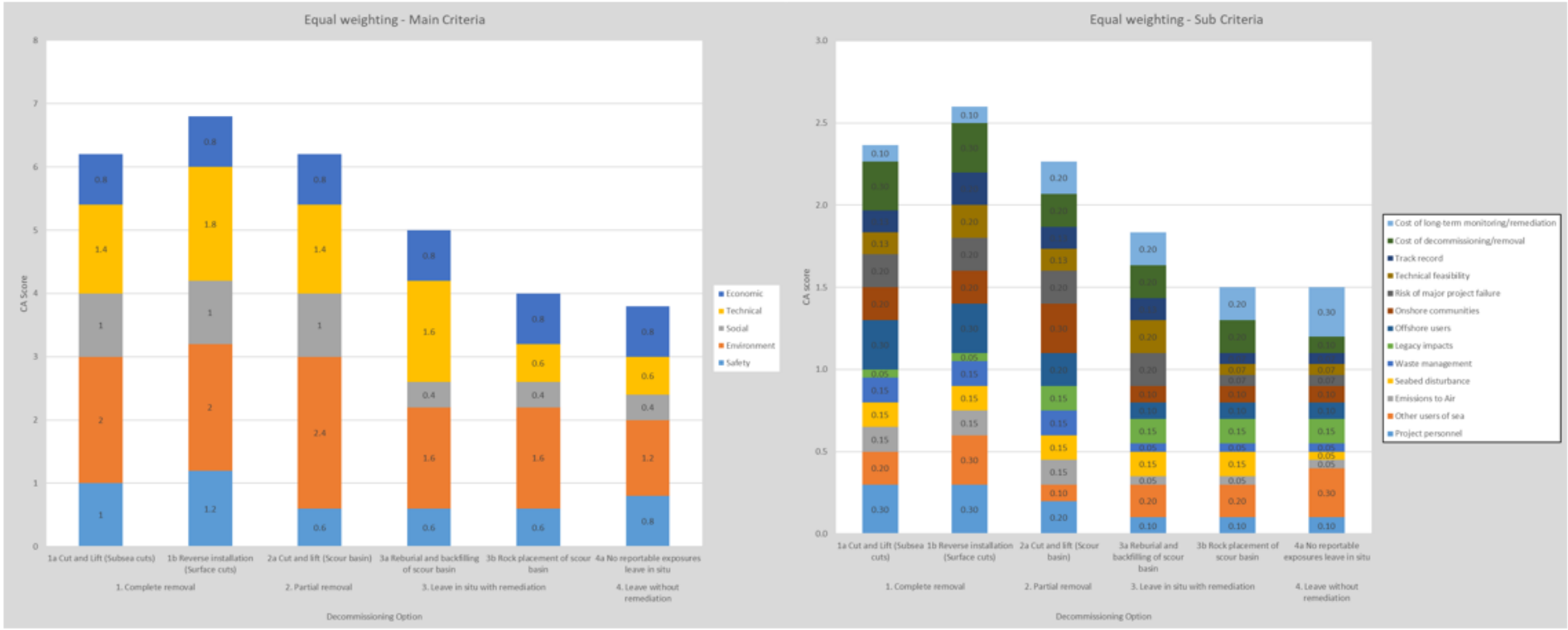
In order to determine overall scores, an overall rating was determined by applying a score of 1 to low impact (green), 2 to medium impact (amber) and 3 to high impact (red) ratings. These scores were summed and rated with ranking being inversely proportional to rating (the lowest overall rating score represents the preferred option) (Table 11-1). This method was chosen in order to allow comparison across all five main criteria where safety, environmental, social and economic underwent a quantitative assessment and technical underwent a qualitative assessment.

Full details of the HIRA scoring and technical/economic assessment are presented in Appendices 2 and 3, respectively.

Table 11-1: CA results

Criterion	Sub-criterion	Decommissioning Option					
		1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
		1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	Risk to Project personnel	High Impact (3)	High Impact (3)	Moderate Impact (2)	Low Impact (1)	Low Impact (1)	Low Impact (1)
	Risk to Other users	Moderate Impact (2)	High Impact (3)	Low Impact (1)	Moderate Impact (2)	Moderate Impact (2)	High Impact (3)
	Criterion total	**5**	**6**	**3**	**3**	**3**	**4**
Environmental	Emissions to air	High Impact (3)	High Impact (3)	High Impact (3)	Low Impact (1)	Low Impact (1)	Low Impact (1)
	Seabed disturbance	High Impact (3)	High Impact (3)	High Impact (3)	High Impact (3)	High Impact (3)	Low Impact (1)
	Waste management	High Impact (3)	High Impact (3)	High Impact (3)	Low Impact (1)	Low Impact (1)	Low Impact (1)
	Legacy impacts	Low Impact (1)	Low Impact (1)	High Impact (3)	High Impact (3)	High Impact (3)	High Impact (3)
	Criterion total	**10**	**10**	**12**	**8**	**8**	**6**
Societal	Offshore users	High Impact (3)	High Impact (3)	Moderate Impact (2)	Low Impact (1)	Low Impact (1)	Low Impact (1)
	Onshore communities	Moderate Impact (2)	Moderate Impact (2)	High Impact (3)	Low Impact (1)	Low Impact (1)	Low Impact (1)
	Criterion total	**5**	**5**	**5**	**2**	**2**	**2**
Technical	Risk of major project failure	High Impact (3)	High Impact (3)	High Impact (3)	High Impact (3)	Low Impact (1)	Low Impact (1)
	Technical feasibility	Moderate Impact (2)	High Impact (3)	Moderate Impact (2)	High Impact (3)	Low Impact (1)	Low Impact (1)
	Track record	Moderate Impact (2)	High Impact (3)	Moderate Impact (2)	Moderate Impact (2)	Low Impact (1)	Low Impact (1)
	Criterion total	**7**	**9**	**7**	**8**	**3**	**3**
Economic	Cost of decommissioning/removal	High Impact (3)	High Impact (3)	Moderate Impact (2)	Moderate impact (2)	Moderate Impact (2)	Low Impact (1)
	Cost of long-term monitoring/remediation	Low Impact (1)	Low Impact (1)	Moderate Impact (2)	Moderate Impact (2)	Moderate Impact (2)	High Impact (3)
	Criterion total	**4**	**4**	**4**	**4**	**4**	**4**
Overall rating		31	34	31	25	20	19
Overall ranking		4	5	4	3	2	1

Figure 11-1: CA output under equal weighting



11.1 Conclusions and the Preferred Method

The results of the CA indicate that the preferred decommissioning option for both pipelines (PL 1220 and PL1221) and stabilisation material is leave in situ with rock placement of the scour basin (option 3b) or leave in situ without remediation (option 4a) (Table 11-1; Figure 11-1). Option 4a obtained a negligible preferred score over option 3b when compared under equal weighting assessment for the main criteria. However, further detailed assessment of the sub-criteria revealed that both options had identical scores.

Scores across all criteria were very similar between option 3b and option 4a, with the exception of the environmental and safety criteria. Options 2a, 3a and 3b scored lower for the safety criteria due to the reduced snagging risk of removing or burying the exposed pipelines, while option 4a scored lower at the environmental criteria due to the zero impact on the seabed.

While scores were almost identical between option 3b (Leave in situ with remediation by rock placement of the scour basin) and option 4a (Leave in situ without remediation), PUK wishes to progress with option 3b as this option represents the lowest overall impact across all remaining criteria after committing to the option with the lowest safety impact score.

Scores according to individual criteria as discussed further below.

11.1.1 Safety

Option 2a, 3a and 3b were the lowest scores for safety criteria, with the result being predominantly driven by a combination of reduced risk to project personnel and other users of the sea.

Offshore operations for option 4a are limited to legacy surveys which require significantly reduced offshore days and reduced vessel crew sizes to complete, with the lowest associated PLL of 1.22E-04. However, option 4a scored the highest with regard to the safety for other sea users due to the snagging risk associated with leaving the scour basin and pipeline exposed (especially for fishing activities). The full removal options 1a and 2b scored the highest for safety, with the result driven by long duration offshore operations and the large crew required to complete activities. This pattern was reflected within the PLL assessment of all options.

A similar pattern was still observed after greater weighting was applied to safety scores. However, in this scenario, option 3b was the preferred overall decommissioning option over option 4a. These results were driven by the risk associated with other sea users from the scour basin pipeline exposures left in situ without remediation.

Overall, there is a preference for option 3b from a safety perspective.

11.1.2 Environmental

Under equal weighting, option 4a was the lowest score for environmental criteria, with the result being primarily driven by zero seabed disturbance, and lower air emissions and operational waste associated with the short vessel operations during surveys. This result was closely followed by option 3b which differed only by a degree of seabed disturbance while air emissions, legacy impacts and waste showed similar scores. Conversely, full removal options (1a and 1b) scored highest for air emissions, waste generation and seabed disturbance while scoring low when considering legacy impacts.

This pattern was still observed after applying greater weighting to environmental scores. Partial and full removal options (1a, 1b and 2a) scored the highest, followed by the remediation options (3a and 3b), and 4a remained the lowest scoring option. A detailed assessment of all potentially significant environmental impacts associated with the preferred option is presented in the Tyne Pipelines EA [25].

Overall, there is a preference for Option 4a from an environmental perspective, closely followed by option 3b.

11.1.3 Societal

Option 3a, 3b and 4a were equally the lowest scores for societal criteria, with the result being predominantly driven by a lower impact on other offshore users of the area, particularly impacts on fishing activity and shipping in the area where exclusion would be limited to smaller vessels operating over a period of days within the Tyne 500m exclusion zone.

Similarly, options 3a, 3b and 4a scored the lowest when assessed against impacts on onshore communities. Despite these options reducing the recycling and employment opportunities due to the pipeline remaining in situ, they scored low in terms of landfill usage in comparison to full removal options, which ultimately guided the result.

This pattern was still observed after greater weighting was applied to societal scores, where the partial or full removal options scored higher than the leave in situ with or without remediation options.

Overall, there is a preference for options 3b and 4a from a societal perspective.

11.1.4 Technical

Options 3b and 4a were the lowest score for technical criteria, with the overall result being driven by lower scores across all three sub-criteria. This pattern was still observed after greater weighting was applied to technical scores.

Overall, there is a preference for options 3b and 4a from a technical perspective.

11.1.5 Economic

All the options scored the same from an economic perspective. This is because the long-term cost for monitoring operations associated with the less intrusive decommissioning options eventually equals the initial cost for the full or partial removal options.

Overall, there is no preference between options from an economic perspective and it can be determined that economics is not driving the result.

11.2 Sensitivity Analysis

In order to determine if any particular criteria are responsible for driving the preferred outcome, sensitivity analysis was performed and compared with the initial outcome.

Sensitivity analysis was carried out by converting the rating score from each criterion into a percentage and multiplying by the weighted value. An initial assessment with equal ratings across all criteria was completed (Figure 11-1) followed by subsequent comparisons with greater weighting allocated to individual criteria in turn (Figure 11-2 to Figure 11-6).

The equal weighting assessment applied an equal value of 20% across the five main criteria with values assigned to sub-criteria on a pro-rata basis. Later comparisons against weighted criteria applied a greater value of 60% to that criterion (again with values for sub criteria allocated on a pro-rata basis) as detailed in Table 11-2 below.

The results were then assessed to determine which criteria had the greatest impact on the original scoring and if any change in the preferred method was observed.

Table 11-2: Weightings applied across each criterion to assess sensitivity of the results.

Criteria with greater weighting	Safety	Environmental	Technical	Societal	Economic
	Percentage				
Safety	60	10	10	10	10
Environmental	10	60	10	10	10
Technical	10	10	60	10	10
Societal	10	10	10	60	10
Economic	10	10	10	10	60

Figure 11-2: Safety Weighting

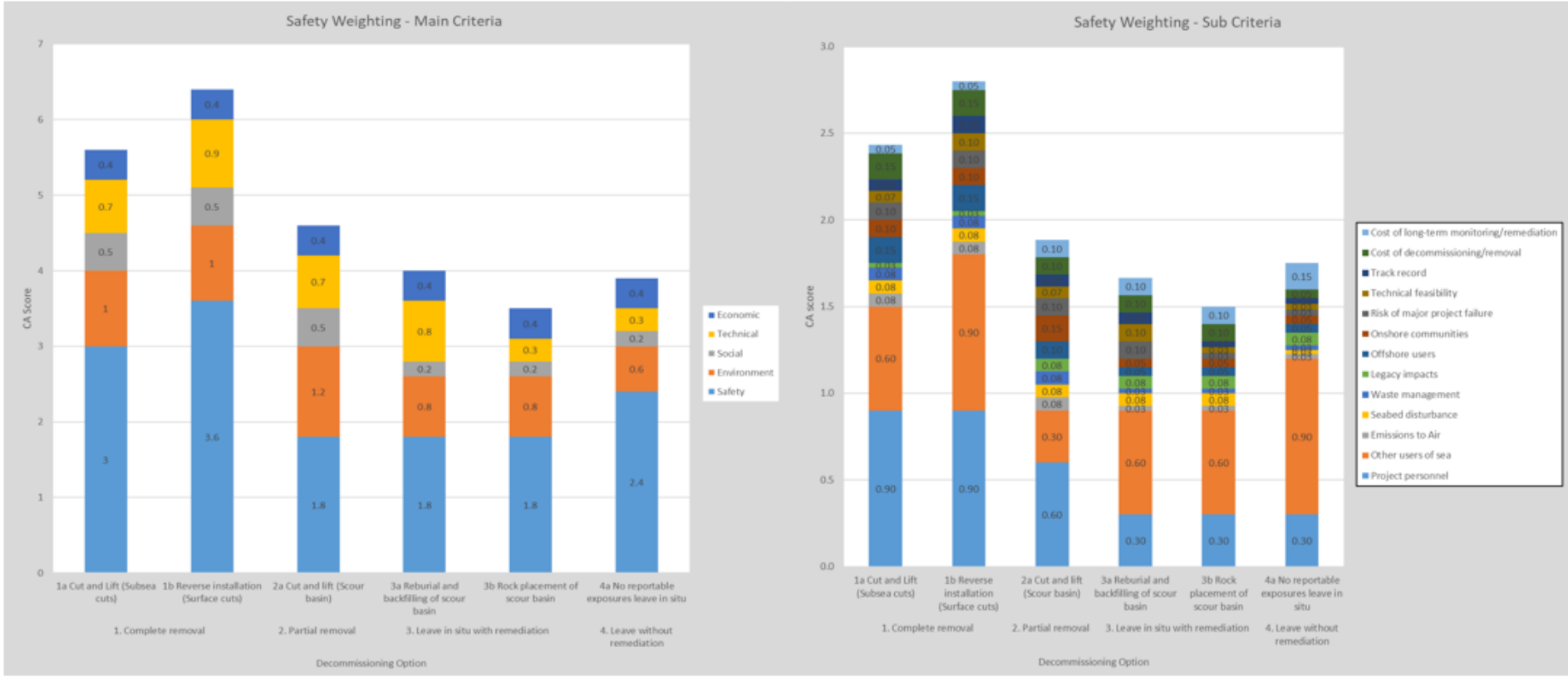


Figure 11-3: Environmental Weighting

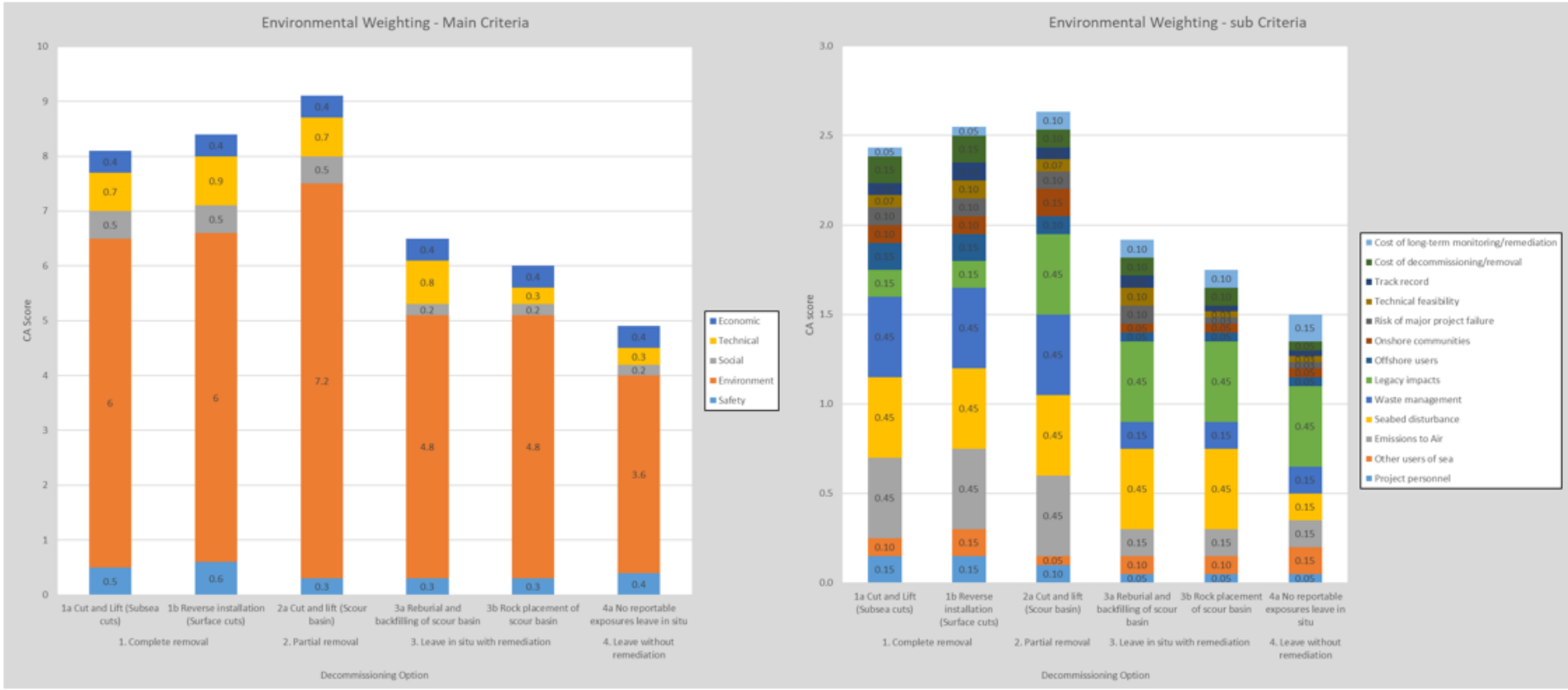


Figure 11-4: Societal Weighting

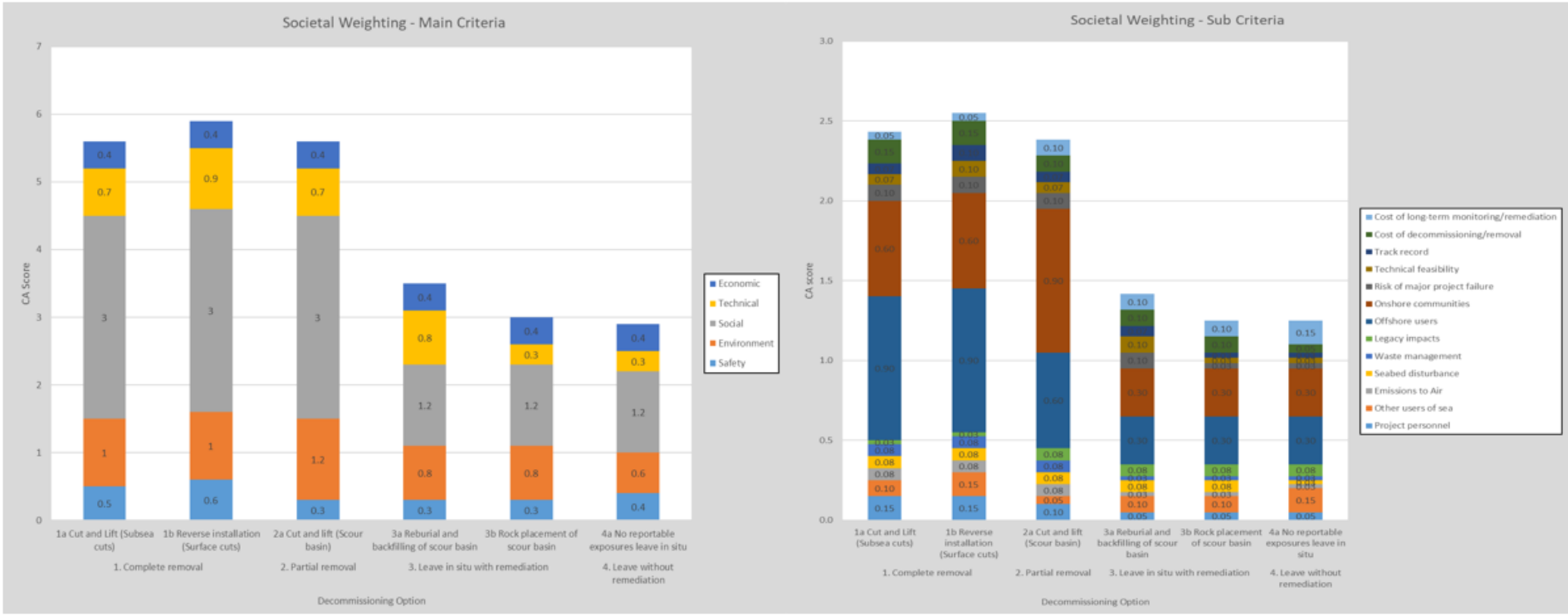


Figure 11-5: Technical Weighting

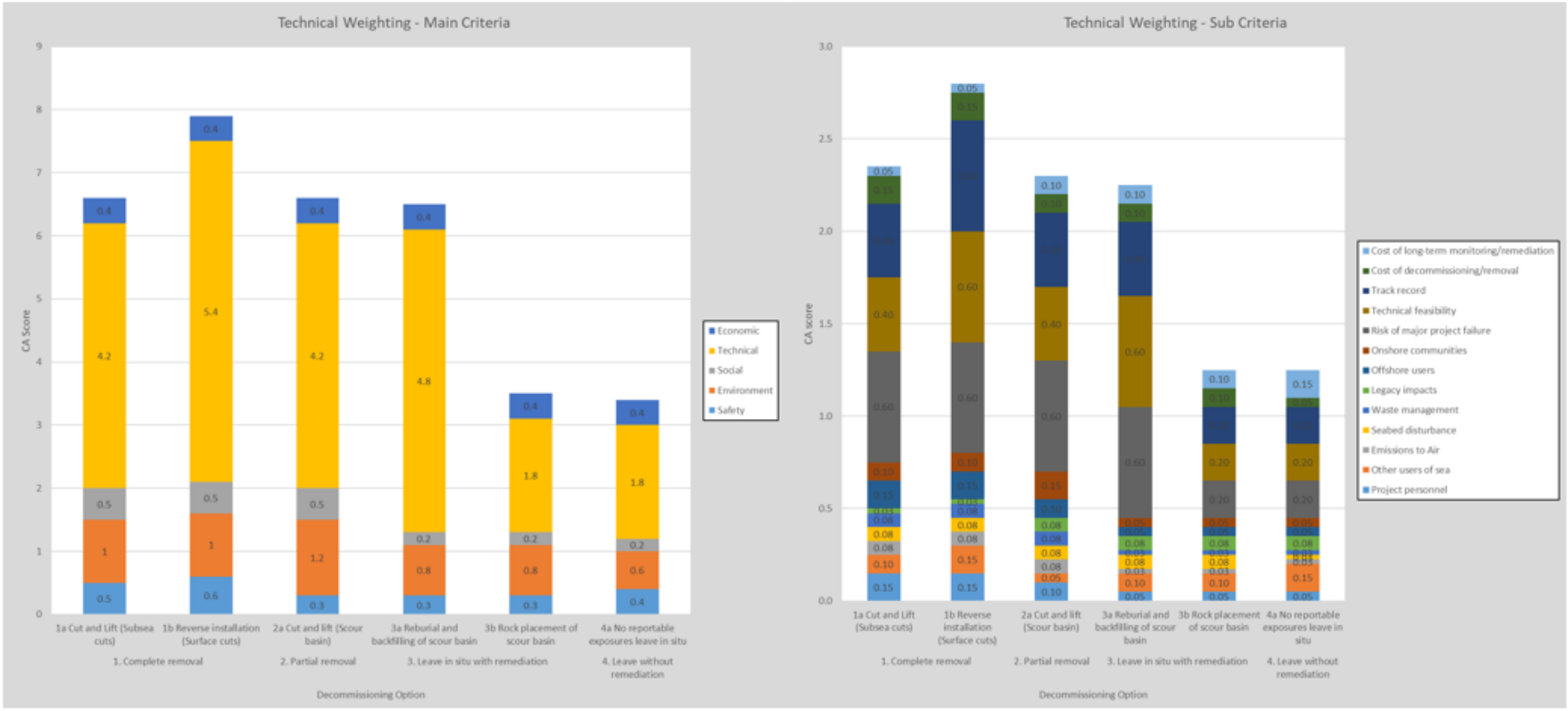
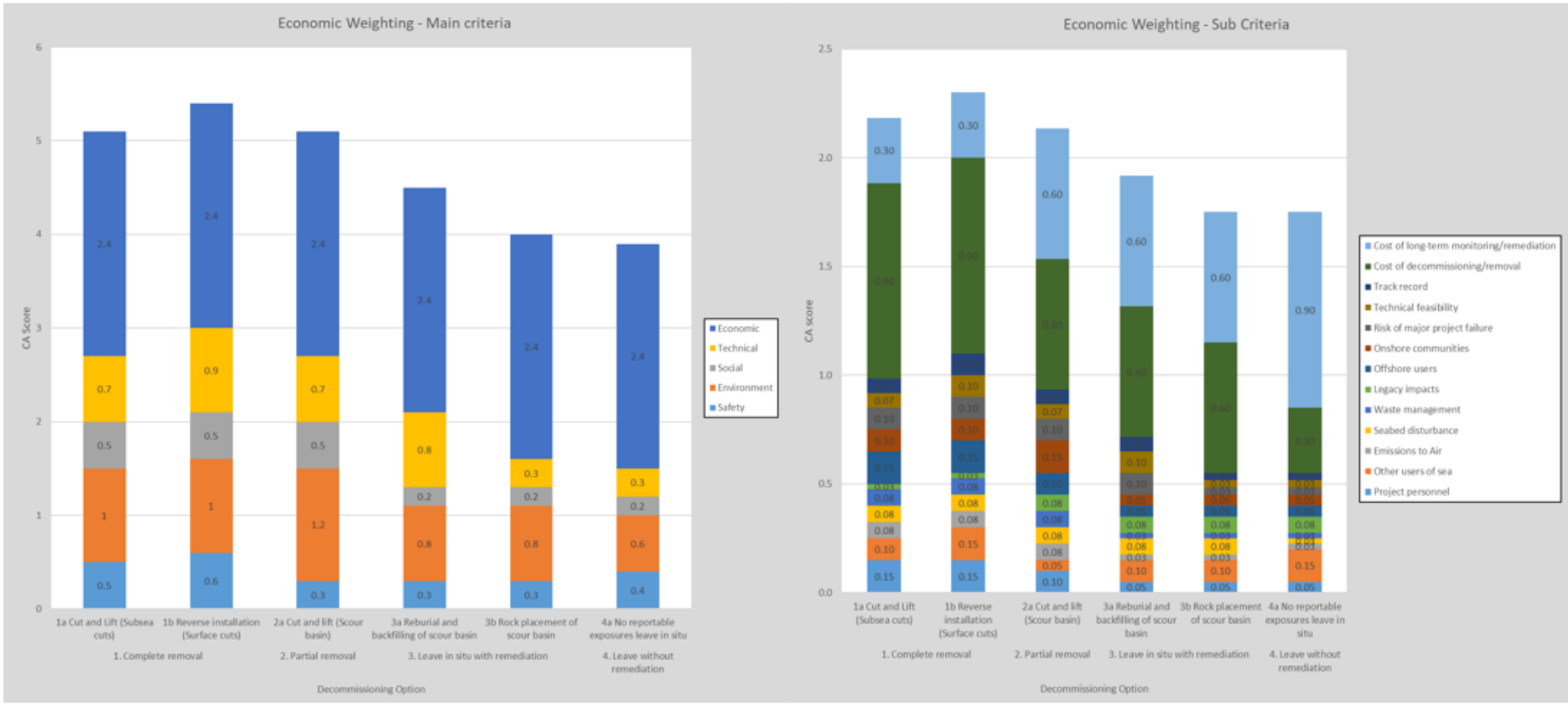


Figure 11-6: Economic Weighting



12 CA Conclusions and Recommendations

The results of the CA indicate that the preferred decommissioning option for the Tyne pipelines and stabilisation materials is to leave in situ with remediation by rock placement of the scour basin (option 3b) or leave in situ without remediation (Option 4a). Option 4a obtained a negligible preferred score over option 3b when compared under equal weighting for the main criteria. However, further detailed assessment of the sub-criteria revealed that both options scored identical.

Sensitivity analysis has been carried out on the assessment outcomes where greater weighting was allocated to individual criteria and compared against a standard equal weighting version (see section 11), this provides an opportunity to assess which, if any, of the criteria are responsible for driving the CA result. The sensitivity analysis reveals small changes in the preferred order of methods when weighting was applied to safety and environmental criteria, scoring option 3b as the most preferred option from the safety perspective and option 4a from the environmental perspective. Both preferred methods remained with similar scores across the social, technical, and economic criteria scenarios.

While scores were almost identical between option 3b (Leave in situ with remediation by rock placement of the scour basin) and option 4a (Leave in situ without remediation), PUK wishes to progress with option 3b as this option represents the lowest overall impact across all remaining criteria after committing to the option with the lowest safety impact score.

As a result, the decommissioning option presented within the Tyne pipelines DP and EA is to leave in situ with remediation by rock placement of the scour basin (Table 12-1)**.** This outcome does carry within it several obligations that will be discussed and agreed with OPRED, including the requirement to carry out an overtrawl survey (or other agreed non-intrusive method) of the Tyne 500m exclusion zones when relevant to confirm a lack of snagging hazard after rock placement. Additionally, periodic post decommissioning surveys will be completed to confirm that the pipelines remain buried under the rock and do not present a snagging hazard, as well as the monitoring of the scour basin.

In line with the CA outcome, PUK considers the key aspects which could generate impacts and would therefore be included in a detailed assessment within the EA to be:

- **Physical presence of infrastructure decommissioned in situ in terms of snagging risk and residual impacts;**
- **Seabed disturbance from rock placement of the scour basin.**

A detailed assessment of impacts, both positive and negative, on the environment and society is presented within the Tyne pipelines and stabilisation materials EA which has been submitted alongside this CA to support the DP.

Table 12-1: Selected Decommissioning options

Infrastructure	Decommissioning option
c.52m of PL 1220 and concrete mattress within Tyne 500m zone (scour basin)	Left in situ under rock placement
c.52m of PL 1221 within Tyne 500m zone (scour basin)	Left in situ under rock placement
PL 1220 within Trent 500m zone	To be considered in Trent DP
PL 1221 within Trent 500m zone	To be considered in Trent DP
PL 1220 Remaining section	Left in situ
PL 1221 Remaining section	Left in situ
Exposed Concrete Mattress over pipelines	left in situ
Exposed Concrete Mattress displaced from pipeline	left in situ
Historic Rock placement	Left in situ

13 References

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Appendix 1 - CA Scoring Criteria

	Sub-criteria	Low (1)	Moderate (2)	High (3)
Safety	Project personnel	Results from HIRA		
	Other users of sea	Results from HIRA		
Environmental	Atmospheric Emissions	Results from HIRA		
	Seabed disturbance/Loss of habitat			
	Waste generation			
	Legacy impacts			
Technical	Risk of major project failure	Offshore Execution Phase unlikely to slip beyond planned schedule (including contingencies).	Potential for extended Offshore Execution Phase duration >1month but <3months beyond planned schedule (including contingencies) but within same campaign/season. Some minor uncertainties.	Potential for unplanned and unforeseen activity delaying project end by > 4 months, and potential to cause a 2nd unplanned campaign in a separate season. Major uncertainties exist
	Technical feasibility	Scope is straightforward and well understood.	Scope is understood but presents some technical challenges to overcome.	Scope is poorly understood and presents significant technical challenges to overcome.
	Track record	No new technology or working practices to be introduced. Option has good industry track record in the basin and can be executed by contractors with significant previous experience of all activities involved.	No new technology or working practices to be introduced. Option has limited industry track record in the basin and can be executed by contractors with some previous experience of most activities involved.	New technology/untried working practice to be introduced. Option has no industry track record in the basin.
Societal	Offshore users	Results from HIRA		
	Onshore communities			
Economic	Cost of decommissioning/removal	Lowest cost	Costs between lowest and highest to be ranked accordingly, if within 20% lowest also rank Green, if within 20% of highest also rank Red	Highest cost
	Cost of long-term monitoring/remediation	Lowest cost	Costs between lowest and highest to be ranked accordingly, if within 20% lowest also rank Green, if within 20% of highest also rank Red	Highest cost

Appendix 2 - HIRA Results

Criterion	Sub-criterion	Basis of rating	Decommissioning option																	
			Op 1. Complete removal						Op 2. Partial removal			Op 3. Partial removal						Op 4. Leave without remediation		
		Guideword/Hazard	C	L	1a Cut and Lift (Subsea cuts)	C	L	1b Reverse installation (Surface cuts)	C	L	2a Cut and lift (Scour basin)	C	L	3a Reburial and backfilling of scour basin	C	L	3b Rock placement of scour basin	C	L	4a No reportable exposures leave in situ
Safety	Risk to project personnel	Offshore Vessel use	4	2	8	3	4	12	3	2	6	3	2	6	3	2	6	1	2	2
		Diving Operations	4	3	12	4	3	12	4	3	12	0	0	0	0	0	0	0	0	0
		Sim ops e.g. Remotely operated vehicle operation, cutting tools, Divers	2	3	6	2	2	4	3	3	9	0	0	0	0	0	0	0	0	0
		Lifting ops (offshore)	4	3	12	4	3	12	4	2	8	2	2	4	0	0	0	0	0	0
		Lifting ops (Quayside)	4	2	8	4	2	8	3		6	0	0	0	0	0	0	0	0	0
		Subsea pipeline cuts	3	3	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Surface pipeline cuts	0	0	0	4	3	12	0	0	0	0	0	0	0	0	0	0	0	0

Criterion	Sub-criterion	Basis of rating	Decommissioning option																		
			Op 1. Complete removal						Op 2. Partial removal			Op 3. Partial removal						Op 4. Leave without remediation		
		Guideword/Hazard	C	L	1a Cut and Lift (Subsea cuts)	C	L	1b Reverse installation (Surface cuts)	C	L	2a Cut and lift (Scour basin)	C	L	3a Reburial and backfilling of scour basin	C	L	3b Rock placement of scour basin	C	L	4a No reportable exposures leave in situ
		Rock Placement			N/A			N/A			N/A			N/A			N/A			N/A
		Vessel collision (With platforms or project vessels)	5	3	15	4	4	16	3	1	3	3	1	3	3	1	3	3	1	3
		Average			9			10			6			2			1			1
	Risk to other users	Third party vessel collision with Project infrastructure/vessel	3	2	6	4	4	16	3	1	3	3	1	3	3	1	3	3	1	3
		Snagging risk of items left in situ	0	0	0	0	0	0	0	0	0	3	3	9	3	2	6	3	4	12
		Average			3			8			2			6			5			8

Criterion	Sub-criterion	Basis of rating	Decommissioning option																	
			Op 1. Complete removal						Op 2. Partial removal			Op 3. Partial removal						Op 4. Leave without remediation		
		Guideword/Hazard	C	L	1a Cut and Lift (Subsea cuts)	C	L	1b Reverse installation (Surface cuts)	C	L	2a Cut and lift (Scour basin)	C	L	3a Reburial and backfilling of scour basin	C	L	3b Rock placement of scour basin	C	L	4a No reportable exposures leave in situ
	Emissions to air	Emissions to air	5	5	25	5	5	25	4	5	20	3	5	15	3	5	15	3	5	15
		Average			25			25			20			15			15			15
	Seabed disturbance	Seabed disturbance / Loss of Habitat	1	5	5	1	5	5	1	5	5	1	5	5	1	5	5	0	0	0
		Impact on Annex 1 sandbanks	1	5	5	1	5	5	1	5	5	1	5	5	1	5	5	0	0	0
		Impact on Annex 1 Reefs			N/A			N/A			N/A			N/A			N/A			N/A
		Average			5			5			5			5			5			0

Criterion	Sub-criterion	Basis of rating	Decommissioning option																	
			Op 1. Complete removal						Op 2. Partial removal			Op 3. Partial removal						Op 4. Leave without remediation		
		Guideword/Hazard	C	L	1a Cut and Lift (Subsea cuts)	C	L	1b Reverse installation (Surface cuts)	C	L	2a Cut and lift (Scour basin)	C	L	3a Reburial and backfilling of scour basin	C	L	3b Rock placement of scour basin	C	L	4a No reportable exposures leave in situ
	Waste management	Vessel waste generation	1	5	5	1	5	5	1	5	5	1	5	5	1	5	5	1	5	5
		Operational waste generation	5	5	25	5	5	25	4	5	20	0	0	0	0	0	0	0	0	0
		Average			15			15			13			3			3			3
	Legacy Impacts	Deterioration of materials left in situ	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
		Average			0			0			1			1			1			1
Societal	Offshore users	Exclusion of third parties	3	4	12	3	3	9	0	0	0	0	0	0	0	0	0	0	0	0
		Short term impacts on fishing (Operations)	3	4	12	3	3	9	0	0	0	0	0	0	0	0	0	0	0	0
		Long term impacts on fishing (legacy)	2	5	10	2	5	10	1	5	5	0	0	0	0	0	0	0	0	0

Criterion	Sub-criterion	Basis of rating	Decommissioning option																	
			Op 1. Complete removal						Op 2. Partial removal			Op 3. Partial removal						Op 4. Leave without remediation		
		Guideword/Hazard	C	L	1a Cut and Lift (Subsea cuts)	C	L	1b Reverse installation (Surface cuts)	C	L	2a Cut and lift (Scour basin)	C	L	3a Reburial and backfilling of scour basin	C	L	3b Rock placement of scour basin	C	L	4a No reportable exposures leave in situ
		Total			11			9			2			0			0			0
	Onshore communities	Provision of employment	0	0	0	0	0	0	1	5	5	1	5	5	1	5	5	1	5	5
		Loss of recycling options (resource extraction)	0	0	0	0	0	0	1	5	5	1	5	5	1	5	5	1	5	5
		Use of Landfill	4	5	20	4	5	20	4	5	20	0	0	0	0	0	0	0	0	0
		Average			7			7			10			3			3			3
		Total			**74.75**			**78.50**			**57.17**			**34.46**			**32.46**			**29.96**

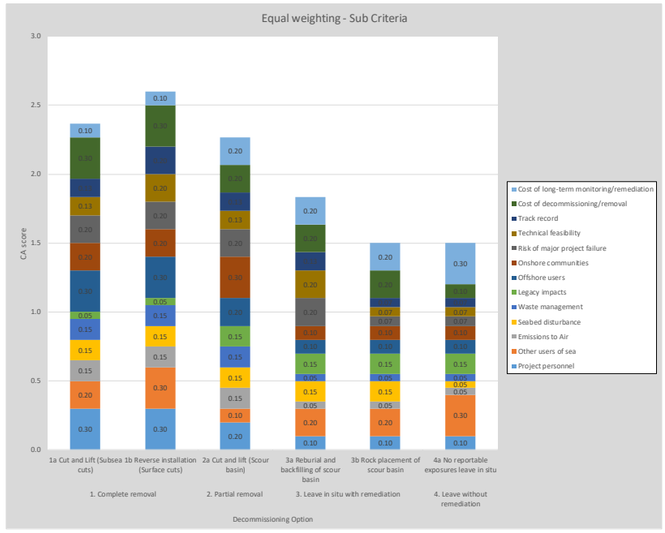
Appendix 3 - Technical and Economic Assessment Results

Criterion	Sub-Criterion	Decommissioning Option					
		1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a rebury and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Technical	Risk of major project failure	3	3	3	3	1	1
	Technical feasibility	2	3	2	3	1	1
	Track record	2	3	2	2	1	1
Economic	Cost for operations	3	3	2	2	2	1
	Cost of long-term monitoring/remediation	1	1	2	2	2	3
	Total	11	13	11	12	7	7

Appendix 4 - Detailed CA Analysis Results

Criterion	Sub-criterion	Weigting	Decommissioning Option					
			1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
			1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	Project personnel	10.0	3	3	2	1	1	1
	Other users of sea	10.0	2	3	1	2	2	3
Environmental	Emissions to Air	5.0	3	3	3	1	1	1
	Seabed disturbance	5.0	3	3	3	3	3	1
	Waste management	5.0	3	3	3	1	1	1
Societal	Legacy impacts	5.0	1	1	3	3	3	3
	Offshore users	10.0	3	3	2	1	1	1
	Onshore communities	10.0	2	2	3	1	1	1
Technical	Risk of major project failure	6.7	3	3	3	3	1	1
	Technical feasibility	6.7	2	3	2	3	1	1
	Track record	6.7	2	3	2	2	1	1
Economic	Cost of decommissioning/removal	10.0	3	3	2	2	2	1
	Cost of long-term monitoring/remediation	10.0	1	1	2	2	2	3
Total		100.0	31	34	31	25	20	19

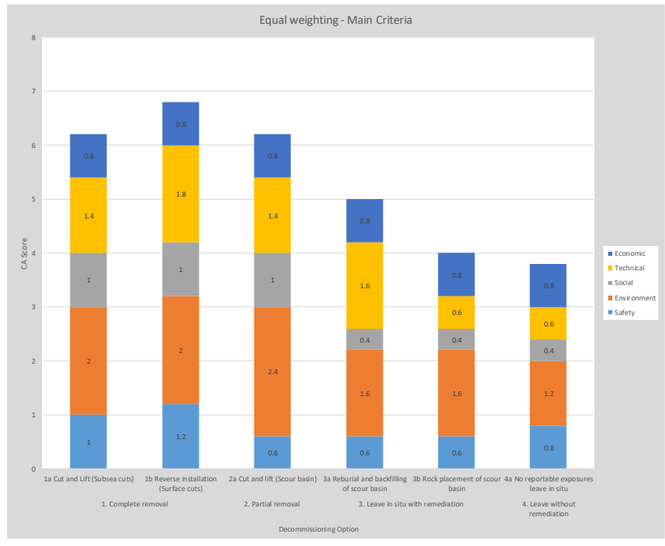
	Weighting
Criteria with greater weighting	Percentage
Safety	20
Environmental	20
Societal	20
Technical	20
Economic	20



Criterion	Sub-criterion	Weigting	Decommissioning Option					
			1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
			1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	Project personnel	10.0	0.30	0.30	0.20	0.10	0.10	0.10
	Other users of sea	10.0	0.20	0.30	0.10	0.20	0.20	0.30
Environmental	Emissions to Air	5.0	0.15	0.15	0.15	0.05	0.05	0.05
	Seabed disturbance	5.0	0.15	0.15	0.15	0.15	0.15	0.05
	Waste management	5.0	0.15	0.15	0.15	0.05	0.05	0.05
Societal	Legacy impacts	5.0	0.05	0.05	0.15	0.15	0.15	0.15
	Offshore users	10.0	0.30	0.30	0.20	0.10	0.10	0.10
	Onshore communities	10.0	0.20	0.20	0.30	0.10	0.10	0.10
Technical	Risk of major project failure	6.7	0.20	0.20	0.20	0.20	0.07	0.07
	Technical feasibility	6.7	0.13	0.20	0.13	0.20	0.07	0.07
	Track record	6.7	0.13	0.20	0.13	0.13	0.07	0.07
Economic	Cost of decommissioning/removal	10.0	0.30	0.30	0.20	0.20	0.20	0.10
	Cost of long-term monitoring/remediation	10.0	0.10	0.10	0.20	0.20	0.20	0.30
Total		100.0	2.37	2.60	2.27	1.83	1.50	1.50

Criterion	Weigting	Decommissioning Option					
		1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
		1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	20	5	6	3	3	3	4
Environment	20	10	10	12	8	8	6
Social	20	5	5	5	2	2	2
Technical	20	7	9	7	8	3	3
Economic	20	4	4	4	4	4	4
Total	100	31	34	31	25	20	19

Criterion	Weigting	Decommissioning Option					
		1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
		1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	20	1	1.2	0.6	0.6	0.6	0.8
Environment	20	2	2	2.4	1.6	1.6	1.2
Social	20	1	1	1	0.4	0.4	0.4
Technical	20	1.4	1.8	1.4	1.6	0.6	0.6
Economic	20	0.8	0.8	0.8	0.8	0.8	0.8
Total	100	6.2	6.8	6.2	5	4	3.8



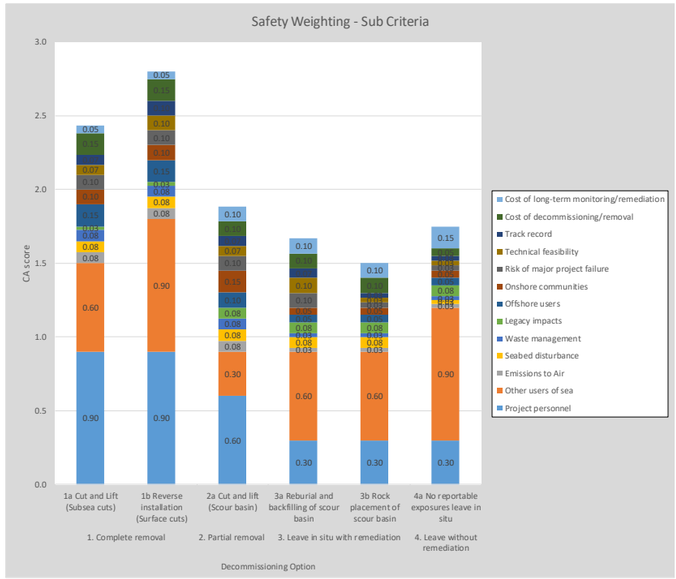
Criterion	Sub-criterion	Weigting	Decommissioning Option					
			1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
			1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	Project personnel	30.0	3	3	2	1	1	1
	Other users of sea	30.0	2	3	1	2	2	3
Environmental	Emissions to Air	2.5	3	3	3	1	1	1
	Seabed disturbance	2.5	3	3	3	3	3	1
	Waste management	2.5	3	3	3	1	1	1
	Legacy impacts	2.5	1	1	3	3	3	3
Societal	Offshore users	5.0	3	3	2	1	1	1
	Onshore communities	5.0	2	2	3	1	1	1
Technical	Risk of major project failure	3.3	3	3	3	3	1	1
	Technical feasibility	3.3	2	3	2	3	1	1
	Track record	3.3	2	3	2	2	1	1
Economic	Cost of decommissioning/removal	5.0	3	3	2	2	2	1
	Cost of long-term monitoring/remediation	5.0	1	1	2	2	2	3
Total		100.0	31	34	31	25	20	19

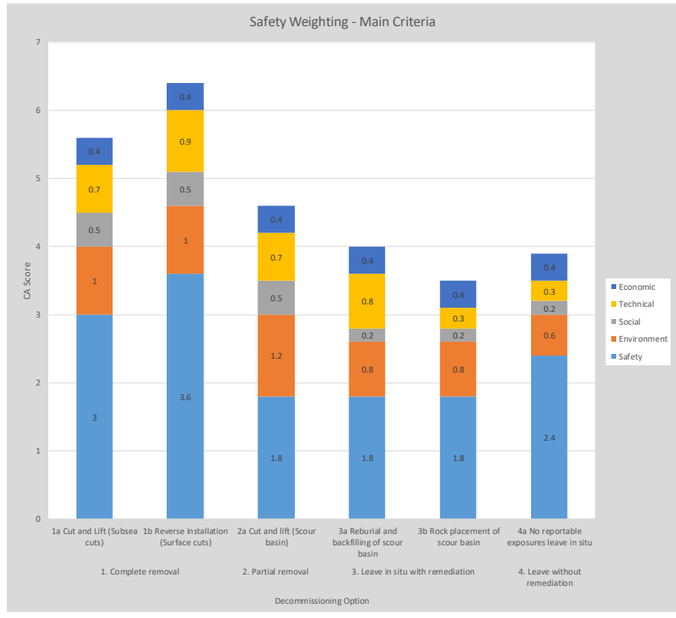
Criterion	Sub-criterion	Weigting	Decommissioning Option					
			1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
			1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	Project personnel	30.0	0.90	0.90	0.60	0.30	0.30	0.30
	Other users of sea	30.0	0.60	0.90	0.30	0.60	0.60	0.90
Environmental	Emissions to Air	2.5	0.08	0.08	0.08	0.03	0.03	0.03
	Seabed disturbance	2.5	0.08	0.08	0.08	0.08	0.08	0.03
	Waste management	2.5	0.08	0.08	0.08	0.03	0.03	0.03
	Legacy impacts	2.5	0.03	0.03	0.08	0.08	0.08	0.08
Societal	Offshore users	5.0	0.15	0.15	0.10	0.05	0.05	0.05
	Onshore communities	5.0	0.10	0.10	0.15	0.05	0.05	0.05
Technical	Risk of major project failure	3.3	0.10	0.10	0.10	0.10	0.03	0.03
	Technical feasibility	3.3	0.07	0.10	0.07	0.10	0.03	0.03
	Track record	3.3	0.07	0.10	0.07	0.07	0.03	0.03
Economic	Cost of decommissioning/removal	5.0	0.15	0.15	0.10	0.10	0.10	0.05
	Cost of long-term monitoring/remediation	5.0	0.05	0.05	0.10	0.10	0.10	0.15
Total		100.0	2.43	2.80	1.88	1.67	1.50	1.75

Criterion	Weigting	Decommissioning Option					
		1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
		1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	60	5	6	3	3	3	4
Environment	10	10	10	12	8	8	6
Social	10	5	5	5	2	2	2
Technical	10	7	9	7	8	3	3
Economic	10	4	4	4	4	4	4
Total	100	31	34	31	25	20	19

Criterion	Weigting	Decommissioning Option					
		1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
		1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	60	3	3.6	1.8	1.8	1.8	2.4
Environment	10	1	1	1.2	0.8	0.8	0.6
Social	10	0.5	0.5	0.5	0.2	0.2	0.2
Technical	10	0.7	0.9	0.7	0.8	0.3	0.3
Economic	10	0.4	0.4	0.4	0.4	0.4	0.4
Total	100	5.6	6.4	4.6	4	3.5	3.9

Weighting	Safety	Environmental	Societal	Technical	Economic
	Percentage				
Safety	60	10	10	10	10
Environmental	10	60	10	10	10
Societal	10	10	60	10	10
Technical	10	10	10	60	10
Economic	10	10	10	10	60





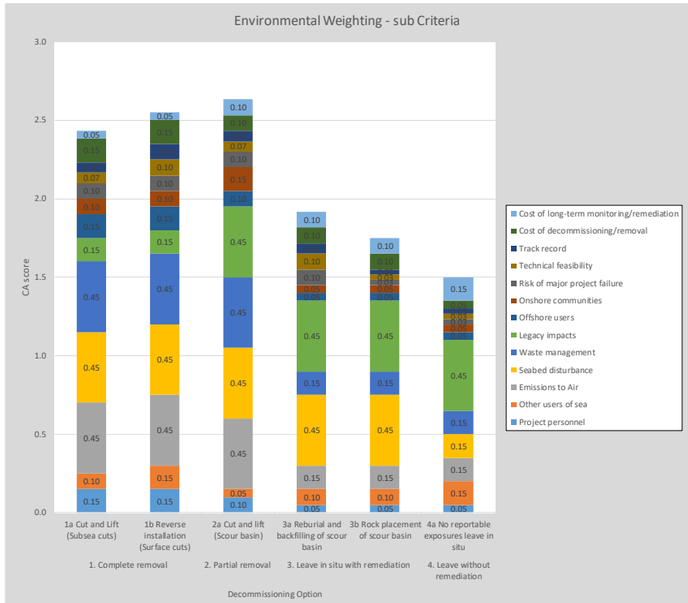
Criterion	Sub-criterion	Weigting	Decommissioning Option					
			1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
			1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	Project personnel	5.0	3	3	2	1	1	1
	Other users of sea	5.0	2	3	1	2	2	3
Environmental	Emissions to Air	15.0	3	3	3	1	1	1
	Seabed disturbance	15.0	3	3	3	3	3	1
	Waste management	15.0	3	3	3	1	1	1
	Legacy impacts	15.0	1	1	3	3	3	3
Societal	Offshore users	5.0	3	3	2	1	1	1
	Onshore communities	5.0	2	2	3	1	1	1
Technical	Risk of major project failure	3.3	3	3	3	3	1	1
	Technical feasibility	3.3	2	3	2	3	1	1
	Track record	3.3	2	3	2	2	1	1
Economic	Cost of decommissioning/removal	5.0	3	3	2	2	2	1
	Cost of long-term monitoring/remediation	5.0	1	1	2	2	2	3
Total		100.0	31	34	31	25	20	19

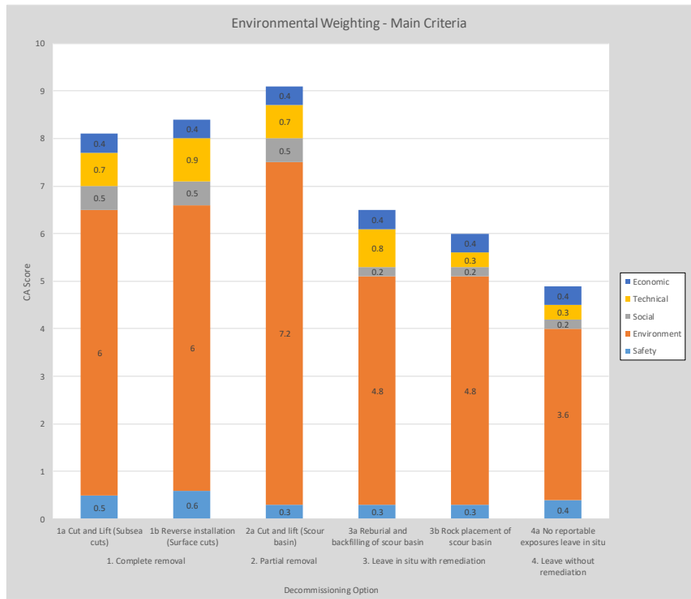
Criterion	Sub-criterion	Weigting	Decommissioning Option					
			1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
			1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	Project personnel	5.0	0.15	0.15	0.10	0.05	0.05	0.05
	Other users of sea	5.0	0.10	0.15	0.05	0.10	0.10	0.15
Environmental	Emissions to Air	15.0	0.45	0.45	0.45	0.15	0.15	0.15
	Seabed disturbance	15.0	0.45	0.45	0.45	0.45	0.45	0.15
	Waste management	15.0	0.45	0.45	0.45	0.15	0.15	0.15
	Legacy impacts	15.0	0.15	0.15	0.45	0.45	0.45	0.45
Societal	Offshore users	5.0	0.15	0.15	0.10	0.05	0.05	0.05
	Onshore communities	5.0	0.10	0.10	0.15	0.05	0.05	0.05
Technical	Risk of major project failure	3.3	0.10	0.10	0.10	0.10	0.03	0.03
	Technical feasibility	3.3	0.07	0.10	0.07	0.10	0.03	0.03
	Track record	3.3	0.07	0.10	0.07	0.07	0.03	0.03
Economic	Cost of decommissioning/removal	5.0	0.15	0.15	0.10	0.10	0.10	0.05
	Cost of long-term monitoring/remediation	5.0	0.05	0.05	0.10	0.10	0.10	0.15
Total		100.0	2.43	2.55	2.63	1.92	1.75	1.50

Criterion	Weigting	Decommissioning Option					
		1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
		1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	10	5	6	3	3	3	4
Environment	60	10	10	12	8	8	6
Social	10	5	5	5	2	2	2
Technical	10	7	9	7	8	3	3
Economic	10	4	4	4	4	4	4
Total	100	31	34	31	25	20	19

Criterion	Weigting	Decommissioning Option					
		1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
		1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	10	0.5	0.6	0.3	0.3	0.3	0.4
Environment	60	6	6	7.2	4.8	4.8	3.6
Social	10	0.5	0.5	0.5	0.2	0.2	0.2
Technical	10	0.7	0.9	0.7	0.8	0.3	0.3
Economic	10	0.4	0.4	0.4	0.4	0.4	0.4
Total	100	8.1	8.4	9.1	6.5	6	4.9

Weighting	Safety	Environmental	Societal	Technical	Economic
	Percentage				
Safety	60	10	10	10	10
Environmental	10	60	10	10	10
Societal	10	10	60	10	10
Technical	10	10	10	60	10
Economic	10	10	10	10	60





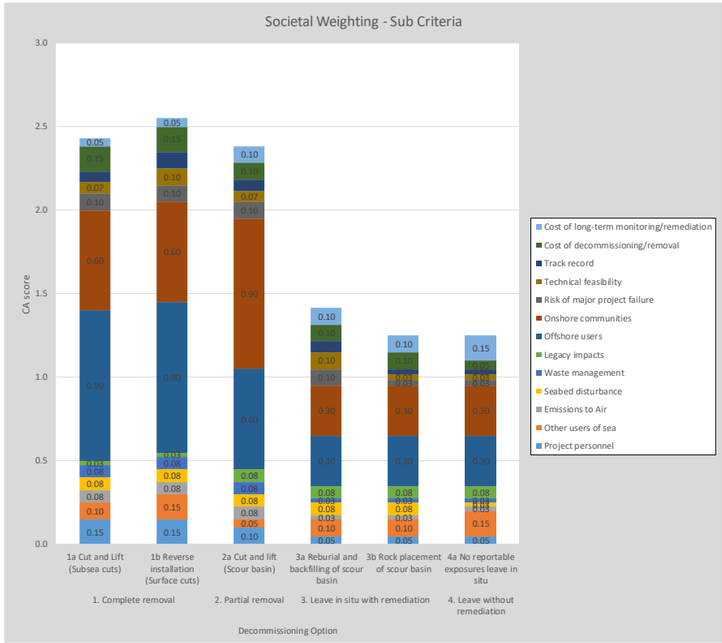
Criterion	Sub-criterion	Weigting	Decommissioning Option					
			1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
			1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	Project personnel	5.0	3	3	2	1	1	1
	Other users of sea	5.0	2	3	1	2	2	3
Environmental	Emissions to Air	2.5	3	3	3	1	1	1
	Seabed disturbance	2.5	3	3	3	3	3	1
	Waste management	2.5	3	3	3	1	1	1
	Legacy impacts	2.5	1	1	3	3	3	3
Societal	Offshore users	30.0	3	3	2	1	1	1
	Onshore communities	30.0	2	2	3	1	1	1
Technical	Risk of major project failure	3.3	3	3	3	3	1	1
	Technical feasibility	3.3	2	3	2	3	1	1
	Track record	3.3	2	3	2	2	1	1
Economic	Cost of decommissioning/removal	5.0	3	3	2	2	2	1
	Cost of long-term monitoring/remediation	5.0	1	1	2	2	2	3
Total		100.0	31	34	31	25	20	19

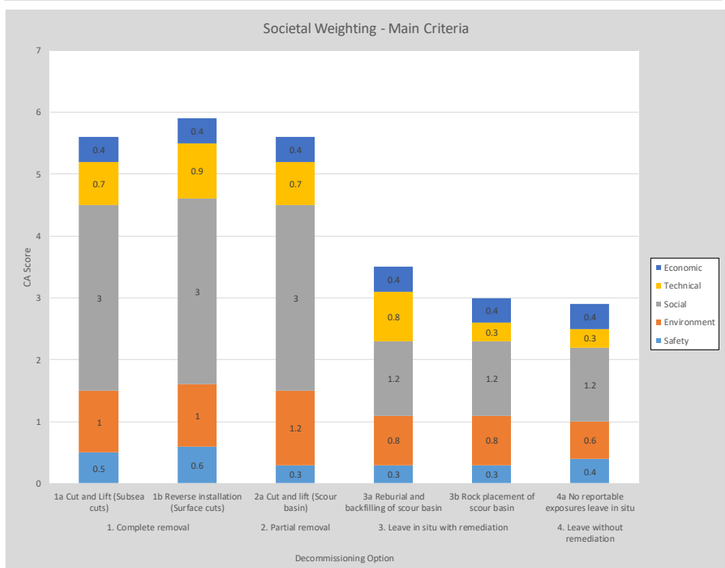
Criterion	Sub-criterion	Weigting	Decommissioning Option					
			1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
			1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	Project personnel	5.0	0.15	0.15	0.10	0.05	0.05	0.05
	Other users of sea	5.0	0.10	0.15	0.05	0.10	0.10	0.15
Environmental	Emissions to Air	2.5	0.08	0.08	0.08	0.03	0.03	0.03
	Seabed disturbance	2.5	0.08	0.08	0.08	0.08	0.08	0.03
	Waste management	2.5	0.08	0.08	0.08	0.03	0.03	0.03
	Legacy impacts	2.5	0.03	0.03	0.08	0.08	0.08	0.08
Societal	Offshore users	30.0	0.90	0.90	0.60	0.30	0.30	0.30
	Onshore communities	30.0	0.60	0.60	0.90	0.30	0.30	0.30
Technical	Risk of major project failure	3.3	0.10	0.10	0.10	0.10	0.03	0.03
	Technical feasibility	3.3	0.07	0.10	0.07	0.10	0.03	0.03
	Track record	3.3	0.07	0.10	0.07	0.07	0.03	0.03
Economic	Cost of decommissioning/removal	5.0	0.15	0.15	0.10	0.10	0.10	0.05
	Cost of long-term monitoring/remediation	5.0	0.05	0.05	0.10	0.10	0.10	0.15
Total		100.0	2.43	2.55	2.38	1.42	1.25	1.25

Criterion	Weigting	Decommissioning Option					
		1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
		1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	10	5	6	3	3	3	4
Environment	10	10	10	12	8	8	6
Social	60	5	5	5	2	2	2
Technical	10	7	9	7	8	3	3
Economic	10	4	4	4	4	4	4
Total	100	31	34	31	25	20	19

Criterion	Weigting	Decommissioning Option					
		1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
		1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	10	0.5	0.6	0.3	0.3	0.3	0.4
Environment	10	1	1	1.2	0.8	0.8	0.6
Social	60	3	3	3	1.2	1.2	1.2
Technical	10	0.7	0.9	0.7	0.8	0.3	0.3
Economic	10	0.4	0.4	0.4	0.4	0.4	0.4
Total	100	5.6	5.9	5.6	3.5	3	2.9

Weighting	Safety	Environmental	Societal	Technical	Economic
	Percentage				
Safety	60	10	10	10	10
Environmental	10	60	10	10	10
Societal	10	10	60	10	10
Technical	10	10	10	60	10
Economic	10	10	10	60	60





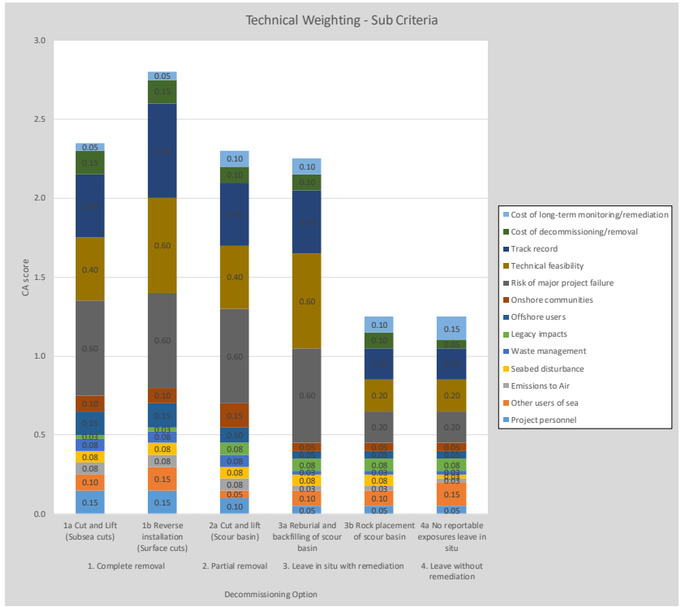
Criterion	Sub-criterion	Weigting	Decommissioning Option					
			1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
			1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	Project personnel	5.0	3	3	2	1	1	1
	Other users of sea	5.0	2	3	1	2	2	3
Environmental	Emissions to Air	2.5	3	3	3	1	1	1
	Seabed disturbance	2.5	3	3	3	3	3	1
	Waste management	2.5	3	3	3	1	1	1
	Legacy impacts	2.5	1	1	3	3	3	3
Societal	Offshore users	5.0	3	3	2	1	1	1
	Onshore communities	5.0	2	2	3	1	1	1
Technical	Risk of major project failure	20.0	3	3	3	3	1	1
	Technical feasibility	20.0	2	3	2	3	1	1
	Track record	20.0	2	3	2	2	1	1
Economic	Cost of decommissioning/removal	5.0	3	3	2	2	2	1
	Cost of long-term monitoring/remediation	5.0	1	1	2	2	2	3
Total		100.0	31	34	31	25	20	19

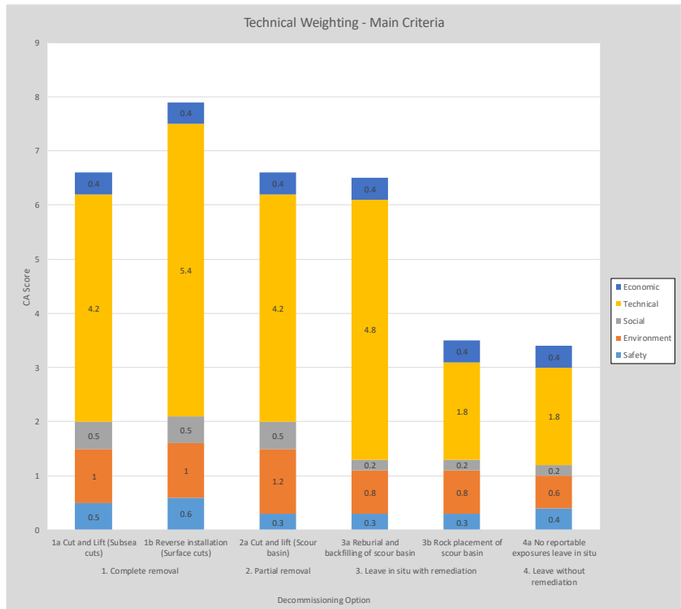
Criterion	Sub-criterion	Weigting	Decommissioning Option					
			1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
			1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	Project personnel	5.0	0.15	0.15	0.10	0.05	0.05	0.05
	Other users of sea	5.0	0.10	0.15	0.05	0.10	0.10	0.15
Environmental	Emissions to Air	2.5	0.08	0.08	0.08	0.03	0.03	0.03
	Seabed disturbance	2.5	0.08	0.08	0.08	0.08	0.08	0.03
	Waste management	2.5	0.08	0.08	0.08	0.03	0.03	0.03
	Legacy impacts	2.5	0.03	0.03	0.08	0.08	0.08	0.08
Societal	Offshore users	5.0	0.15	0.15	0.10	0.05	0.05	0.05
	Onshore communities	5.0	0.10	0.10	0.15	0.05	0.05	0.05
Technical	Risk of major project failure	20.0	0.60	0.60	0.60	0.60	0.20	0.20
	Technical feasibility	20.0	0.40	0.60	0.40	0.60	0.20	0.20
	Track record	20.0	0.40	0.60	0.40	0.40	0.20	0.20
Economic	Cost of decommissioning/removal	5.0	0.15	0.15	0.10	0.10	0.10	0.05
	Cost of long-term monitoring/remediation	5.0	0.05	0.05	0.10	0.10	0.10	0.15
Total		100.0	2.35	2.80	2.30	2.25	1.25	1.25

Criterion	Weigting	Decommissioning Option					
		1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
		1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	10	5	6	3	3	3	4
Environment	10	10	10	12	8	8	6
Social	10	5	5	5	2	2	2
Technical	60	7	9	7	8	3	3
Economic	10	4	4	4	4	4	4
Total	100	31	34	31	25	20	19

Criterion	Weigting	Decommissioning Option					
		1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
		1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	10	0.5	0.6	0.3	0.3	0.3	0.4
Environment	10	1	1	1.2	0.8	0.8	0.6
Social	10	0.5	0.5	0.5	0.2	0.2	0.2
Technical	60	4.2	5.4	4.2	4.8	1.8	1.8
Economic	10	0.4	0.4	0.4	0.4	0.4	0.4
Total	100	6.6	7.9	6.6	6.5	3.5	3.4

Weighting	Safety	Environmental	Societal	Technical	Economic
	Percentage				
Safety	60	10	10	10	10
Environmental	10	60	10	10	10
Societal	10	10	60	10	10
Technical	10	10	10	60	10
Economic	10	10	10	10	60





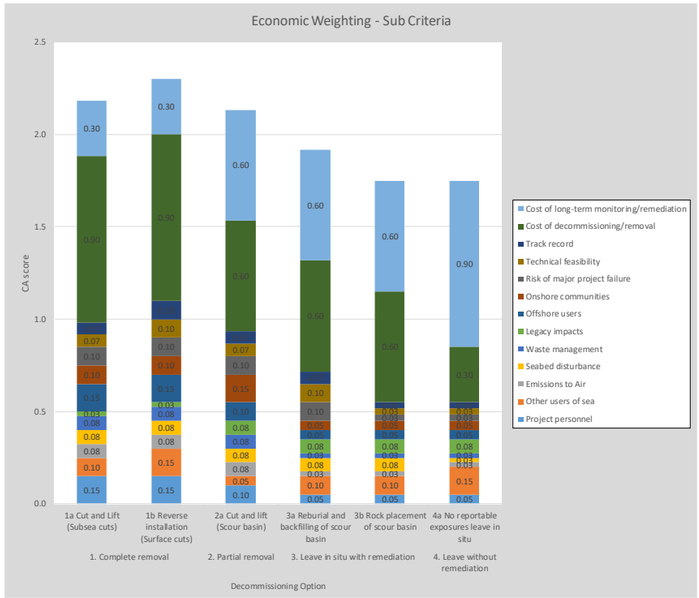
Criterion	Sub-criterion	Weigting	Decommissioning Option					
			1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
			1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	Project personnel	5.0	3	3	2	1	1	1
	Other users of sea	5.0	2	3	1	2	2	3
Environmental	Emissions to Air	2.5	3	3	3	1	1	1
	Seabed disturbance	2.5	3	3	3	3	3	1
	Waste management	2.5	3	3	3	1	1	1
	Legacy impacts	2.5	1	1	3	3	3	3
Societal	Offshore users	5.0	3	3	2	1	1	1
	Onshore communities	5.0	2	2	3	1	1	1
Technical	Risk of major project failure	3.3	3	3	3	3	1	1
	Technical feasibility	3.3	2	3	2	3	1	1
	Track record	3.3	2	3	2	2	1	1
Economic	Cost of decommissioning/removal	30.0	3	3	2	2	2	1
	Cost of long-term monitoring/remediation	30.0	1	1	2	2	2	3
Total		100.0	31	34	31	25	20	19

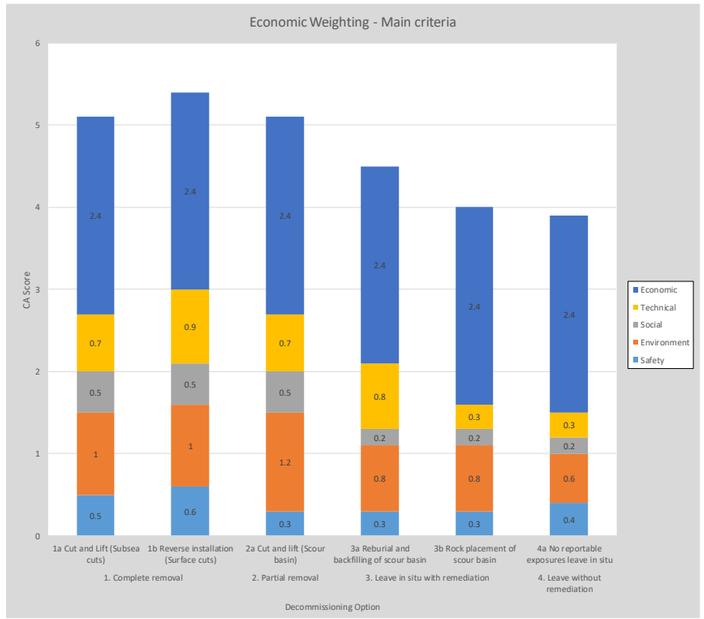
Criterion	Sub-criterion	Weigting	Decommissioning Option					
			1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
			1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	Project personnel	5.0	0.15	0.15	0.10	0.05	0.05	0.05
	Other users of sea	5.0	0.10	0.15	0.05	0.10	0.10	0.15
Environmental	Emissions to Air	2.5	0.08	0.08	0.08	0.03	0.03	0.03
	Seabed disturbance	2.5	0.08	0.08	0.08	0.08	0.08	0.03
	Waste management	2.5	0.08	0.08	0.08	0.03	0.03	0.03
	Legacy impacts	2.5	0.03	0.03	0.08	0.08	0.08	0.08
Societal	Offshore users	5.0	0.15	0.15	0.10	0.05	0.05	0.05
	Onshore communities	5.0	0.10	0.10	0.15	0.05	0.05	0.05
Technical	Risk of major project failure	3.3	0.10	0.10	0.10	0.10	0.03	0.03
	Technical feasibility	3.3	0.07	0.10	0.07	0.10	0.03	0.03
	Track record	3.3	0.07	0.10	0.07	0.07	0.03	0.03
Economic	Cost of decommissioning/removal	30.0	0.90	0.90	0.60	0.60	0.60	0.30
	Cost of long-term monitoring/remediation	30.0	0.30	0.30	0.60	0.60	0.60	0.90
Total		100.0	2.18	2.30	2.13	1.92	1.75	1.75

Criterion	Weigting	Decommissioning Option					
		1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
		1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	10	5	6	3	3	3	4
Environment	10	10	10	12	8	8	6
Social	10	5	5	5	2	2	2
Technical	10	7	9	7	8	3	3
Economic	60	4	4	4	4	4	4
Total	100	31	34	31	25	20	19

Criterion	Weigting	Decommissioning Option					
		1. Complete removal		2. Partial removal	3. Leave in situ with remediation		4. Leave without remediation
		1a Cut and Lift (Subsea cuts)	1b Reverse installation (Surface cuts)	2a Cut and lift (Scour basin)	3a Reburial and backfilling of scour basin	3b Rock placement of scour basin	4a No reportable exposures leave in situ
Safety	10	0.5	0.6	0.3	0.3	0.3	0.4
Environment	10	1	1	1.2	0.8	0.8	0.6
Social	10	0.5	0.5	0.5	0.2	0.2	0.2
Technical	10	0.7	0.9	0.7	0.8	0.3	0.3
Economic	60	2.4	2.4	2.4	2.4	2.4	2.4
Total	100	5.1	5.4	5.1	4.5	4	3.9

Weighting	Safety	Environmental	Societal	Technical	Economic
	Percentage				
Safety	60	10	10	10	10
Environmental	10	60	10	10	10
Societal	10	10	60	10	10
Technical	10	10	10	60	10
Economic	10	10	10	10	60





Appendix 5 - PUK Risk Matrix

		Severity	Safety	Environmental	Societal	Financial	Likelihood of Occurrence				
							Frequency	Negligible (N) < 1 in 1000 chance of occurring	Low (L) 1 in 100 to 1 in 1000 chance of occurring	Medium (M) 1 in 10 to 1 in 100 chance of occurring	High (H) 1 in 10 chances of occurring	Very High (VH) > 1 in 2 chances of occurring
								1	**2**	**3**	**4**	**5**
Potential consequence of Risk	**5**	**Very High (VH)**	**Very Major Health Incident** Potential for 5 of more fatalities	**Very major impact** Large scale impact on seabed/water column (>50km²) and/or persistent impact (Recovery >5 years). Emissions >1000te Carbon dioxide (CO_2)	**Very major impact** Onshore waste >1000te and/or loss of 3rd party access >20km²	**>£5mil** gross project costs		5	10	15	20	25
	4	**High (H)**	**Major Health / Safety incident** 1 or more fatalities, acute or chronic, actual or alleged	**Significant impact** Large scale impact on seabed/water column (25-50km²) and/or persistent impact (Recovery 2-5 years). Emissions 500-1000te (CO_2)	**Significant impact** Onshore waste 500-1000te and/or loss of 3rd party access 10-20km²	**£1-5mil** gross project costs		4	8	12	16	20
	3	**Medium (M)**	**High impact Health / Safety incident** Single or multiple reportable (Health and Safety Executive) injuries Permanent partial disability(ies)	**Moderate Impact** Moderate scale impact on seabed/water column (5-25km²) and/or persistent impact (Recovery 1-2 years) Emissions 15-0-500te (CO_2)	**Moderate impact** Onshore waste 150-500te and/or loss of 3rd party access 5-10km²	**£500k to £1mil** gross project costs		3	6	9	12	15
	2	**Low (L)**	**Medium Impact Health / Safety incident** Lost Time Incident	**Low impact** Low scale impact on seabed/water column (1-5km²) and/or short-term impact (Recovery < 1 year). Emissions 10-150te (CO_2)	**Low impact** Onshore waste 10-150te and/or loss of 3rd party access 1-5km²	**£100k-£500k** gross project costs		2	4	6	8	10
	1	**Negligible**	**Low Impact Health / Safety Incident** First Aid Case	**Negligible Impact** Negligible impact on seabed/Water column (<1km²) and or limited recovery (Recovery weeks to months) Emissions <10te (CO_2)	**Negligible impact** Onshore waste <10te and/or loss of 3rd party access <1km²	**<£100k**		1	2	3	4	5
	0	**Positive / N/A**	Positive or zero impact	Positive or zero impact	Positive or zero impact	Positive or zero impact		Positive / 0	Positive / 0	Positive / 0	Positive / 0	Positive / 0

Appendix 6 - Technical Assessments

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