

BANFF & KYLE DECOMMISSIONING PROJECT

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REPORT – BANFF & KYLE PHASE 2 & 3 DECOMMISSIONING SUPPORT - COMPARATIVE ASSESSMENT REPORT

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EXECUTIVE SUMMARY

CNRI have conducted a Comparative Assessment (CA) for the decommissioning of the subsea infrastructure associated with the Banff & Kyle fields. The following steps from the Oil and Gas UK CA Guidelines have been completed:



This CA report for the Banff & Kyle fields presents the methodology, decisions taken, the preparation works carried out, and the outcomes (recommendations) from the internal and external (with stakeholders) workshops.

The CA for the Banff & Kyle field subsea infrastructure has focussed on four decommissioning groups - groups 1, 2, 4 and 8, as described in the table below.

All other decommissioning groups of the Banff & Kyle Subsea Infrastructure were confirmed at the CA Scoping and Screening stage to be fully removed from the field. The outcome of the CA process has made the following recommendations:

Grp	Title	Decommissioning Approach
1	Rigid Pipelines, Trenched and Buried.	Option 4a - Rock Placement Over Areas of Spans / Exposure / Shallow Burial
		Pipelines will be disconnected
		 Rock placement over surface laid sections of lines out with existing trench
		Rock placement at all areas of spans and exposure
2	Flexibles/Umbilicals Trenched and Buried	Option 4a - Rock Placement Over Areas of Spans / Exposure / Shallow Burial
		 Lines will be disconnected
		 Rock placement over surface laid sections of lines out with existing trench
		Note: There are no areas of spans or exposure associated with the lines in Group 2.
3	Flexibles/Umbilicals, Surface Laid	Full Removal
4	Rigid Pipelines, Trenched and Rock Covered	Option 4a - Rock Placement Over Areas of Spans / Exposure / Shallow Burial
		 Lines will be disconnected
		 Rock placement over surface laid sections of lines out with existing trench
		Note: There are no areas of spans or exposure associated with the lines in Group 4.
5	Spools and Jumpers	Full Removal
6	Subsea Installations (Structures)	Full Removal
7	Protection / Stabilisation	Full Removal

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Grp	Title	Decommissioning Approach	
8	FSO Mooring Piles and Remaining Chains	Option 5 – Leave in-situ: Remove pile below seabed to a depth to ensure that any remains are unlikely to become uncovered – Dredge out pile internals	
		 Cut piles below seabed using internal pile cutter In line with current guidance, any piles will be severed below the natural seabed level at such a depth to ensure that any remains are unlikely to become uncoveredCNRI will aim to achieve a cut depth of 3 m below the natural seabed level, however consideration will be given to the prevailing seabed conditions and currents. Any deviation from this Guidance will be discussed and agreed with OPRED. 	
		 to a depth to ensure that any remains are unlikely to become uncovered 	
		Recover pile top section to vessel	
		 Lift, tension and cut remaining chain at the seabed 	
9	FPSO Mooring Scour	Full Remediation	

The decisions were reached on completion of an appropriate amount of preparatory study work, with clear decision outcomes.

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1 INTRODUCTION

1.1 Background

CNRI are conducting a Comparative Assessment (CA) for the remaining infrastructure in their Banff and Kyle Fields. The fields were originally tied back to an FPSO (Banff) which has since been removed along with the associated risers and mooring system.

The current Banff and Kyle Fields consists of subsea wellheads, subsurface completions, rigid pipelines, static umbilicals, static flowlines, spools, jumpers and various subsea structures. The FPSO mooring systems have been removed from the field. The dynamic risers and umbilicals which previously connected the subsea production system to the FPSO have been removed. The STL Buoy/FSO moorings have been removed, apart from 8 off mooring piles, each with a short length of chain (up to 10m in length).

The subsea wellheads are to be addressed as part of a plugging and abandonment (P&A) campaign and are out with this scope.

Production and gas lift pipelines and flowlines have been purged free of hydrocarbons, flushed and left filled with raw seawater.

Umbilical cores have been flushed through apart from several blocked cores.

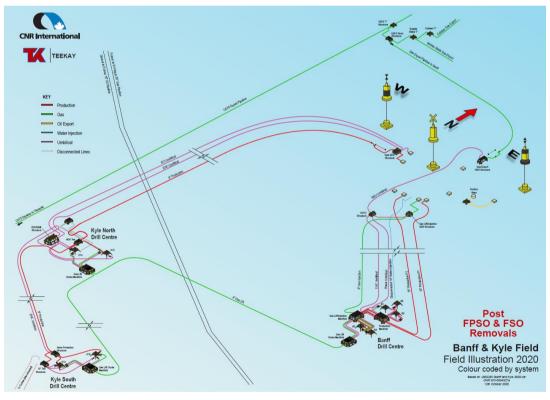


Figure 1.1: Banff and Kyle Fields Remaining Seabed Infrastructure

1.2 Purpose

The purpose of this document is to present a Comparative Assessment (CA) for the Subsea Infrastructure of the Banff & Kyle Fields in support of the Decommissioning Programme (DP). It is produced in satisfaction of the requirement to perform a CA for any potential derogation application for subsea equipment as detailed in the OGUK Decommissioning CA Guidelines ref. [1].

It describes the field infrastructure addressed, the decommissioning options considered, the CA methodology conducted, and the recommendations made during the CA process.

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1.3 Report Structure

This CA Report contains the following:

- > Section 1 An introduction to the document and project, including acronyms and references.
- > Section 2 An overview of the CA methodology and definition of the scoping and boundaries of the CA.
- > Section 3 The decommissioning groups identified and the initial decommissioning approach.
- > Section 4 The CA outcome obtained for Group 1 Rigid Pipelines, Trenched and Buried.
- > Section 5 The CA outcome obtained for Group 2 Flexibles/Umbilicals Trenched and Buried.
- > Section 6 The CA outcome obtained for Group 4 Rigid Pipelines, Trenched and Rock Covered.
- > Section 7 The CA outcome obtained for Group 8 FSO Mooring Piles and Remaining Chains.
- > Section 8 Recommendations
- > Appendix A Evaluation Methodology.
- Appendix B Stakeholder CA Workshop Minutes.
- > Appendix C Group 1 Detailed Evaluation Results.
- > Appendix D Group 2 Detailed Evaluation Results.
- Appendix E Group 4 Detailed Evaluation Results
- Appendix F Decommissioning Methodologies and Datasheets all groups

1.4 Terms, Abbreviations and Acronyms

AHP Analytical Hierarchy Process
API American Petroleum Institute

BEIS Department of Business, Energy and Industrial Strategy

CA Comparative Assessment

CATS Central Area Transmission System

CNRI Canadian Natural Resources International

CP Cathodic Protection

CSV Construction Support Vessel
DP Decommissioning Programme

DUTA Dynamic Umbilical Termination Unit

DWC Diamond Wire Cutting

EMT Environmental Management Team

FAR Fatal Accident Rate

FSO Floating Storage and Offloading

FPSO Floating Production, Storage and Offloading

HCE High Consequence Events
HSE Health and Safety Executive

IP Institute of Petroleum (now the Energy Institute)

JNCC Joint Nature Conservation Committee

KP Kilometre Point

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MCDA Multi-Criteria Decision Analysis
MEI Major Environmental Incident

MFE Mass Flow Excavator
MPA Marine Protected Area

MS Much Stronger MW Much Weaker

NFFO National Federation of Fishermen's Organisations

NORM Naturally Occurring Radioactive Material

OD Outside Diameter

ODU Offshore Decommissioning Unit

OGUK Oil & Gas UK

OPRED Offshore Petroleum Regulator for Environment & Decommissioning

P&A Plugging and Abandonment

PL Pipeline

PLL Potential for Loss of Life
PLU Pipeline (umbilical)
POB Personnel on Board

S Stronger

SAM Subsea Accumulator Module SDU Subsea Distribution Unit

SFF Scottish Fishermen's Federation
SHE Safety, Health, Environment
SRB Sulphite Producing Bacteria
STL Submerged Turret Loading
SSIV Subsea Safety Isolation Valve
TUTU Topside Umbilical Termination Unit

UK United Kingdom
VC Video Conference
VMS Very Much Stronger
VMW Very Much Weaker

W Weaker

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1.5 References

1. OGUK Decommissioning CA OGUK - Guidelines for Comparative Assessment in Decommissioning Programmes, Dated: October 2015, ISBN: 1 903 004 55 1, Issue: 1. Guidelines

BEIS, Guidance Notes: Decommissioning of Offshore Oil and Gas **BEIS Guidance Notes** 2.

Installations and Pipelines, Nov 2018.

Banff & Kyle Phase 2 and 3 Decommissioning Support - Comparative Assessment Screening Report, Doc. No.: BFD399029-XDS-EN-REP-3. **CA Screening Report**

00003_REVA1, Rev.: A1, Dated 30/11/2020.

Safetec, Joint Industry Project Report "Risk Analysis of Risk Analysis of 4.

Decommissioning Activities Decommissioning Activities

(http://www.hse.gov.uk/research/misc/safetec.pdf), 2005

Analytical Hierarchy Process T.L. Saaty, The Analytical Hierarchy Process, 1980 5.

OGUK North Sea Pipeline Decommissioning of Pipelines in the North Sea Region – 2013, Issued 6. **Decommissioning Guidelines**

by Oil & Gas UK

Guidelines for the Calculations of estimates of energy use and gaseous 7. IP 2000

emissions in the decommissioning of offshore structures.

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2 COMPARATIVE ASSESSMENT METHODOLOGY

2.1 Overview

Comparative Assessment is a process by which decisions are made on the most appropriate approach to decommissioning. As such it is a core part of the overall decommissioning planning process being undertaken by CNRI for the Banff & Kyle Decommissioning Project (Subsea Infrastructure).

The OGUK Decommissioning CA Guidelines ref. [1] were prepared in 2015 by Oil and Gas UK, where seven steps to the CA process were recommended. Table 2-1 introduces each of these steps, along with a status and commentary to demonstrate the current position.

Title	Scope	Status	Commentary
Scoping Decide on appropriate CA method, confirm criteria, identify boundaries of CA (physical and phase).		√	CA methodology and criteria established for screening to ensure appropriate evaluation phase. Detailed in Section 2.2 and Appendix A.
Consider alternative uses and deselect unfeasible options.		√	Screening workshops were held in Q3 2020 the screening workshops were attended by members of the CNRI project team. Screening outcomes are documented in CA Screening Report [3]
Preparation	Undertake technical, safety, environmental and other appropriate studies. Undertake stakeholder engagement.	√	Studies identified during screening phase undertaken to inform the evaluation of the remaining options. Detailed in Section 2.4.
Evaluate the options using the chosen evaluation methodology.		√	Internal workshops held Q4 2020 and Stakeholder Workshop on 17/11/2020. Evaluation methodology described in Section 2.5 and outcomes detailed in Section 4, 5 and 6. More detail can be found in Appendix A.
Recommendation	Document the recommendation in the form of narrative supported by charts explaining key tradeoffs.	√	The emerging recommendations for the decommissioning options selected are as identified during the Stakeholder Workshop and as detailed in the CA Report (this document). Recommendations can be found in Section 7.
Review	Review the recommendation with internal and/or external stakeholders.	√	The Stakeholder CA Review Workshop was held on 17 th November 2020 and the minutes can be found in Appendix B.
Submit	Submit to OPRED as part of/alongside Decommissioning Programme.	√	Planned Q2 2021

Table 2-1: CA Process Overview and Status

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2.2 Scoping

The scoping phase of the CA process addresses the following elements:

> Boundaries for the CA;

- > Physical attributes of equipment;
- > Decommissioning options.

These are addressed in the following sub-sections.

2.2.1 CA Boundaries

The CA Scoping phase includes the definition of the boundaries of the CA. Offshore oil and gas production systems are complex and are often interconnected, and as a result of that, it is important to understand the limitations of the scope. The Banff and Kyle subsea infrastructure is tied back to the CATS gas pipeline. The boundary of the infrastructure is the tie-in flange at the CATS Tie-In Structure. Fluids export was via the FPSO and FSO which have been removed from the field.

The infrastructure that will be considered under this CA is as follows:

- > Banff & Kyle Fields' subsea infrastructure addressed within this CA is as follows:
 - All subsea structures (installations) including their foundations;
 - All rigid and flexible subsea flowlines;
 - All control and chemical jumpers;
 - All spools;
 - All umbilicals;
 - All mattresses and deposits;
 - FSO mooring piles & remaining chains.

The starting conditions for the CA are defined below:

- The following will be complete prior to the Banff & Kyle subsea infrastructure decommissioning scope commencing:
 - The pipelines will be cut / disconnected from subsea infrastructure;
 - The umbilicals will be cut / disconnected from subsea infrastructure;
 - The CATS system will be physically isolated from the Banff export pipeline.

2.2.2 Physical Attributes of Equipment

All equipment within the scope of the Banff & Kyle Decommissioning Project (subsea infrastructure) is considered along with the physical attributes that define the equipment. Attributes considered include the following:

- > Structures:
 - Type:
 - Weight / size / shape;
 - General arrangement;
 - Installation method / foundation type;
 - Integrity issues.
- > Pipelines / Flowlines / Spools:
 - Pipeline number;

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- Type (rigid / flexible);
- Service (gas / oil / water);
- Material / diameter / wall thickness / coatings / length;
- Seabed configuration (trenched / buried / surface laid);
- Details of crossings / mattresses;
- As-left cleanliness / ability to clean lines;
- Integrity issues.
- > Umbilicals / Jumpers:
 - Material / diameter / wall thickness / coatings / length;
 - Seabed configuration (trenched / buried / surface laid);
 - Details of crossings / mattresses;
 - As-left cleanliness / ability to clean lines / chemicals used;
 - Integrity issues.

The equipment associated with the Banff & Kyle Decommissioning Project (subsea infrastructure) is summarised in Table 3-1 herein.

2.2.3 Decommissioning Groups

Once the equipment to be decommissioned and their attributes are captured, it is desirable to group similar items of equipment together. This has the benefit that many items can be considered as a single group and can reduce the number of items for consideration from potentially hundreds, down to a few, thus streamlining the process.

For the Banff & Kyle Decommissioning Project (Subsea Infrastructure) the decommissioning groups are summarised in Table 3-1 herein.

2.2.4 Decommissioning Options

With the decommissioning groups established, all potential decommissioning options for each of the groups are identified. The base case for all groups is full removal as per the BEIS Guidance Notes ref. [2] and it is only those decommissioning groups where default full removal is not considered to be the clear recommended solution, that alternative decommissioning options are considered.

Alongside full removal options, the following partial removal scenarios should be considered as specified in the BEIS Guidance Notes ref. [2] and OGUK North Sea Pipeline Decommissioning Guidelines ref. [6].

- > Re-Use.
- > Full Removal:
 - Cut and Lift Cut pipe into small sections and recover;
 - Reverse Installation without de-burial Recover pipe using reverse s-lay or reverse reeling;
 - Reverse Installation with de-burial Recover pipe using reverse s-lay or reverse reeling.
- > Leave In-Situ with Major Intervention:
 - Rock cover entire length including surface laid sections out with trench / cover;
 - Re-Trench and bury entire length including surface laid sections out with trench / cover.
- > Leave In-Situ with Minor Intervention:

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 Rock cover areas of spans, exposure and shallow burial and surface laid portions of lines. Remove surface laid sections out with trench / cover;

- Trench and bury areas of spans, exposure and shallow burial. Remove surface laid sections out with trench / cover:
- Cut and Lift areas of spans, exposure and shallow burial. Remove surface laid sections out with trench / cover;
- Accelerated Decomposition of lines using reverse cathodic protection / chemicals / etc.
- Leave In-Situ and Minimal Intervention:
 - Cut and Lift surface laid sections out with trench / cover only.
- Leave In-Situ and Do Nothing.

Table 3-1 lists the decommissioning groups and identifies those which were judged to be appropriate for decommissioning by full removal and those where full removal was not considered the clear recommended solution. Of those groups where full removal was not considered the clear recommended solution, the proposed decommissioning options for each of those groups are detailed as follows:

- Section 4.2 for Group 1 Rigid Pipelines, Trenched and Buried;
- > Section 5.2 for Group 2 Flexible Flowlines and Umbilicals, Trenched and Buried;
- Section 6.2 for Group 4 Rigid Flowlines, Trenched and Rock Back-filled.

2.3 Screening Phase

The screening phase of the comparative assessment was carried out during a series of workshops held in Q3 2020. The methodology adopted, workshop attendance and outcomes obtained are detailed fully in the CA Screening Report ref. [3]. The methodology is briefly summarised below.

- > Identify decommissioning groups for full removal:
- > Review proposed decommissioning options for each remaining group;
- > Assess decommissioning options and record assessment and outcome in screening worksheets;
- Record actions required to support retained decommissioning options;
- > Compile Screening Report.

The decommissioning options for the remaining groups were assessed against the primary assessment criteria suggested in the OGUK Decommissioning CA Guidelines ref. [1]. These are:

- Safety;
- > Environmental;
- > Technical:
- > Societal;
- > Economic.

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The assessment was performed using a coarse Red / Amber / Green method, as recommended in the OGUK Decommissioning CA Guidelines ref. [1]. An additional category of 'showstopper', coloured dark grey, was used. These categories are described Table 2-2.

Category	Description
Attractive	The option is considered attractive i.e. it has positive attributes in terms of the criterion being assessed.
Acceptable	The option is considered acceptable i.e. its attributes are not positive or negative in terms of the criterion being assessed.
Unattractive	The option is considered unattractive i.e. it has negative attributes in terms of the criterion being assessed.
Show stopper	The option is considered unacceptable. Should an option be assessed as unacceptable against any of the criteria, no further assessment is required.

Table 2-2: Screening Assessment Categories

The cumulative assessment for each decommissioning option was then captured based on some basic ground rules. These are:

- > Three or more criteria assessed as red resulted in the option being screened out (red).
- > For similar full removal options, the likely least onerous option was retained (green) with any more onerous option considered as a sub-set of the less onerous option (light grey). Should the easiest full removal option be selected, the manner in which the removal would be conducted would be agreed with the removal contractor during execution to maintain flexibility.
- > For similar leave in-situ options, the most onerous option was retained (green) with any less onerous options considered as a sub-set of the more onerous option (light grey). This approach promotes the principle of not unduly 'burdening' the retained full removal option.
- > This approach was considered appropriate to ensure that the best-case full removal options were compared to the most onerous leave in-situ options. This ensures, during the evaluation phase, that the assessment is not skewed such that leave in-situ options are selected over full removal options.

The outcomes for each group are summarised in Table 4-2, Table 5-2 and Table 6-2.

2.4 Preparation Phase

During the preparation phase, detailed studies / analyses are conducted to provide information to support the Evaluation phase of the Comparative Assessment. The detailed studies / analyses that may be required are often identified early in the CA process. These studies / analyses are then supplemented by additional studies / analyses identified during the screening phase of the CA.

The studies / analyses conducted during the preparation phase of the CA process are as follows:

> I	Burial Status Review	Review of historical survey data to understand current and historical burial status of lines.
>	Method Statements	Detailed method statements were developed for options carried forward to ascertain the activities and resources required to deliver the option.
> l	Emissions Assessment	Fuel consumption and atmospheric emissions assessment performed for options carried forward based upon activities and resources identified in method statements.
> I	Environmental Impact Review	Environmental impact reviews were conducted for options carried forward in areas of planned discharges, unplanned

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discharges and seabed disturbance based on activities and resources identified in method statements. Underwater noise impact was based on a qualitative assessment of the vessels and activities employed as detailed in the method statements.

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The findings of the studies / analyses are gathered in preparation for the evaluation phase of the CA. The key information obtained from these studies / analyses, used during the evaluation phase are provided in the attributes tables, included in Appendix C, Appendix D and Appendix E.

2.5 Evaluation Phase

The evaluation phase of the comparative assessment is where the remaining decommissioning options for each group are evaluated against each other. This evaluation process is conducted according to the OGUK Decommissioning CA Guidelines ref. [1] and employs the data obtained during the preparation phase as summarised in the attributes tables, included in Appendix C and Appendix D.

The evaluation phase was performed during several evaluation workshops where the decommissioning project team and field partners were represented. This enabled the supporting information for each of the decommissioning groups and associated decommissioning options to be interrogated and increased in maturity and definition.

Once the evaluation of the remaining decommissioning groups and options was ready, a CA Workshop was convened with external stakeholders; the CA process to date was described and the evaluation of the remaining options was reviewed. This CA Stakeholder Workshop enabled the invited stakeholders to gain familiarity with the evaluation methodology and the information generated through the supporting studies and analyses. It also allowed the evaluation to be challenged in key areas and, at the culmination of the workshop, outcomes for each of the decommissioning groups were validated.

The CA Stakeholder Workshop was held via VC / Microsoft Teams Tuesday 17th November 2020. The attendees were as detailed in Table 2-3.

Company	Name	Role	
	David Hennessy	Subsea Engineer	
	Isabelle Pouncey	Observer - Ninian North	
	Jonathan Hoare	Pipelines Technical Authority	
	Kerry Langworthy	SHE Advisor / Decommissioning Focal Point	
CNRI	Kirsty Lal	Project Engineer - Decommissioning	
	Peter Ronnie	SHE Manager	
	Roy Aspden	Decommissioning Manager	
	Sarah Gill	Technical Assistant - Developments	
	Stephen Brown	Project leader Banff & Kyle Decommissioning	
Dana Petroleum Anne Milne Jo		Joint Venture Manager	
HSE	Bill Chilton	Offshore Diving & Decommissioning	
TIOL	Stephanie Enz	Pipelines Technical Authority	

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Company	Name	Role
	Claire Thomson	Decommissioning Manager
OPRED	Helen McArthur	Assistant Decommissioning Manager
OFRED	Julie Cook	Environmental Manager
	Stewart Welsh	Senior Decommissioning Manager
Premier Oil	Pieter voor de Poorte	Decommissioning Lead
Tookov	Kenny Ironside	Decommissioning Representative
Teekay	Tom Griffiths	Director, Technical & Projects
SFF	Andrew Third	Industry Advisor
SFF	Steven Alexander	Offshore Liaison
	Deborah Morgan	Project Manager
Xodus Group	John Foreman	Comparative Assessment Lead
	Nic Duncan	Decommissioning Consultant

Table 2-3: Stakeholder Workshop Attendees & Roles

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3 BANFF & KYLE AREA DECOMMISSIONING GROUPS

Table 3-1 lists all decommissioning groups identified for the Banff & Kyle Subsea Infrastructure. Early CA scoping and screening activities, detailed in the CA Screening Report ref. [3], identified the decommissioning groups where full removal is the recommended decommissioning approach (highlighted in grey).

The remaining groups are subjected to the remainder of the CA process to identify the recommended decommissioning option. These outcomes are also captured in Table 3-1.

Grp	Title	Description	Decommissioning Approach
1	Rigid Pipelines, Trenched and Buried	All rigid pipelines, trenched and backfilled.	Subject to full Comparative Assessment
2	Flexibles/Umbilicals Trenched and Buried	All flexible flowlines and umbilicals, trenched and backfilled.	Subject to full Comparative Assessment
3	Flexibles/Umbilicals, Surface Laid	A single umbilical, surface laid in shallow trench.	Full Removal Note 1
4	Rigid Pipelines, Trenched and Rock Covered	All rigid pipelines, trenched and rock covered.	Subject to full Comparative Assessment
5	Spools and Jumpers	All spools associated with the tie-in of pipelines to structures / risers. All jumpers associated with the tie-in of umbilicals to structures / risers.	Full Removal
6	Subsea Installations (Structures)	All subsea structures (installations).	Full Removal
7	Protection / Stabilisation	All protection, support and stabilisation materials such as mattresses and grout bags.	Full Removal
8	Moorings and Related Scour	The moorings and scour / impact to the seabed caused by the moorings.	Full Removal

Table 3-1: Decommissioning Groups and Initial Decommissioning Recommendation

Note 1: Post-screening, the decommissioning approach for Group 3 was adjusted from being considered for full CA to being full removal. This adjustment was made due to the surface laid nature of the single short line in this group (PLU4522 – Banff Power Cable).

3.1 Decommissioning Groups for Full CA

In summary, the decommissioning groups for the Banff & Kyle subsea Infrastructure where full removal was not considered to be the clear recommended solution and that are to be subjected to the full CA process are:

- > Group 1 Rigid Pipelines, Trenched and Buried
- > Group 2 Flexibles/Umbilicals Trenched and Buried
- > Group 4 Rigid Pipelines, Trenched and Rock Covered

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4 GROUP 1 - RIGID PIPELINES, TRENCHED AND BURIED

4.1 Group 1 Characteristics

The items that make up Group 1 and their key characteristics are listed in Table 4-1.

ID	Description	OD (inches)	Length (km)
PL1546	10" Banff Oil Production Pipeline (P2), Manifold to Riser Base	10	1.546
PL1547	10" Banff Oil Production Pipeline (P1), Manifold to Riser Base	10	1.546
PL1548	10" Banff Water Injection Pipeline, Riser Base to Manifold	10	1.715
PL1550	12" Banff Oil Export Pipeline, Tie-in Spool to 12" Flowline	12	1.248
PL1660	8" Kyle Oil Production Pipeline, North Kyle DC to Riser Base	8	12.023
PL1797	8" Kyle Oil Production Pipeline, Kyle North Tee Structure to Kyle South Tee Structure	8	3.370
PL1798	12" Curlew Production Pipeline, Kyle South 12" Tee Structure to Curlew FPSO	12	17.383
PL2388	4" Kyle Gas Lift Pipeline, Kyle North Gas Lift / Choke Manifold to Kyle South Gas Lift / Choke Manifold	4	3.289

Table 4-1: Group 1 Items

4.2 Group 1 Decommissioning Options & Screening Outcome

During the Screening Phase, all potential decommissioning options were assessed against the Safety, Environmental, Technical, Societal and Economic criteria using a coarse, red / amber / green methodology. The assessment performed and the outcomes are detailed fully in the CA Screening Report ref. [3] and summarised in Table 4-2.

Group 1 – Rigid Pipelines, Trenched and Buried				
Category	Option	Description	Discussion	
Re-use	1 – Re-use	- Leave pipelines in-situ for use in any potential new developments	Ruled out as a show stopper as no potential re-use in-situ options for these lines.	
	2a – Cut and lift w ith de-burial	 Pipelines will be disconnected De-burial of pipelines using MFE Note 1 Recover by cutting into sections and removal 	Retained as the least onerous and credible Full Removal option.	
Full removal	2b – Reverse Installation (S-lay) w ithout de-burial	Lines will be disconnectedNo de-burial prior to removalRecover by reverse s-lay	Screened out due to concerns regarding the lines having the integrity required to perform reverse installation.	
	2c – Reverse Installation (S-lay) w ith de-burial	 Lines will be disconnected De-burial of line using MFE Note 1 Recover by reverse s-lay 	Screened out due to concerns regarding the lines having the integrity required to perform reverse installation.	
Leave in-situ (major intervention)	3a – Rock placement over entire line	 Pipelines will be disconnected Rock placement over full length of pipelines to address areas of spans, exposure & shallow burial No recovery of pipelines 	Ruled out as a technical show stopper as there are insufficient areas of spans, exposure or shallow burial to justify fully rock covering lines already fully buried.	

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Group 1 – Rigid Pipelines, Trenched and Buried				
Category	Option	Description	Discussion	
Leave in-situ (major intervention)	3b – Retrench and bury entire line	 Pipelines will be disconnected Re-trench and backfill full length of pipelines to remove areas of spans, exposure & shallow burial depth No recovery of pipelines No introduction of new material 	Ruled out as a technical show stopper as there are insufficient areas of spans, exposure or shallow burial to justify trenching lines already fully buried.	
	4a – Rock placement over areas of spans, exposures and shallow burial	 Pipelines will be disconnected Removal and recovery of surface laid sections out with existing trench Note 2 Rock placement to remediate snag risk from cut ends Rock placement at all areas of spans, exposure and shallow burial depth 	Retained as a viable leave in-situ option and should be evaluated.	
	4b – Trench & bury areas of spans, exposures and shallow burial	 Pipelines will be disconnected Removal and recovery of surface laid sections out with existing trench Rock placement to remediate snag risk from cut ends Trench / bury areas of spans, exposure and shallow burial depth Minimal introduction of new material 	Ruled out as a technical show stopper due to the technical challenges associated with trenching lines due to geotechnical conditions in this area (stiff clays).	
Leave in-situ (minor intervention)	4c – Remove areas of spans, exposures and shallow burial	 Pipelines will be disconnected Removal and recovery of surface laid sections out with existing trench Rock placement to remediate snag risk from cut ends Removal of areas of spans, exposure and shallow burial depth using cut and lift techniques, including de-burial where required 	Retained as a viable leave in-situ option and should be evaluated.	
	4d – Accelerated decomposition	 Pipelines will be disconnected Removal and recovery of surface laid sections out with existing trench Rock placement to remediate snag risk from cut ends Introduce material / techniques to accelerate the decomposition process Potential options include reverse polarity CP, Sulphate Reducing Bacteria (SRBs), chemicals, etc. 	Ruled out as a technical show stopper as accelerated decomposition not a viable solution for polymer coated rigid lines as polymer coating would remain.	
Leave in-situ (minimal intervention)	5 – Remove ends and remediate snag risk	Pipelines will be disconnected Removal and recovery of surface laid section out with existing trench Rock placement to remediate snag risk from cut ends	Retained as a viable leave in-situ option and should be evaluated.	
Leave in-situ (do nothing)	6 – Leave as-is	There will be no planned subsea intervention Appropriate legislative considerations shall be addressed and any advisory zones implemented for remaining subsea infrastructure	Ruled out as a safety show stopper due to the sections of line out with the trench leaving an unacceptable potential snagging risk.	

Table 4-2: Group 1 Decommissioning Options & Screening Summary

Note 1: After Screening, the project team shared historical issues regarding the geotechnical conditions in the area. The seabed conditions of stiff clays are such that de-burial by MFE is unlikely to be successful as experienced during previous remediation activities in this area. As such, all de-burial operations for retained options were modified to be excavation using bucket excavator rather than using MFE.

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Note 2: After Screening, the rock cover option was adjusted to include rock cover of surface laid portions of line ends out with existing trench. This aligns with the approach executed by CNRI during the Murchison decommissioning programme.

4.3 Group 1 Decommissioning Options for Evaluation

The decommissioning options for Group 1 that remained after screening and which were taken forward to the evaluation phase are therefore:

- > Full Removal
 - 2a Cut and lift with de-burial
- > Leave in-situ (minor intervention)
 - 4a Rock placement over areas of spans, exposures and shallow burial
 - 4c Remove areas of spans, exposures and shallow burial
- > Leave in-situ (minimal intervention)
 - 5 Remove ends & remediate snag risk

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4.4 Group 1 Evaluation Summary

Group 1 - Rigid Pipelines, Trenched and Buried Note: for full attributes tables and assessment see Appendix C Option 4a is assessed as being the preferred option from a safety perspective. Option 4a is preferred from a risk exposure to Operations Personnel perspective. This is due to the shorter durations associated with the offshore scope to rock cover the line ends and areas of spans and exposure compared to the other options and there being no offshore lifting associated with the rock cover option. It is also preferred from an onshore risk exposure perspective as there is no material returned for processing. Option 2a is preferred to the other options in the Legacy Risk criterion due to the line being fully removed (albeit with two under crossings remaining). The difference in risk profile between Option 2a and the rock cover / exposure removal options is assessed as minimal as the remaining lines are rock covered or trenched and buried along their entire lengths. There is a stronger preference for Option 2a over Option 5 as spans and exposures would remain in Option 5. Option 4c and Option 5 are assessed as being equally preferred from an environmental perspective. Option 4a, 4c and 5 are equally preferred over Option 2a from an Operational Marine Impact perspective due to the cumulative impact of releases from cutting the lines into short sections for recovery in Option 2a. These releases would have a low environmental impact as the lines will be flushed and cleaned to best endeavours. Option 2a was also less preferred than the other options due to the noise impact associated with the vessels being onsite for extended offshore durations and the Diamond Wire Cutting (DWC) at the crossing locations although, again the noise impact is assessed as being minimal. Option 2a is less preferred than the other options from an Atmospheric Emissions perspective as the fuel use and atmospheric emissions are higher due to the longer duration offshore operations. Option 4c and Option 5 are preferred with respect to Seabed Disturbance as the full removal option results in a large area of moderate seabed disturbance from the de-burial of the lines by bucket excavation to gain access for cutting. They are also preferred over Option 4a due to the introduction of additional rockcover, resulting in permanent habitat change. Option 2a is preferred from a Legacy Marine Impacts perspective as there is limited legacy marine impact as the lines are removed (although two under crossings will remain in-situ). The Legacy Marine Impact from the lines left in-situ, while less preferred to the full removal option, are expected to be minimal as lines are flushed and cleaned to best endeavours and any releases / degradation products will occur over a long time frame and over a wide area. Option 4a, Option 4c and Option 5 are assessed as being equally preferred from a technical perspective. All options are considered technically feasible as they use largely routine approaches. However, Option 2a was less preferred to the other options due to the challenges associated with excavating the lines (necessary due to geotechnical conditions) to gain access for cutting and challenges in remediating the affected area to allow the area to be overtrawlable. All options were assessed as being equally preferred from an Ease of Recovery from Excursion and Use of Proven **Evaluation** Technology and Equipment perspective. Option 2a and Option 4c are assessed as being equally preferred from a societal perspective. With respect to Societal impact on Fishing, Option 2a and Option 4c are preferred as these present a clear seabed for future Societal fishing operations. Option 4a introduces additional rockberms and Option 5 leaves residual spans and exposures in -situ The Socio-economic Impacts on Communities and Ammeneties for all options were considered I argely balanced as, while there is more useful, recyclable material (steel) returned in the full removal option, there is also the polymer coatings returned which are likely to go to landfill. Option 4a is assessed as being the preferred option from an Economic perspective. From a short-term cost perspective, Option 4a is preferred as it is around a quarter of the cost of the next lowest cost option. The full removal option is more than 40 times more expensive. For long-term costs, the legacy costs associated with monitoring, surveying and managing potential snag hazards for all options are similar and equally preferred. Option 4a was preferred (or equally Group 1: Rigid Pipelines Trenched & Buried preferred) against the Safety, and ■ 2. Environmental ■ 3. Technical ■ 4. Societal ■ 5. Economic Technical criteria. It was marginally preferred against Environmental and Societal criteria, but 30.3% 30.0% this was insufficient to offset the strong preference for Option 4a against the 25.0% 23.9% Safety criterion. 5.4% 20.5% Summary 5.4% Once the Economics criterion was 5.3% considered, this strengthens the preference for Option 4a. 5.3% 5.3% 4.0% 10.0% Option 4a - Rock Placement Over 4.2% Areas of Spans / Exposure / Shallow 11.3% Burial will form the emerging 6.7% 6.5% recommendation for 0.0% decommissioning Group 1. O4A - Rock Placement Over O4C - Remove Areas of Areas of Spans / Exposure / Spans / Exposure / Shallow Burial (Leave, Minor) Burial (Leave, Minor) O5 - Remove Ends & nediate Snag Risk (Leave

Table 4-3: Group 1 Evaluation Summary

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5 GROUP 2 – FLEXIBLES/UMBILICALS TRENCHED AND BURIED

5.1 Group 2 Characteristics

The items that make up Group 2 and their key characteristics are listed in Table 5-1.

ID	Description	OD (inches)	Length (km)
PL2052	6" Banff Gas Lift / Injection Flowline, Gas Lift / Injection Riser base to Gas Lift / Injection Manifold	6	1.800
PLU1552 1-2	Umbilical (Hydraulic / Chemical), FPSO TUTU to Banff Manifold	N/A	1.990
PLU1553, PLU1554.1-7	Umbilical (Hydraulic / Chemical), DUTA to Banff Manifold	N/A	1.625
PL1661.1-22	Kyle Umbilical (Electrical / Hydraulic / Chemical), DUTA to Well K14	N/A	11.926
PLU3117	Kyle Umbilical (Electrical / Chemical), Kyle SSIV to North Kyle SDU / SAM	N/A	12.292
PL1799.1-8	Main Kyle Umbilical, Kyle North SDU/SAM to Kyle South SDU	N/A	3.607
PL1800	Curlew Control Umbilical	N/A	17.55

Table 5-1: Group 2 Items

5.2 Group 2 Decommissioning Options & Screening Outcome

During the Screening Phase, all potential decommissioning options were assessed against the Safety, Environmental, Technical, Societal and Economic criteria using a coarse, red / amber / green methodology. The assessment performed and the outcomes are detailed fully in the CA Screening Report ref. [3] and summarised in Table 5-2.

Group 2 – Flexibles/Umbilicals Trenched and Buried			
Category	Option	Description	Discussion
Re-use	1 – Re-use	- Leave lines in-situ for use in any potential new developments	Ruled out as a show stopper as no potential re-use in-situ options for these lines.
Full removal	2a – Cut and lift w ith de- burial	 Lines will be disconnected De-burial of lines using MFE Note 1 Recover by cutting into sections and removal 	Considered a more onerous full removal option than the more efficient reverse reeling operations in Option 2b.
	2b – Reverse Installation (Reeling) w ithout de- burial	Lines will be disconnected No de-burial prior to removal Recover by reverse reeling	Retained as the least onerous and credible Full Removal option as integrity of the lines expected to be sufficient to allow reverse reeling without de-burial.
	2c – Reverse Installation (Reeling) with de-burial	Lines will be disconnected De-burial of lines using MFE Note 1 Recover by reverse s-lay	Considered a more onerous full removal option than Option 2b due to the inclusion of de-burial prior to reverse reeling.

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	Group 2 – Flexibles/Umbilicals Trenched and Buried			
Category	Option	Description	Discussion	
Leave in-situ	3a – Rock placement over entire line	 Lines will be disconnected Rock placement over full length of lines to address areas of spans, exposure & shallow burial No recovery of lines 	Ruled out as a technical show stopper as there are insufficient areas of spans, exposure or shallow burial to justify fully rock covering line already fully buried.	
(major intervention)	3b – Retrench and bury entire line	 Lines will be disconnected Re-trench and backfill full length of lines to remove areas of spans, exposure & shallow burial depth No recovery of lines No introduction of new material 	Ruled out as a technical show stopper as there are insufficient areas of spans, exposure or shallow burial to justify trenching line already fully buried.	
	4a – Rock placement over exposures	 Lines will be disconnected Removal and recovery of surface laid sections out with existing trench Note 2 Rock placement to remediate snag risk from cut ends Rock placement at all areas of spans, exposure and shallow burial depth Note 3 	Retained as a viable leave insitu option and should be evaluated.	
Leave in-situ (minor intervention)	4b – Trench & bury exposures	 Lines will be disconnected Removal and recovery of surface laid sections out with existing trench Rock placement to remediate snag risk from cut ends Trench / bury areas of spans, exposure and shallow burial depth Note 3 Minimal introduction of new material 	Ruled out as a technical show stopper due to the technical challenges associated with trenching lines due to geotechnical conditions in this area (stiff clays).	
	4c – Remove exposures	 Lines will be disconnected Removal and recovery of surface laid sections out with existing trench Rock placement to remediate snag risk from cut ends Removal of areas of spans, exposure and shallow burial depth using cut and lift techniques, including de-burial where required Note 3 	Ruled out as a technical show stopper as there are no areas of spans, exposure or shallow burial. As there are no areas to address, this option becomes the same as Option 5.	
	4d – Accelerated decomposition	 Lines will be disconnected Removal and recovery of surface laid sections out with existing trench Rock placement to remediate snag risk from cut ends Introduce material / techniques to accelerate the decomposition process Potential options include reverse polarity CP, Sulphate Reducing Bacteria (SRBs), chemicals, etc. 	Ruled out as a technical show stopper as accelerated decomposition not a viable solution for flexible flow lines / umbilicals due to their construction.	
Leave in-situ (minimal intervention)	5 – Remove ends and remediate snag risk	 Lines will be disconnected Removal and recovery of surface laid sections out with existing trench Rock placement to remediate snag risk from cut ends 	As there are no areas of spans, exposure or shallow burial, removing the ends of the line out with the trench presents a leave in-situ option that should be evaluated.	

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Group 2 – Flexibles/Umbilicals Trenched and Buried			
Category	Option	Description	Discussion
Leave in-situ (do nothing)	6 – Leave as- is	 There will be no planned subsea intervention Appropriate legislative considerations shall be addressed and any advisory zones implemented for remaining subsea infrastructure 	Ruled out as a safety show stopper due to the sections of line out with the trench leaving an unacceptable potential snagging risk.

Table 5-2: Group 2 Decommissioning Options and Screening Summary

Note 1: After Screening, the project team shared historical issues regarding the geotechnical conditions in the area. The seabed conditions of stiff clays are such that de-burial by MFE is unlikely to be successful as experienced during previous remediation activities in this area. As such, all de-burial operations for retained options were modified to be excavation using bucket excavator rather than using MFE.

Note 2: After Screening, the rock cover option was adjusted to include rock cover of surface laid portions of line ends out with existing trench. This aligns with the approach executed by CNRI during the Murchison decommissioning programme.

Note 3: During the burial status review conducted as part of the Preparation phase, there were no areas of spans or exposure identified for the lines within this group.

5.3 Group 2 Decommissioning Options for Evaluation

The decommissioning options for Group 2 remaining after screening and taken forward to evaluation are:

- > Full Removal
 - 2b Reverse Installation (Reeling) without de-burial
- Leave in-situ (minor intervention)
 - 4a Rock placement over areas of spans, exposures and shallow burial
- > Leave in-situ (minimal intervention)
 - 5 Remove ends & remediate snag risk

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Group 2 - Flexibles/Umbilicals Trenched and Buried

5.4 Group 2 Evaluation Summary

Note: for full attributes tables and assessment see Appendix D Option 4a is assessed as being the preferred option from a safety perspective. Option 4a is preferred from a risk exposure to Operations Personnel perspective. This is due to the shorter durations associated with the offshore scope to rock cover the line ends compared to the other options and there being no offshore

associated with the offshore scope to rock cover the line ends compared to the other options and there being no offshore lifting associated with the rock cover option. It is also preferred from an onshore risk exposure perspective as the re is no material returned for processing.

Option 2b is preferred to the other options in the Legacy Risk criterion due to the line being fully removed (albeit with two under crossings remaining). The difference in risk profile between Option 2b and the partial removal options is assessed as minimal as the remaining lines are rock covered or trenched and buried along their entire lengths.

Option 5 is assessed as being the preferred option from an environmental perspective.

Option 4a and 5 are equally preferred over Option 2b from an Operational Marine Impact perspective due to the cumulative impact of releases from reverse reeling the lines in Option 2a. These releases would have a low environmental impact as the lines will be flushed and cleaned to best endeavours however, they would be released in one location when reverse reeling. Additionally, the Banff Umbilical (PLU1554) and the Kyle Umbilical (PL1661) have blocked cores containing Scale Inhibitor (RX-6034 - 62 litres) and Wax Inhibitor (RX-2099 - 2,509 litres, RX-7020 - 12 litres and RX-7014 - 1,138 litres) which cannot be flushed and cleaned. The releases of the contents of these lines will have the greatest environmental impact.

All options are equally preferred from an Atmospheric Emissions perspective as the fuel use and atmospheric emissions are largely similar across all options.

Option 5 is preferred with respect to Seabed Disturbance as the full removal option results in a large area of seabed disturbance from reverse reeling the lines. The impact is reduced as the reverse reeling is performed by pulling the lines through the existing cover. The rock cover option is less preferred due to the introduction of additional rock cover, resulting in permanenthabitat change.

Option 2b is preferred from a Legacy Marine Impacts perspective as there is limited legacy marine impact as the lines are removed (although two under crossings will remain in-situ). The Legacy Marine Impact from the lines left in-situ, while less preferred to the full removal option, are expected to be minimal as lines are flushed and cleaned to best endeavours (with the exception of the blocked cores) and any releases / degradation products will occur over a long time frame and over a wide area.

Option 4a and Option 5 are assessed as being equally preferred from a technical perspective.

All options are considered technically feasible as they use largely routine approaches and are equally preferred from a Technical Feasibility perspective.

Option 2b is marginally less preferred from an Ease of Recovery from Excursion perspective due to the challenges associated with finding and connecting to the buried line end after any unplanned excursion.

All options were assessed as being equally preferred from a Use of Proven Technology and Equipment perspective, again due to the use of routine operations/equipment.

Option 2b is assessed as being the preferred option from a societal perspective.

With respect to Societal impact on Fishing, Option 2b is preferred as this presents a clear seabed for future fishing operations. Option 4a introduces additional rock berms and Option 5 leaves the lines in -situ albeit fully trenched and buried.

The Socio-economic Impactson Communities and Ammeneties for all options were considered largely balanced as, while there is more useful, recyclable material (steel, copper) returned in the full removal option, there is also the polymers from the flexible flowlines and umbilicals returned which are likely to go to landfill.

Option 4a is assessed as being the preferred option from an economic pespective.

From a short-term cost perspective, Option 4a is preferred as it is less than half the cost of the next lowest cost option (Option 5). The full removal option is more than seven times more expensive.

For long-term costs, the legacy costs associated with monitoring, surveying and managing potential snag hazards for all options are similar and equally preferred.

Option 4a was preferred (or equally preferred) against the Safety, and Technical criteria. It was marginally less preferred against the Environmental and Societal criteria, but this was insufficient to offset the strong preference for Option 4a against the Safety criterion.

Once the Economics criterion was considered, this strengthens the preference for Option 4a.

Option 4a – Rock Placement Over Areas of Spans / Exposure / Shallow Burial will form the emerging recommendation for decommissioning Group 2.

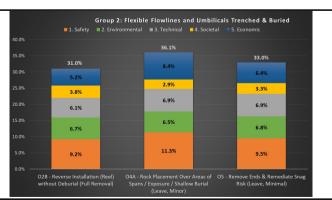


Table 5-3: Group 2 Evaluation Summary

Societal

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6 GROUP 4 - RIGID PIPELINES, TRENCHED AND ROCK COVERED

6.1 Group 4 Characteristics

The items that make up Group 4 and their key characteristics are listed in Table 6-1.

ID	Description	OD (inches)	Length (km)
PL1549	6" Banff Gas Export Pipeline, API Transition Spool to CATS Tie- in	6	6.268
PL2387	4" Kyle Gas Lift Pipeline, Banff Gas Lift / Injection Manifold to Kyle North Gas Lift / Choke Manifold	4	10.252

Table 6-1: Group 4 Items

6.2 Group 4 Decommissioning Options & Screening Outcome

During the Screening Phase, all potential decommissioning options were assessed against the Safety, Environmental, Technical, Societal and Economic criteria using a coarse, red / amber / green methodology. The assessment performed and the outcomes are detailed fully in the CA Screening Report ref. [3] and summarised in Table 6-2.

Group 4 – Rigid Pipelines, Trenched and Rock Covered			
Category	Option	Description	Discussion
Re-use	1 – Re-use	- Leave lines in-situ for use in any potential new developments	Ruled out as a show stopper as no potential re-use in-situ options for these lines.
	2a – Cut and lift w ith de- burial	 Pipelines will be disconnected De-burial of pipelines using MFE Note 1 Recover by cutting into sections and removal 	Retained as the least onerous and credible Full Removal option.
Full removal	2b – Reverse Installation (S- lay) w ithout de-burial	Lines will be disconnectedNo de-burial prior to removalRecover by reverse s-lay	Screened out due to concerns regarding the lines having the integrity required to perform reverse installation.
	2c – Reverse Installation (S- lay) with de- burial	 Lines will be disconnected De-burial of line using MFE Note 1 Recover by reverse s-lay 	Screened out due to concerns regarding the lines having the integrity required to perform reverse installation.
Leave in-situ	3a – Rock placement over entire line	 Lines will be disconnected Rock placement over full length of lines to address areas of spans, exposure & shallow burial No recovery of lines 	Ruled out as a technical show stopper as there are insufficient areas of spans, exposure or shallow burial to justify fully rock covering lines already fully buried.
(major intervention))	3b – Retrench and bury entire line	 Line will be disconnected Re-trench and backfill full length of lines to remove areas of spans, exposure & shallow burial depth No recovery of lines No introduction of new material 	Ruled out as a technical show stopper as there are insufficient areas of spans, exposure or shallow burial to justify trenching lines already fully buried.
Leave in-situ (minor intervention)	4a – Rock placement over exposures	 Line will be disconnected Removal and recovery of surface laid sections out with existing trench Note 2 Rock placement to remediate snag risk from cuts ends Rock placement at all areas of spans, exposure and shallow burial depth Note 3 	Retained as a viable leave insitu option and should be evaluated.

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	Group 4 – Rigid Pipelines, Trenched and Rock Covered					
Category	Option	Description	Discussion			
	4b – Trench & bury exposures	 Lines will be disconnected Removal and recovery of surface laid sections out with existing trench Rock placement to remediate snag risk from cut ends Trench / bury areas of spans, exposure and shallow burial depth Note 3 Minimal introduction of new material 	Ruled out as a technical show stopper due to the challenges associated with trenching rock covered lines.			
	4c – Remove exposures	 Line will be disconnected Removal and recovery of surface laid sections out with existing trench Rock placement to remediate snag risk from cut ends Removal of areas of spans, exposure and shallow burial depth using cut and lift techniques, including de-burial where required Note 3 	Ruled out as a technical show stopper as there are no areas of spans, exposure or shallow burial. As there are no areas to address, this option becomes the same as Option 5.			
	4d – Accelerated decomposition	 Line will be disconnected Removal and recovery of surface laid sections out with existing trench Rock placement to remediate snag risk from cut ends Introduce material / techniques to accelerate the decomposition process Potential options include reverse polarity CP, Sulphate Reducing Bacteria (SRBs), chemicals, etc. 	Ruled out as a technical show stopper as accelerated decomposition not a viable solution for polymer coated rigid lines as polymer coating would remain.			
Leave in-situ (minimal intervention)	5 – Remove ends and remediate snag risk	 Line will be disconnected Removal and recovery of surface laid sections out with existing trench Rock placement to remediate snag risk from cut ends 	As there are no areas of spans, exposure or shallow burial, removing the ends of the line out with the trench presents a leave in-situ option that should be evaluated.			
Leave in-situ (do nothing)	6 – Leave as- is	There will be no planned subsea intervention Appropriate legislative considerations shall be addressed, and any advisory zones implemented for remaining subsea infrastructure	Ruled out as a safety show stopper due to the sections of line out with the trench leaving an unacceptable potential snagging risk.			

Table 6-2: Group 4 Decommissioning Options and Screening Summary

Note 1: After Screening, the project team shared historical issues regarding the geotechnical conditions in the area. The seabed conditions of stiff clays are such that de-burial by MFE is unlikely to be successful as experienced during previous remediation activities in this area. As such, all de-burial operations for retained options were modified to be excavation using bucket excavator rather than using MFE.

Note 2: After Screening, the rock cover option was adjusted to include rock cover of surface laid portions of line ends out with existing trench. This aligns with the approach executed by CNRI during the Murchison decommissioning programme.

Note 3: During the burial status review conducted as part of the Preparation phase, there were no areas of spans or exposure identified for the lines within this group.

6.3 Group 4 Decommissioning Options for Evaluation

The decommissioning options for Group 4 remaining after screening and taken forward to evaluation are:

- > Full Removal
 - 2a Cut and lift with de-burial

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> Leave in-situ (minor intervention)

- 4a Rock placement over areas of spans, exposures and shallow burial
- > Leave in-situ (minimal intervention)
 - 5 Remove ends & remediate snag risk

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6.4 Group 4 Evaluation Summary

Group 4 - Rigid Pipelines, Trenched and Rock Covered Note: for full attributes tables and assessment see Appendix E Option 4a is assessed as being the preferred option from a safety perspective. Option 4a is preferred from a risk exposure to Operations Personnel perspective. This is due to the shorter durations associated with the offshore scope to rock cover the line ends compared to the other options and there being no offshore lifting associated with the rock cover option. It is also preferred from an onshore risk exposure perspective as the re is no material returned for processing. Option 2a is preferred to the other options in the Legacy Risk criterion due to the line being fully removed (albeit with an under crossing remaining). The difference in risk profile between Option 2b and the partial removal options is assessed as minimal as the remaining lines are rock covered or trenched and buried along their entire lengths. Option 5 is assessed as being the preferred option from an environmental perspective. Option 4a and 5 are equally preferred over Option 2a from an Operational Marine Impact perspective due to the cumulative impact of releases from cutting the lines into short sections for recovery in Option 2a. These releases would have a low environmental impact as the lines will be flushed and cleaned to best endeavours. Option 2a was also less preferred than the other options due to the noise impact associated with the vessels being onsite for extended offshore durations and the Diamond Wire Cutting (DWC) at the crossing locations although, again the noise impact is assessed as being minimal. Option 2a is less preferred than the other options from an Atmospheric Emissions perspective as the fuel use and atmospheric emissions are higher due to the longer duration offshore operations. Option 5 is preferred with respect to Seabed Disturbance as the full removal option results in a large area of moderate seabed disturbance from the excavation and distribution of the existing rockcover over the lines to gain access for cutting. The rock cover option is less preferred due to the introduction of additional rock cover, resulting in permanent habitat change. Option 2a is preferred from a Legacy Marine Impacts perspective as there is limited legacy marine impact as the lines are removed (although an under crossing will remain in-situ). The Legacy Marine Impact from the lines left in-situ, while less preferred to the full removal option, are expected to be minimal as lines are flushed and cleaned to best endeavours and any releases / degradation products will occur over a long time frame and over a wide area. Option 4a and Option 5 are assessed as being equally preferred from a technical perspective. All options are considered technically feasible as they use largely routine approaches. However, Option 2a was less Technica preferred to the other options due to the challenges associated with excavating the lines (necessary due to geotechnical conditions) to gain accessfor cutting and challenges in remediating the affected area to allow the area to be over-trawlable. All options were assessed as being equally preferred from an Ease of Recovery from Excursion and Use of Proven Technology and Equipment perspective. All options are assessed as being equally preferred from a societal perspective. With respect to Societal impact on Fishing, all options are equally preferred as, while the lines are removed in Option 2a, the lines left in-situ are fully trenched and buried. The rockberms (4 off) introduced in Option 4a were considered insufficient to Societal express a preference. The Socio-economic Impactson Communities and Ammeneties for all options were considered largely balanced as, while there is more useful, recyclable material (steel) returned in the full removal option, there is also the polymer coatings returned which are likely to go to landfill. Option 4a is assessed as being the preferred option from an economic pespective. From a short-term cost perspective, Option 4a is preferred as it is around half the cost of the next lowest cost option (Option 5). The full removal option is more than eighteen times more expensive. For long-term costs, the legacy costs associated with monitoring, surveying and managing potential snag hazards for all options are similar and equally preferred.

Option 4a was preferred (or equally preferred) against the Safety, Technical and Societal criteria. It was marginally less preferred against the Environmental criterion, but this was insufficient to offset the preference against the other criteria.

Once the Economics criterion was considered, this strengthens the preference for Option 4a.

Option 4a – Rock Placement Over Areas of Spans / Exposure / Shallow Burial will form the emerging recommendation for decommissioning Group 4.

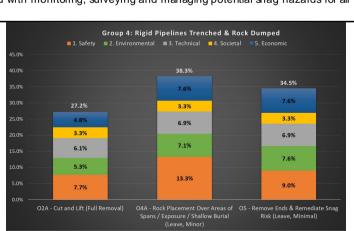


Table 6-3: Group 4 Evaluation Summary

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7 GROUP 8 - MOORINGS PILES AND REMAINING CHAIN

7.1 Group 8 Characteristics

The items that make up Group 8 and their key characteristics are listed in Table 7-1.

Description	OD (mm)	Length (m)
	1,830	A: 28
8 off 1,830 mm diameter, three lengths (A, B and C) steel mooring piles c/w 10 m of mooring chain (max.) each		B: 24
3		C: 30

Table 7-1: Group 8 Items

7.2 Group 8 Decommissioning Options & Screening Outcome

During the Screening Phase, all potential decommissioning options were assessed against the Safety, Environmental, Technical, Societal and Economic criteria using a coarse, red / amber / green methodology. The assessment performed and the outcomes are detailed fully in the CA Screening Report ref. [3] and summarised in Table 7-2.

Group 8 – FSO Mooring Piles and Remaining Chain					
Category	Option	Description	Discussion		
Full removal	2B – Reverse Installation w ithout De- burial	 Dredge around top of pile to provide access for vibro-hammer Vibro-hammer used to extract pile from seabed Recover piles to vessel and return to shore for processing 	Ruled out as a technical show stopper as the capability of vibro-hammer to extract piles of this size is not proven and a significant over-pull of piles is expected to be necessary. Insufficient technical confidence in this technique to carry it through to evaluation		
	2C – Reverse Installation with De- burial	Fully excavate piles using excavator grab Recover piles to vessel and return to shore for processing Back fill excavation with seabed and / or rock	Retained as the most feasible full removal option.		
Leave in-situ (major intervention)	3A – Rock cover exposed piles and chains	- Deploy rock over exposed piles and chain locations via a fall pipe vessel	Option ruled out as the infrastructure is not removed with additional rock installed proud of the surrounding seabed.		
Leave in-situ (minimal intervention)	5 – Leave insitu: Remove below seabed	Dredge out pile internals below seabed Cut piles below seabed using internal pile cutter to a depth to ensure that any remains are unlikely to become uncovered Recover pile top section to vessel Lift, tension and cut remaining chain at the seabed	Retained as a viable leave insitu option and should be evaluated.		
Leave in-situ (minimum intervention)	6 – Leave As-is	There will be no planned subsea intervention Appropriate legislative considerations shall be addressed, and any advisory zones implemented for remaining subsea infrastructure Exposed pile tops and chains will remain unmitigated	Option ruled out as unacceptable from a residual safety perspective.		

Table 7-2: Group 4 Decommissioning Options and Screening Summary

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7.3 Group 8 Decommissioning Options for Evaluation

The decommissioning options for Group 4 remaining after screening and taken forward to evaluation are:

> Full Removal

- 2c Reverse installation with de-burial
- > Leave in-situ (minimal intervention)
 - 5 Leave in-situ: Remove pile below seabed

7.4 Group 8 Evaluation

It should be noted that during the screening phase of the comparative assessment it was clear that performing a full evaluation of Option 2c, where the mooring piles are fully excavated and removed versus Option 5, partial removal below seabed with minimal dredging, using an MCDA approach as per other groups, would not be a justified or efficient use of project resources given the large differences between these options against the majority of criteria. As such, it was deemed appropriate to perform the evaluation using a narrative based method, similar to the approach adopted during screening. This is in keeping with the CA Guidelines, ref. [1] where a lighter approach is acceptable where the assessment and thus the likely outcome is clear.

	Group 8 – Mooring Piles and Remaining Chains					
Evaluation	Safety	Option 5 is assessed as the most preferred option. The method statements developed for each Option demonstrate that the Option 2C will require approximately 50 days to execute, whereas Option 5 is estimated to require approximately 10 days to execute. Thus, the exposure to personnel is 5 times greater for Option 2C. Given the partial removal of the piles below seabed with Option 5, there is not expected to be any material difference between the Options with regards to residual risk. As such, from a safety perspective, Option 5 is most preferred.				
	Environment	Option 5 is assessed as the most preferred option. The extent of excavation required to fully de-bury the piles, Option 2C, is unattractive from a seabed disturbance perspective. Approximately 200,000 m3 of soils requires to be excavated and replaced. Whereas, for Option 5 a relatively small quantity of soils will require to be dredged, mostly internally, to facilitate the pile cutting and removal below seabed. In line with current guidance, any piles will be severed below the natural seabed level at such a depth to ensure that any remains are unlikely to become uncoveredCNRI will aim to achieve a cut depth of 3 m below the natural seabed level, however consideration will be given to the prevailing seabed conditions and currents. Any deviation from this Guidance will be discussed and agreed with OPRED. Mooring chains will be removed to shore From an environmental perspective, Option 5 is most preferred.				
	Technical	Option 5 is assessed as the most preferred option. Both Options involve equipment with good trackrecords. The technical risk associated with Option 2C, full removal and the associated excavation is considerably greater than the partial removal, Option 5. There is a significant risk of Option 2C encountering challenges that prolong the operation compared to Option 5. That said, Option 5 is not without technical risk. It may not be possible to excavate the pile internal sufficiently below seabed to allow for the pile internal cutting tool to reach target depth in all cases. In balance, Option 5 is preferred from a Technical perspective.				
	Societal	Option 2C is assessed as the most preferred option. The only difference between the Options from a Societal perspective is the quantity of material returned to shore. There is more recyclable material returned to shore with Option 2C. There is not expected to be any land fill requirement with either Option. There is no difference between the Options with regard to commercial fishing operations. From a Societal perspective Option 2C is preferred.				
	Economi	Option 5 is assessed as the most preferred option. The Option 2C operation is estimated to cost approximately £ 9.24M versus £ 1.74M for Option 5. Post decommissioning monitoring is assumed to not be required for Option 5. Option 5 is preferred from an economic perspective.				
	Sum	Option 5 is assessed as the most preferred option. In summary, Option 5 is the clear preference. The only criterion where Option 2C is preferred is Societal and that is a relatively marginal preference.				

Table 7-3: Group 8 Evaluation Summary

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8 RECOMMENDATIONS

The outcomes obtained from performing the comparative assessment of the decommissioning groups and decommissioning options for the Banff & Kyle subsea infrastructure are summarised here.

There were several groups where full removal was the recommended decommissioning approach without any further comparative assessment. These are:

- > Group 3 Flexibles/Umbilicals, Surface Laid
- Group 5 Spools and Jumpers
- > Group 6 Subsea Installations (Structures)
- > Group 7 Protection / Stabilisation

There was one group where full removal was already completed with remediation of the remaining seabed scour recommended.

Group 9 – FPSO Moorings and Associated Scour

The full comparative assessment process was applied to the remaining decommissioning groups (1, 2, 4 and 8). The recommended decommissioning options for these groups follow below.

8.1 Group 1 Recommendations

The recommended decommissioning option for Group 1 – Rigid Pipelines, Trenched and Buried is:

- > Option 4a Rock Placement Over Areas of Spans / Exposure / Shallow Burial
 - Pipelines will be disconnected
 - Rock placement over surface laid sections of lines out with existing trench
 - Rock placement at all areas of spans and exposure

The following sections provide a summary of the evaluation of the four most viable Group 1 decommissioning options (Option 2c, Option 4a, Option 4c and Option 5) against the five criteria and why this recommendation has been made.

8.1.1 Safety

Option 4a has the lowest risk exposure of all options for operations personnel. This is due to the short offs hore durations associated with the scope to rock cover the line ends and limited areas of spans and exposure when compared to the other options, particularly the full removal option which requires the use of divers to support the cutting operations at an under crossing location. It also has the lowest onshore risk exposure as no material is returned for processing. There is also the lowest potential for high consequence events due to there being no offshore lifting associated with this option.

The full removal option was preferred from a legacy risk perspective, however while Option 4a leaves the lines in-situ, they are trenched and rock covered, or surface laid and rock covered over their entire length. Additionally, there is a commitment to survey and monitor the lines to ensure any future snag risk is managed.

Overall, there is a preference for Option 4a from a Safety perspective.

8.1.2 Environment

All partial removal options are marginally preferred to the full removal option from an Operational Marine Impact perspective. This is due to the increased releases from cutting the lines into sections and the greater noise impact from extended vessel operations on-site and the DWC of the lines at crossing locations in the full removal option. It is noted that these impacts are expected to be low, hence the small preference for the other options.

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The partial removal options are also marginally preferred to the full removal option from an Atmospheric Emissions, Fuel Use and Other Consumptions perspective due to the increased emissions from the extended offshore scope in the full removal option. Again, the impact is expected to be low hence the small preference for the other options.

From a Seabed Disturbance perspective, the full removal Option was the least preferred due to the large area of significant impact caused by the excavation of the lines prior to removal by cut and lift. This was followed by the rock cover option due to the smaller area of impact, although this is permanent in nature. The remaining options were equally preferred due to the minimal areas of low impact seabed disturbance. It is noted that the only line in this group that is within the East of Gannet & Montrose Marine Protected Area is PL1550 which is a 1.2 km line and only represents a small portion (total group line length around 49km) of the seabed disturbance in all options and is therefore not dominant in the assessment made.

It is recognised that the full removal option is preferred from a legacy environmental impact perspective, however, the legacy impact from the lines remaining in-situ in the other options is expected to be low due to the lines being flushed and cleaned prior to decommissioning and any residual contents or degradation products being released in small quantities over a long time period.

Overall, there is a small preference for Option 4c and Option 5 ahead of Option 4a with Option 2a being least preferred from an Environmental perspective.

8.1.3 Technical

All partial removal options were equally preferred over the full removal option from a Technical Feasibility perspective. While the operations for all options are considered feasible, there are challenges associated with the scale of the excavation required to gain access to the lines for removal by cut and lift. There are also challenges associated with remediating the excavation to return the seabed to an overtrawlable condition due to the geotechnical conditions of stiff clays in this area.

All other technical considerations such as Ease of Recovery from Excursion and Use of Proven Technology were considered similar across all options.

Overall, there is an equal preference for Option 4a, Option 4c and Option 5 over the full removal option from a Technical perspective.

8.1.4 Societal

Option 2a and Option 4c were preferred over Option 4a and Option 5 from a Societal – Fishing perspective due to these presenting a clear seabed as the final decommissioning solution. The rock berms and the remaining spans / exposures in Option 4a and Option 5 respectively being less preferred from a fishing operations perspective.

The assessment against the Socio-economic Impact on Amenities and Communities was largely balanced for all options. The key consideration was the societal benefits of returning the steel for recycling in the full removal option, but this was offset by the polymer coatings of the lines which would be likely to be destined for limited landfill capacity.

Overall Option 2a and Option 4c are preferred from a Societal perspective.

8.1.5 Economic

The preferred option from a Short-term Costs perspective was Option 4a as it is four times lower than the next lowest cost option with the full removal option being more than 40 times more expensive.

All options have some residual surveying and monitoring associated with them with the full removal option having two under crossings that will remain until the 3rd party line is removed. All options were considered equally preferred from a Long-term Costs perspective.

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Overall, Option 4a is preferred from an Economic perspective.

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8.2 Group 2 Recommendations

The recommended decommissioning option for Group 2 - Flexibles/Umbilicals Trenched and Buried is:

- > Option 4a Rock Placement Over Areas of Spans / Exposure / Shallow Burial
 - Pipelines will be disconnected
 - Rock placement over surface laid sections of lines out with existing trench

Note: There are no areas of spans or exposure associated with the lines in Group 2.

The following sections provide a summary of the evaluation of the three most viable Group 2 decommissioning options (Option 2b, Option 4a and Option 5) against the five criteria and why this recommendation has been made.

8.2.1 Safety

Option 4a has the lowest risk exposure of all options for operations personnel. This is due to the short offshore durations associated with the scope to rock cover the line ends when compared to the other options, particularly the full removal option which requires the use of divers to support the cutting operations at the under crossing locations (2 off). It also has the lowest onshore risk exposure as no material is returned for processing. There is also the lowest potential for high consequence events due to there being no offshore lifting associated with this option.

The full removal option was preferred from a legacy risk perspective, however, while Option 4a leaves the lines in-situ, they are trenched and buried, or surface laid and rock covered over their entire length. Additionally, there is a commitment to survey and monitor the lines to ensure any future snag risk is managed.

Overall, there is a preference for Option 4a from a Safety perspective.

8.2.2 Environment

All partial removal options are marginally preferred to the full removal option from an Operational Marine Impact perspective. This is due to the increased releases from cutting the lines into sections, particularly from the blocked cores containing small quantities of Wax, Scale and Corrosion Inhibitor, and the greater noise impact from extended vessel operations on-site and the DWC of the lines at crossing locations in the full removal option. It is noted that these impacts are expected to be low, hence the small preference for the other options.

All options are equally preferred from an Atmospheric Emissions, Fuel Use and Other Consumptions as, while there are differences in the fuel use and emissions across the options, these differences were considered insufficient to express a preference.

From a Seabed Disturbance perspective, Option 4a was least preferred due to the area of permanent habitat change from the rock cover over the line ends. Option 2b was next, with the large area of seabed impact being considered short-term and temporary in nature as it is caused by reverse reeling these lines through the existing cover. The preferred option was Option 5 where recovering the line ends only, had the lowest impact on the seabed.

It is recognised that the full removal option is preferred from a legacy environmental impact perspective, however, the legacy impact from the lines remaining in-situ in the other options is expected to be low due to the lines being flushed and cleaned prior to decommissioning and any residual contents or degradation products being released over a long time period. It is noted that the blocked cores result in small residual quantities of Wax, Scale and Corrosion Inhibitor, however the legacy environmental impact of these remain low.

Overall, there is a small preference for Option 5 ahead of Option 2b with Option 4a being least preferred from an Environmental perspective.

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8.2.3 Technical

All options employ largely routine operations and were considered equally preferred from a Technical Feasibility and Use of Proven Technology perspective.

When considering the Ease of Recovery from Excursion criterion, it was recognised that there would be challenges associated with locating and reconnecting to the line end in the full removal by reverse reeling option after an unplanned excursion.

Overall, there is an equal preference for Option 4a and Option 5 over the full removal option from a Technical perspective.

8.2.4 Societal

Option 2b was preferred over Option 4a and Option 5 from a Societal – Fishing perspective due it presenting a clear seabed as the final decommissioning solution. Option 5 was preferred over Option 4a due to the rock berms introduced over the line ends in Option 4a.

The assessment against the Socio-economic Impact on Amenities and Communities was largely balanced for all options. The key consideration was the societal benefits of returning the steel and copper for recycling in the full removal option but this was offset by the polymer coatings / packers of the lines which would be likely to be destined for limited landfill capacity.

Overall Option 2b is preferred from a Societal perspective.

8.2.5 Economic

The preferred option from a Short-term Costs perspective was Option 4a as it is less than half the cost of the next lowest cost option with the full removal option being more than seven times more expensive.

All options have some residual surveying and monitoring associated with them, with the full removal option having under crossings (2 off) that will remain until the 3rd party line is removed. All options were considered equally preferred from a Long-term Costs perspective.

Overall, Option 4a is preferred from an Economic perspective.

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8.3 Group 4 Recommendations

The recommended decommissioning option for Group 4 - Rigid Pipelines, Trenched and Rock Covered is:

- > Option 4a Rock Placement Over Areas of Spans / Exposure / Shallow Burial
 - Pipelines will be disconnected
 - Rock placement over surface laid sections of lines out with existing trench

Note: There are no areas of spans or exposure associated with the lines in Group 4.

The following sections provide a summary of the evaluation of the three most viable Group 4 decommissioning options (Option 2a, Option 4a and Option 5) against the five criteria and why this recommendation has been made.

8.3.1 Safety

Option 4a has the lowest risk exposure of all options for operations personnel. This is due to the short offshore durations associated with the scope to rock cover the line ends when compared to the other options, particularly the full removal option which requires the use of divers to support the cutting operations at an under crossing location. It also has the lowest onshore risk exposure as no material is returned for processing. There is also the lowest potential for high consequence events due to there being no offshore lifting associated with this option.

The full removal option was preferred from a legacy risk perspective, however while Option 4a leaves the lines in-situ, they are trenched and rock covered, or surface laid and rock covered over their entire length. Additionally, there is a commitment to survey and monitor the lines to ensure any future snag risk is managed.

Overall, there is a preference for Option 4a from a Safety perspective.

8.3.2 Environment

All partial removal options are marginally preferred to the full removal option from an Operational Marine Impact perspective. This is due to the increased releases from cutting the lines into sections and the greater noise impact from extended vessel operations on-site and the DWC of the lines at crossing locations in the full removal option. It is noted that these impacts are expected to be low, hence the small preference for the other options.

The partial removal options are also marginally preferred to the full removal option from an Atmospheric Emissions, Fuel Use and Other Consumptions perspective due to the increased emissions from the extended offshore scope in the full removal option. Again, the impact is expected to be low hence the small preference for the other options.

From a Seabed Disturbance perspective, the full removal Option was the least preferred due to the large area of significant impact caused by the excavation and distribution of the existing rock cover over the lines prior to removal by cut and lift. This was followed by the rock cover option due to the smaller area of impact, although this is permanent in nature. The remaining option of recovering the line ends only was preferred due to the minimal area of low impact seabed disturbance.

It is recognised that the full removal option is preferred from a legacy environmental impact perspective, however, the legacy impact from the lines remaining in-situ in the other options is expected to be low due to the lines being flushed and cleaned prior to decommissioning and any residual contents or degradation products being released over a long time period.

Overall, there is a small preference for Option 5 ahead of Option 4a with Option 2a being least preferred from an Environmental perspective.

8.3.3 Technical

All partial removal options were equally preferred over the full removal option from a Technical Feasibility perspective. While the operations for all options are considered feasible, there are challenges associated with

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the scale of the excavation required to gain access to the lines for removal by cut and lift. There are also challenges associated with remediating the excavation to return the seabed to an overtrawlable condition as the trenches are back filled with rock which would be dispersed following excavation.

All other technical considerations such as Ease of Recovery from Excursion and Use of Proven Technology were considered similar across all options.

Overall, there is an equal preference for Option 4a and Option 5 over the full removal option from a Technical perspective.

8.3.4 Societal

All options were equally preferred from a Societal – Fishing perspective as, while Option 2a and Option 5 both present a clear seabed as the final decommissioning solution, the introduction of four small rock berms in Option 4a was considered insufficient to express a preference for the other options.

The assessment against the Socio-economic Impact on Amenities and Communities was largely balanced for all options. The key consideration was the societal benefits of returning the steel for recycling in the full removal option, but this was offset by the polymer coatings of the lines which would be likely to be destined for limited landfill capacity.

Overall, all options are equally preferred from a Societal perspective.

8.3.5 Economic

Option 4a and Option 5 are equally preferred option from a Short-term Costs perspective as, while Option 5 is double the cost of Option 4a, the low cost of both options resulted in both options being equally preferred. The full removal option is more than 18 times more expensive than Option 4a.

All options have some residual surveying and monitoring associated with them with the full removal option having two over crossings remaining until the 3rd party line is removed. All options were considered equally preferred from a Long-term Costs perspective.

Overall, Option 4a is preferred from an Economic perspective.

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8.4 Group 8 Recommendations

The recommended decommissioning option for Group 8 – FSO Mooring Piles and Remaining Chain is:

- Option 5 Partial Removal of the Piles
 - Dredge piles internally;
 - Install internal pile cutting tools and cut piles to a depth to ensure that any remains are unlikely to become uncovered;
 - Recover upper section of piles to surface and replace dredged soils into remaining holes.

The following sections provide a summary of the evaluation of the two most viable Group 8 decommissioning options (Option 2C and Option 5) against the five criteria and why this recommendation has been made.

8.4.1 Safety

Option 5 has the lowest risk exposure of the options for operations personnel. This is due to the shorter offshore durations associated with the scope to partially remove the piles to a depth to ensure that any remains are unlikely to become uncovered, versus the full removal option which requires a considerable amount of excavation to access the full length of each pile. It also has the lowest onshore risk exposure as less material is returned for processing. There is also the lowest potential for high consequence events as there is less weight to recover from each pile with this option.

There is no difference between the options from a legacy risk perspective.

Overall, there is a preference for Option 5 from a Safety perspective.

8.4.2 Environment

From both vessel duration on site and seabed disturbance perspectives the full removal case is considerably less favourable to the partial removal case. The quantity of excavation required to fully de-bury the piles is calculated as approximately 200,000 m³ and this equates to approximately 10,000 m² of seabed disturbance. As the piles are located within the East of Gannet & Montrose MPA this amount of disturbance would be significantly less preferred.

The duration on site to conduct the full removal is estimated as at least three times as long as the partial removal option, resulting in three times as much fuel use, vessel discharges and gaseous emissions.

Overall, the preference for Option 5 is clear.

8.4.3 Technical

The difference between full removal and partial removal options from a technical perspective comes down to the overall complexity of the tasks. Both options involve equipment with comparable track records. The technical risk associated with Option 2C, full removal and the associated excavation is considerably greater than the partial removal, Option 5 as there is a significant risk of Option 2C encountering challenges that prolong the operation compared to Option 5. The technical risk associated with Option 5 is associated with the ability to excavate the pile internals sufficiently below seabed to allow for the pile internal cutting tool to reach a depth at which the piles will not become exposed. If this was not achievable the alternative would be to externally excavate the pile and cut externally.

On balance, Option 5 is preferred from a Technical perspective.

8.4.4 Societal

Both options were equally preferred from a fishing perspective, both should result in a clear seabed following remediation.

The only difference between the options from a societal perspective is the quantity of material returned to shore. There is more recyclable material returned to shore with Option 2C. There is not expected to be any land fill requirement with either option as the piles are steel.

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From a Societal perspective there is a slight preference for Option 2C.

8.4.5 Economic

From a short term cost perspective, Option 5 is preferred over Option 2C as it represents a fifth of the cost.

Long term costs are associated with post decommissioning monitoring and remediation. There is not expected to be a requirement for post decommissioning monitoring with the partial removal option as the target depth of cut, 3.0 m below seabed, is in line with no requirement for monitoring of other pile / well conductor removed to 3.0 below seabed. Should it be found that post decommissioning monitoring is required for a period, it would not cost enough to overturn the preference for Option 5, partial removal.

Option 5 is preferred from an economic perspective.

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Project: P0009

Document Title: Report - Banff & Kyle Phase 2 & 3 Decommissioning Support - Comparative Assessment Report

APPENDIX A EVALUATION METHODOLOGY

Appendix A.1 CA Evaluation Methodology

CNRI has selected a Multi Criteria Decision Analysis (MCDA) methodology for the evaluation phase of the CA. This methodology uses a pairwise comparison system based on the methodologies of the Analytical Hierarchy Process (AHP) by T.L. Saaty, described in various publications, such as Analytical Hierarchy Process ref. [5]. This allows the relative importance of each differentiating criteria to be judged against each other in a qualitative way, supported by quantification where appropriate. The key steps for the evaluation phase of the CA are as follows:

- > Define Differentiating Criteria this was completed in Q3 2020 and listed in Appendix A.2
- > Define Options completed as part of CA Screening;
- > Pre-populate worksheets for internal CA workshops based on all the studies undertaken the worksheets were pre-populated in advance of the internal CA workshops;
- Perform internal CA workshop;
- Discuss attributes of each option against each differentiating criteria the discussion was recorded 'live' during the workshop in order that informed opinion and experience was factored into the decision-making process;
- > Perform scoring (see Section Appendix A.5);
- > Perform sensitivity analyses to test the decision outcomes;
- > Export worksheets as a formal record of the workshop attendees' combined opinion on the current preferred options, the 'Emerging Recommendations';
- > Evaluate whether the CA needs to 'recycle' to the Preparation phase to obtain any further information to help inform decision making;
- > Discuss Emerging Recommendations with stakeholders (November 2020); and
- > Recycle process as required prior to decision on the selected options which will be presented in the Decommissioning Programme and assessed in the Environmental Impact Assessment.

The sections below describe how the MCDA methodology has been applied.

Appendix A.2 Differentiating Criteria & Approach to Assessment

A key step in setting up the CA was agreeing and defining the appropriate criteria that differentiates between each of the tabled options. As a starting point, the criteria considered for this CA were taken from the BEIS Guidelines for Decommissioning of Offshore Oil and Gas Installations and Pipelines [2] which are as follows:

> Safety

> Technical

Environmental

> Societal

> Economic

These differentiating criteria were found to be appropriate for the decommissioning options tabled and were taken forward as the primary differentiating criteria for the CA. Additional sub-criteria and definitions were added for clarity and are shown in Figure 8.1.

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Criteria	Sub-Criteria	Description	Approach to Assessment
1. Safety	1.1 Operations Personnel	This sub-criterion considers elements that impact risk to offshore personnel and includes, project teams, project vessel crews, diving teams, and survey vessel crews. This sub-criterion also considers elements that impact risk to onshore personnel and includes, dismantling, recycling or disposal operations, material transfer, and onshore handling. Any requirement for handling HazMat / NORM shall also be addressed here. This sub-criterion also includes any inherent potential for high consequence events i.e. major accident hazard type events. It applies to all onshore and offshore personnel involved in the project. Considerations such as lifting operations, dropped object, operational vessel collision risks and back of deck working may be considered.	Quantitative data is used to compare the decommissioning options against this criterion. Potential for Loss of Life (PLL) metrics are calculated based on the Fatal Accident Rate (FAR) x Hours of Exposure for each of the worker groups and is considered a suitable metric for Comparative Assessment purposes. The FAR is taken from the summary report of the Joint Industry Project investigating the Risk Analysis into Decommissioning Activities issued by Safetec [4]. The Hours of Exposure is taken from the various studies / method statements developed to define the decommissioning options. A narrative of the potential for High Consequence Events is provided to allow a qualitative comparison.
	1.2 Legacy Risk	This sub-criterion addresses residual safety risk to other sea users i.e. fishermen, military vessel crews, commercial vessel crews and passengers, other sea users, that is provided by the option. Issues such as residual snag risk, collision risk, etc. may be considered. Legacy safety impact from survey and monitoring activities also considered.	Informed by expert judgment upon the understanding of the operations associated with the decommissioning options. Legacy risk informed by an assessment of the fishing operations conducted in the area of interest and the knowledge of the burial status of the lines being assessed. Survey & monitoring impact uses calculated PLLs as per 1.1.



Criteria	Sub-Criteria	Description	Approach to Assessment
	2.1 Operational Marine Impact	This sub-criterion addresses the marine environmental impact caused by performing the decommissioning option. Covers both planned impacts (inherent to the option being assessed) and potential unplanned impacts (accidental releases, both large and small in scale and encompassing Major Environmental Incidents (MEIs)). Impacts may be from Project Vessels, Supply Boats, Survey vessels, etc. Examples include; Noise generated by vessels, cutting operations, any explosives, etc., discharges from vessels and from removing infrastructure such as residual pipeline contents.	Planned and unplanned marine impacts are narrative judgement informed by estimates of volumes / composition of any releases. Impacts from vessels are qualitative in nature. Marine noise impact is a qualitative judgement informed by the vessel durations, subsea cutting operations and other operations that generate marine noise.
2. Environmental	2.2 Atmospheric Emissions & Fuel Consumption	This sub-criterion addresses the atmospheric emissions, fuel consumption and energy consumption from performing the decommissioning option. This may be from Project Vessels, Survey vessels, etc. Impacts may be greenhouse gas emissions such as CO ₂ , NO _x , SO ₂ , etc. Fuel and energy consumption are included and are tightly correlated to atmospheric emissions. Energy / emissions / resource consumption required to replace materials not recovered for re-use or recycling is also covered.	Fuel use, emissions and energy consumption are calculated for vessel operations using IP 2000 ref. [7] factors for decommissioning of offshore structures. Emissions and energy associated with recycling of recovered materials and replacement of material left in situ are also calculated [7]. Fuel use, and emissions are provided in metric tonnes. Energy is provided in joules.
	2.3 Seabed Disturbance	This sub-criterion addresses the direct and indirect seabed disturbance caused by performing the decommissioning option. Impacts that are both permanent and temporary in nature are considered. The level of impact caused and any specific seabed concerns, such as protected areas or habitat changes may be covered.	Assessment based on quantifying the area of disturbance and by type of disturbance (dredging, rock dump, trenching, backfilling, mass flow excavation) in combination with an understanding of the baseline environment in the area as shown by the outputs from the environmental surveys.
	2.4 Legacy Marine Impacts	This sub-criterion addresses the marine environmental impact caused after the decommissioning option has been performed. Covers the long-term impact of any infrastructure left in-situ such as release of materials into the marine environment, environmental impact from legacy monitoring and remediation i.e. planned and unplanned releases from vessels, vessel noise, etc. also considered.	Planned and unplanned marine impacts are narrative judgements informed by estimates of volumes / composition of any releases and the duration these may occur over. Impacts from vessels are qualitative in nature.



Criteria	Sub-Criteria	Description	Approach to Assessment
	decommissioning options. Considers potential of	decommissioning option broadly within the timescale / budget / endorsed decommissioning programme.	For all three criteria, assessment is based on definition of the decommissioning option provided in
3. Technical	3.2 Ease of Recovery from Excursion	This sub-criterion addresses the inherent ability for the decommissioning option to recover from any unplanned excursions and complete the option as planned. Consequence of failure to deliver the decommissioning option as planned also considered.	the method statements. Qualitative judgement is provided in areas of feasibility / technical failure / technical challenges / ease of recovery / novelty / track record. Scored 1 – 6 with 1 being most technically feasible
	3.3 Use of Proven Technology and Equipment	This sub-criterion relates to the technical risk associated with any novel equipment, operations or techniques that are inherent to the decommissioning option. Considers Technical Novelty / Track Record / Availability of novel equipment / technology.	and 6 least technically feasible.



Criteria	Sub-Criteria	Description	Approach to Assessment
	4.1 Fishing	This sub-criterion addresses the impact of the option on commercial fishing operations. Type and intensity of fishing operations factored into assessment. It includes consideration of impacts from both the decommissioning activities any residual impacts post decommissioning such as reinstatement of access to area. It addresses commercial impacts as safety impacts are addressed in criteria 1.2.	A qualitative judgement that provides a narrative (rather than quantification) regarding the positive and negative impacts of the decommissioning option on commercial fishing operations. Area of impact in m² may be included. Scored 1 – 6 with 1 being least impactful and 6 most impactful.
4. Societal	4.2 Socio- economic Impacts on Amenities and Communities	This sub-criterion addresses any positive or negative socio-economic impacts on other users, where the impact may be from dismantling, transporting, treating, recycling and land filling activities relating to the decommissioning option. Additionally, Issues such as impact on the health, well-being, standard of living, structure or coherence of communities or amenities are considered here e.g. business or jobs creation, increase in noise, dust or odour pollution during the decommissioning option which has a negative impact on communities, increased traffic disruption due to extra-large transport loads, etc.	Assessment of impact on other users is a qualitative narrative considering both positive and negative impacts of the decommissioning option on waste paths, recycling, employment and general community impacts. Tonnage and types of material returned may be included. Scored 1 – 6 with 1 being least impactful and 6 most impactful.
5. Economic	5.1 Short-term Costs	This sub-criterion addresses the cost of delivering the option as described. No long-term cost element is considered here.	Cost data (£ k)
G. Eddinoria	5.2 Long-term Costs	This sub-criterion addresses the costs associated with any long-term liabilities such as on-going monitoring and any potential future remediation costs.	Cost data (£ k)

Table 8-1: Sub-criteria Definition



Appendix A.3 Differentiator Weighting

The 5 differentiating criteria and associated sub-criteria carry the following weights which reflects CNRIs position to prioritise Safety considerations:

- > 1 Safety [30%]
 - 1.1 Operations Personnel (incl. HCEs) [15%]
 - 1.2 Legacy [15%]
- > 2 Environment [20%]
 - 2.1 Operational Marine Impact [4%]
 - 2.2 Emissions / Fuel / Energy / Other Cons. [8%]
 - 2.3 Seabed (incl. Ops and Legacy) [4%]
 - 2.5 Legacy Marine Impact [4%]
- > 3 Technical [20%]
 - 3.1 Technical Feasibility [6.66%]
 - 3.2 Ease of Recovery from Excursion [6.66%]
 - 3.3 Use of Proven Technology [6.66%]
- > 4 Societal [10%]
 - 4.1 Fishing Industry [5%]
 - 4.2 Socio-economic Impacts [5%]
- > 5 Economics [20%]
 - 5.1 Short-term Costs [10%]
 - 5.2 Long-term Costs [10%]

Appendix A.4 Option Attributes

The next step in the CA process was to describe and discuss the attributes of each option with respect to each of the differentiating criteria. In preparation, all relevant data and information developed during the preparation phase were pre-populated into the attributes table for each option. Appendix C, Appendix D and Appendix E contain the completed Attributes Tables for Groups 1, 2 and 4 respectively.

Any additional discussion around the relative merits of the options was also recorded in the attributes matrix. A summary discussion of why options are considered more or less attractive with respect to each of the differentiating criteria was also recorded. An easy-to-read version of this matrix was supplied to stakeholders as part of the recommendation review process.

Appendix A.5 Option Pair-Wise Comparison

Once the option attributes were compiled and discussed, a pair-wise comparison was performed for each of the differentiating criteria where the proposed options were compared against each other. The pairwise comparison adopted in this case used phrases such as stronger, much stronger, weaker, much weaker, etc. to make qualitative judgements (often based on quantitative data) of the options against each other. Adopting these phrases rather than the more common numerical 'importance scale' from the Analytical Hierarchy Process (AHP) is often more intuitive and representative of the sentiment of a workshop.

One of the challenges of applying the numerical importance scale historically, is that often when scoring a pair of options against each other as a score of 3, delegates implied the comparison was 3 times better, etc. rather than 'slightly better' as the importance scale suggests.

To manage this, CNRI chose to apply the principles of the AHP by replacing numbers in the pairwise comparison matrix with a narrative or descriptive approach. This is already programmed into the AHP in the



importance scale explanations (see Table 8-2). It was agreed that three positions from equal (and their reciprocals) would be sufficient for this CA. These positions were:

Title	Scope	Relative Preference Ratio
Neutral	Equal Importance, equivalent to 1 in the AHP importance scale.	50 / 50
Stronger (S) / Weaker (W)	Moderate importance of one criteria / option over the other, equivalent to 1.5 in the AHP importance scale.	60 / 40
Much Stronger (MS) / Much Weaker (MW)	Essential / strong importance of one criteria / option over the other equivalent to 5 or 6 in the AHP importance scale.	75 / 25
Very Much Stronger (VMS) / Very Much Weaker (VMW)	Extreme importance of one criteria / option over the other equivalent to 8 or 9 in the AHP importance scale.	90 / 10

Table 8-2: Explanation of Phrasing Adopted for Pairwise Comparison

Using this transposed scoring system made it simpler and, more importantly, more effective at capturing the mind-set and feeling of the attendees at the workshops. Phrases such as 'what are the relative merits of pipeline removal on a project versus rock dumping from a safety perspective? Are these Neutral to each other? Are they stronger? If so, how much stronger? If you had to prioritise one over the other, which would it be?' This promoted a collaborative dynamic in the workshop and enabled the collective mind-set of the attendees to be captured. Where there was quantitative data to provide back-up and evidence to support the collective assertions, so much the better.

A summary example of the completed pair-wise comparisons for differentiating criteria versus options are shown in Figure 8.1.

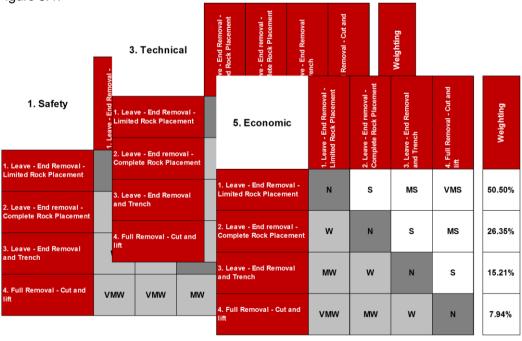


Figure 8.1: Example Option Pair-Wise Comparison



Appendix A.6 Visual Output and Sensitivities

The decision-making tool used the above pairwise comparisons to automatically generate a visual output indicating the highest scoring option i.e. the option which represents the most 'successful' solution in terms of its overall contribution to the set of differentiating criteria. At this stage, opportunity was provided to fine tune the judgements provided, to ensure that all attendees were happy to endorse the outcome. The visual outputs from each decision point are included in Appendix C, Appendix D and Appendix E. An example of the visual output obtained is shown in Figure 8.2.

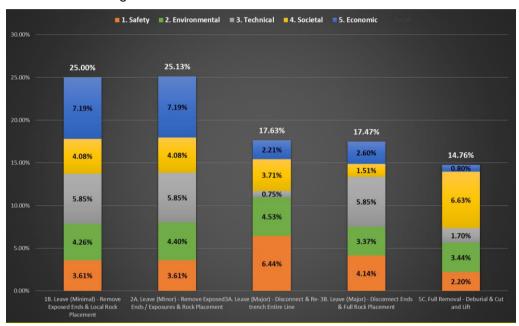


Figure 8.2: CA Visual Output Example

The CA output can then easily be stress tested by the workshop attendees by undertaking a sensitivity analysis:

- > By applying a modification to the weighting of the criteria bearing in mind that the base case for this assessment is to have all criteria equally weighted, and / or
- > Modifying the pair-wise comparison of the options against each other within the criteria where appropriate.

These sensitivities will help inform workshop attendees as to whether a particular aspect is driving a preferred option, or indeed if the preferred option remains the same when the sensitivities are applied.



APPENDIX B STAKEHOLDER CAWORKSHOP MINUTES

Banff & Kyle Decommissioning CA Stakeholder Engagement

Location: Video Conference **Date:** 17th November 2020

Reference: A-400315-S00-MINS-001

Minuted by: Xodus

Issued on: 1st December 2020

Approached for Invitation:

Organisation

The Department for Business, Energy and Industrial Strategy (BEIS) – Offshore Petroleum Regulator for Environment and Decommissioning (OPRED)

The Department for Business, Energy and Industrial Strategy (BEIS) – Environmental Management Team (EMT)

Health and Safety Executive (HSE)

Scottish Fishermen's Federation (SFF)

National Federation of Fishermen's Organisations (NFFO)

Joint Nature Conservation Committee (JNCC)

Dana Petroleum

Premier Oil

Attendina:

Name	Organisation
Claire Thomson	
Helen McArthur	BEIS OPRED ODU
Stewart Welsh	
Julie Cook	BEIS OPRED EMT
Steven Alexander	CEE
Andrew Third	SFF
Bill Chilton	HSE
Stephanie Enz	nse nse
Kerry Langworthy	
David Hennessy	
Stephen Brown	
Jonathan Hoare	CNR International
Peter Ronnie	
Roy Aspden	
Kirsty Lal	

Document Number: A-400315-S00-REPT-001

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Name	Organisation	
Isabelle Pouncey	CNR International	
Sarah Gill	CINIX IIILEITIALIOITAI	
Tom Griffiths	Tookov	
Kenny Ironside	Teekay	
Pieter voor de Poorte	Premier Oil	
Paul Newby	- Premier Oii	
Anne Milne	Dana Petroleum	
Deborah Morgan		
John Foreman	Xodus	
Nic Duncan		

Distribution: Attendees and Invitees

Item	Issue	Action
1.0	Introduction & Presentation	
1.1	The workshop was introduced by CNRI followed by a brief overview of the field history, environmental baseline and relevant infrastructure under consideration. Banff Field	Info
	 Banff FPSO has left the field and is currently located at Loch Kishorn. Banff pipelines and umbilicals have been flushed and cleaned Note 1. Banff subsea wells are shut in and positively isolated. CATS V5 structure is positively isolated from the gas export pipeline (PL1549). 	
	 Kyle pipelines and umbilicals have been flushed and cleaned Note 1. Kyle subsea wells are shut in and positively isolated. Note 1 PL1661 (Kyle) and PLU1552 / PLU1553 / PLU1554 have blocked coresthat were not able to be flushed. 	
2.0	Environmental Baseline	
2.1	The environmental baseline and relevant impacts were described by Xodus Group. Disturbance to the Seabed and Physical Presence being retained with all other impacts scoped out.	Info
	It was also noted that the soils across the site are muddy with clay deposits and minimal seabed mobility.	



Item	Issue	Action
3.0	Comparative Assessment Methodology and Status	
3.1	A synopsis of the CA process conducted to date was provided by Xodus including a summary of the pipeline status assessment conducted.	Info
3.2	CNRI provided an overview of the method statements developed to generate data for the evaluation phase.	Info
3.3	An explanation the operation of the evaluation process to be conducted was provided by Xodus along with a breakdown of the criteria / sub-criteria and associated weightings by CNRI. These weightings are as have been used on the previous three successful decommissioning projects executed by CNRI. For reference a copy of the presentation slides are appended to these minutes.	Info
4.0	Group 1: Rigid Pipelines Trenched & Buried – Evaluation	
4.1	Group 1 includes the following infrastructure: > PL1546, P2 10" Banff Oil Production, 1,546 m > PL1547, P1 10" Banff Oil Production, 1,546 m > PL1548, 10" Water Injection, 1,715 m > PL2388, 4" Gas Lift Pipeline, 3,289 m > PL1550, 12" Banff Oil Export, 1,248 m > PL1798, 12" Curlew Production Pipeline, 17,383 m > PL1660, Kyle 8" Production Pipeline, 12,023 m > PL1797, 8" Production Pipeline, 3,291 m Total length of this group is 42,041 m. There were 23 instances on exposures and spans identified, totalling 345m. None of the spans were FishSafe reportable spans.	Info
4.2	Four options were evaluated for this scope: > Option 2a – Cut and Lift with De-Burial > Option 4a – Rock Placement over Ends / Exposures > Option 4c – Remove Exposures > Option 5 – Remove Ends and Remediate Snag Hazards	Info
4.3	1.0 Safety	
4.3.1	1.1 Operational Personnel – no change to evaluated scores.	Info
4.3.2	1.2 Legacy Risk – no change to evaluated scores.	Info
4.4	2.0 Environmental	
4.4.1	2.1 Operational Marine Impact – no change to evaluated scores.	Info



Item	Issue	Action
4.4.2	2.2 Atmospheric Emissions, Fuel and Energy Consumption – no change to evaluated scores.	Info
4.4.3	2.3 Seabed Disturbance – no change to evaluated scores.	Info
4.4.4	2.4 Legacy Marine Impacts – no change to evaluated scores.	Info
4.5	3.0 Technical	
4.5.1	3.1 Technical Feasibility – no change to evaluated scores.	Info
4.5.2	3.2 Ease of Recovery from Excursion – no change to evaluated scores.	Info
4.5.3	3.3 Use of Proven Technology and Equipment – no change to evaluated scores.	Info
4.6	4.0 Societal	
4.6.1	4.1 Fishing – no change to evaluated scores.	Info
4.6.2	4.2 Socio-Economic – no change to evaluated scores.	Info
4.7	5.0 Economic	
4.7.1	5.1 Short Term Cost – no change to evaluated scores.	Info
4.7.1	5.2 Long Term Cost – no change to evaluated scores.	Info
4.8	Results: Option 4A was determined to be the preferred option. There were no challenges made against any of the previously evaluated scores.	Info
	A query was made regarding whether the creation of additional hard substrate could be at all beneficial. OPRED advised that JNCC would likely clarify that the addition of hard substrate would not be beneficial, and that general preference is to minimise the use of rock.	
	The HSE noted that preference would be to avoid or at least minimise the application of manned diving techniques, however these operations are minimised in this case.	



Item	Issue	Action
5.0	Group 2: Flexible Flowlines & Umbilicals Trenched & Buried – Evaluation	
5.1	Group 2 includes the following infrastructure: > PL2052, 6" Banff Gas Lift/ Injection, 1,800 m > PLU1552, PLU1553, PLU1554.1 –7, Banff Chemical Injection System, Controls and Chemical Umbilical, 1,990 m > PLU3117, Kyle ECI Umbilical (Electrical/ Chemical), 12,292 m > PL1800, Curlew Control Umbilical, 17,550 m > PL1799.1 –19, Main Kyle Umbilical, 3,607 m > PL1661.1 –22, EHC Umbilical, 11,926 m Total length of this group is 49,165 m. There were no instances on exposures and spans identified.	Info
5.2	Three options were evaluated for this scope: > Option 2b – Reverse Reel without De-Burial > Option 4a – Rock Placement over Ends / Exposures > Option 5 – Remove Ends and Remediate Snag Hazards	Info
5.3	1.0 Safety	
5.3.1	1.1 Operational Personnel – no change to evaluated scores.	Info
5.3.2	1.2 Legacy Risk – no change to evaluated scores.	Info
5.4	2.0 Environmental	
5.4.1	2.1 Operational Marine Impact – no change to evaluated scores.	Info
5.4.2	2.2 Atmospheric Emissions, Fuel and Energy Consumption – no change to evaluated scores.	Info
5.4.3	2.3 Seabed Disturbance – no change to evaluated scores.	Info
5.4.4	2.4 Legacy Marine Impacts – no change to evaluated scores.	Info
5.5	3.0 Technical	
5.5.1	3.1 Technical Feasibility – no change to evaluated scores.	Info
5.5.2	3.2 Ease of Recovery from Excursion – no change to evaluated scores.	Info
5.5.3	3.3 Use of Proven Technology and Equipment – no change to evaluated scores.	Info
5.6	4.0 Societal	
5.6.1	4.1 Fishing – no change to evaluated scores.	Info



Item	Issue	Action
5.6.2	4.2 Socio-Economic – no change to evaluated scores.	Info
5.7	5.0 Economic	
5.7.1	5.1 Short Term Cost – no change to evaluated scores.	Info
5.7.2	5.2 Long Term Cost – no change to evaluated scores.	Info
5.8	Results: Option 4A was determined to be the preferred option, although with quite a tight margin.	Info
	OPRED raised a query as to whether criteria weightings were factored in to the results presented. This was confirmed by demonstration, reduction of applied weighting.	
	It was noted that even a slight difference between resultant scores demonstrate a preference.	
	CNRI noted that they had relevant experience with flexible removal from the Murchison decommissioning project and advised that such a close result shall be scrutinised in more detail.	
6.0	Group 4: Rigid Pipelines Trenched & Rock Covered – Evaluation	
6.1	Group 4 includes the following infrastructure:	Info
	 PL2387, 4" Gas Lift Pipeline, 10,252 m PL1549, 6" Banff Gas Export, 6,268 m 	
	Total length of this group is 16,520 m.	
	There were no instances on exposures and spans identified.	
6.2	Three options were evaluated for this scope:	Info
	 Option 2a – Cut and Lift with De-Burial Option 4a – Rock Placement over Ends / Exposures Option 5 – Remove Ends and Remediate Snag Hazards 	
6.3	1.0 Safety	
6.3.1	1.1 Operational Personnel – a challenge was made to the initial score for Option 2a versus Option 4a as it was inconsistent with the same comparison in Group 1. Much Weaker (MW) was changed to Very Much Weaker (VMW). This was accepted by the participants.	Info
6.3.2	1.2 Legacy Risk – no change to evaluated scores.	Info
6.4	2.0 Environmental	
6.4.1	2.1 Operational Marine Impact – no change to evaluated scores.	Info
	<u>l</u>	1



Item	Issue	Action
6.4.2	2.2 Atmospheric Emissions, Fuel and Energy Consumption – no change to evaluated scores.	Info
6.4.3	2.3 Seabed Disturbance – no change to evaluated scores.	Info
6.4.4	2.4 Legacy Marine Impacts – no change to evaluated scores.	Info
6.5	3.0 Technical	
6.5.1	3.1 Technical Feasibility – no change to evaluated scores.	Info
6.5.2	3.2 Ease of Recovery from Excursion – no change to evaluated scores.	Info
6.5.3	3.3 Use of Proven Technology and Equipment – no change to evaluated scores.	Info
6.6	4.0 Societal	
6.6.1	4.1 Fishing – no change to evaluated scores.	Info
6.6.2	4.2 Socio-Economic – no change to evaluated scores.	Info
6.7	5.0 Economic	
6.7.1	5.1 Short Term Cost – no change to evaluated scores.	Info
6.7.2	5.2 Long Term Cost – no change to evaluated scores.	Info
6.8	Results: Option 4A was determined to be the preferred option. There were no comments on the outcome.	Info
7.0	АОВ	
	There were no actions identified.	Info



APPENDIX C GROUP 1 - DETAILED EVALUATION RESULTS

Appendix C.1 Group 1 Attributes Table

	O2A	- Cut and Lift (Full Remo	oval)	O4A - Rock Placement Over Area Burial (Lea		O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)
		using bucket excavator to using hydraulic shears red		Lines already cut / disconnected at a Surface laid sections (out with trenct - Rock placement at all areas of span.)	n) will be rock covered.	Lines already cut / disconnected at ends. Surface laid sections (out with trench) cut into sections using hydraulic shears, recovered to vessel and returned to shore for processing. Removal of areas of spans and exposure using cut and lift techniques (including excavation where required) with hydraulic shears. Rock placement to remediate snag risk from cut ends.	- Lines already cut / disconnected at ends Surface laid sections (out with trench) cut into sections using hydraulic shears, recovered to vessel and returned to shore for processing Rock placement to remediate snag risk from cut ends.
1. Salety . 1.1 Operations Personnel	Resource Type: Days / Hours / PLL Engineering & Management: 3,672.1 / 29,376 / 1.18E-04 Project Management: 3,362.0 / 26,896 / 1.08E-04 Onshore Operations (includes Cleaning & Disposal): 139.0 / 8,896 / 1.08 03		il): 139.0 / 8,896 / 1.09E-	Total operational hours: 2,645 hrs Total operational PLL: 1.32E-04	2 / 1.65E-06 8E-06	Vessel Type: PoB / Days / Hours / PLL CSV: 76 / 24.3 / 22,143 / 1.66E-03 Rockdump Vessel: 20 / 13.4 / 3,216 / 2.41E-04 Total offshore hours: 25,359 hrs Total offshore PLL: 1.90E-03 Resource Type: Days / Hours / PLL Engineering & Management: 348.5 / 2,788 / 1.12E-05 Project Management: 347.0 / 2,776 / 1.11E-05 Onshore Operations (includes Cleaning & Disposal): 5.0 / 320 / 3.94E-05 Total onshore hours: 5,884 hrs Total onshore PLL: 6.16E-05 Total operational hours: 31,244 hrs Total operational PLL: 1.96E-03	Vessel Type: PoB / Days / Hours / PLL CSV: 76 / 21.77 / 19,763 / 1.48E-03 Rockdump Vessel: 20 / 7.2 / 1,721 / 1.29E-04 Total offshore hours: 21,484 hrs Total offshore PLL: 1.61E-03 Resource Type: Days / Hours / PLL Engineering & Management: 320.6 / 2,565 / 1.03E-05 Project Management: 325.0 / 2,660 / 1.04E-05 Project Management: 325.0 / 2,600 / 1.04E-05 Total onshore hours: 5,421 hrs Total onshore PLL: 5.21E-05 Total operational hours: 26,905 hrs Total operational PLL: 1.66E-03
	through water column (29	s. Potential for dropped on the properties. Potential for dropped on the pipeline of the pipel	In addition there is the	Largely routine operations. No potent with this option.	ial for dropped object as no lifting	Largely routine operations. Potential for dropped object from multiple lifts through water column (110 (19 if bundled) lifts). In addition there is the offloading associated with transferring the pipeline to quayside.	Largely routine operations. Potential for dropped object from multiple lifts through water column (75 (13 if bundled) lifts). In addition there is the offloading associated with transferring the pipeline to quayside.
	VMW	MW	MW	MS	MS	W	
Summary	Option 2A is assessed a in Option 4A. Option 2A of divers and much more Option 4A is assessed a vessel in Option 4C and to Option 4C is assessed a	also has potentially thous offshore lifting in Option 2 s being Much Stronger the Option 5.	ter than Option 4A as the sands of lifts through the 2A. Option 2A is also as an both Option 4C and C ion 5 due to a combination.	water column to the vessel whereas the sessed as being Much Weaker than O option 5 as the offshore scope is smalle on of the larger offshore scope and the	ere is no offshore lifting associated vectors, again due to the higher risk er and impacts fewer personnel due to	the use of divers for addressing the under crossing location in Option 2A verwith Option 4A. Option 2A is assessed as being Much Weaker than Option exposure from the greater offshore scope, the use of divers and much more to lower PoB on the Rockdump Vessel versus the CSV. There is also a sign	4C due to the higher risk exposure from the greater offshore scope, the use offshore lifting in Option 2A.

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		O2A	- Cut and Lift (Full Remo	oval)	O4A - Rock Placement Over Area Burial (Lea		O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)			
1. Safety	1.2 Legacy Risk	managed & mitigated as appropriate. The legacy risk associated with this survey and monitoring programme is:			length is trenched and buried as areas covered. Their surface laid line ends op potential snag hazard. The survey & monitoring programme is potential snag hazard from left in-situ	s of spans or exposure will be rock will also be rock covered to mittigate s committed to ensuring that the infrastructure continues to be The legacy risk associated with this	The lines remain in-situ with this option although their entire length is fully trenched and buried as areas of spans or exposure will be removed, as will the surface laid line ends. The survey & monitoring programme is committed to ensuring that the potential snag hazard from left in-situ infrastructure continues to be managed & mitigated as appropriate. The legacy risk associated with this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 16.1 / 8,496 / 6.37E-04	The lines remain in-situ with this option although the majority of their length is trenched and buried as there are minimal areas of spans or exposure (345m total) although these will remain. Their surface laid line ends will be removed. The survey & monitoring programme is committed to ensuring that the potential snag hazard from left in-situ infrastructure continues to be managed & mitigated as appropriate. The legacy risk associated with this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 15.5 / 8,189 / 6.14E-04			
		S	S	MS	W	N	S				
Sur	Option 2A is assessed as being Stronger than Option 4A and Option 4C as the potential for future snag risk is reduced as the lines are removed. Option 2A is assessed as being Much Stronger than Option 5 as there are areas of spans and exposure that will remain in Option 5 which presents a greater legacy salety risk. The crossing that remains in Option 4D due to the introduction of rock berms from rock cover over the line ends and areas of spans and exposures in Option 4A. Option 4A is assessed as Neutral to Option 5 as the rock berms from covering the line ends and areas of spans and exposures (Option 4A) and the remaining areas of spans and exposures (Option 5) were considered largely similar from a legacy risk perspective. Option 4C is assessed as being Weaker than Option 4C cover over the line ends and areas of spans and exposures in Option 4A. Option 4A is assessed as Neutral to Option 5 as the rock berms from covering the line ends and areas of spans and exposures (Option 4A) and the remaining iness of spans and exposures (Option 5 as the rock berms from covering the line ends and areas of spans and exposures (Option 4A) and the remaining iness of spans and exposures (Option 5 as the rock berms from covering the line ends and areas of spans and exposures in Option 4A. Option 4A is assessed as Neutral to Option 5 as the rock berms from covering the line ends and areas of spans and exposures in Option 4A. Option 4A is assessed as Neutral to Option 5 as the rock berms from covering the line ends and areas of spans and exposures in Option 4A. Option 4A is assessed as Neutral to Option 5 as the rock berms from covering the line ends and areas of spans and exposures in Option 4A. Option 4A is assessed as Neutral to Option 5 as the rock berms from covering the line ends and areas of spans and exposures in Option 4A. Option 4A is assessed as Neutral to Option 5 as the rock berms from covering the line ends and areas of spans and exposures in Option 4A. Option 4A is assessed as Neutral to Option 5 as the rock berm										
		Vessel Noise (days on-si 282 days	ite):		Vessel Noise (days on-site): 4 days		Vessel Noise (days on-site): 31 days	Vessel Noise (days on-site): 22 days			
2. Environmental	Tooling noise: 8 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practic (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends and midline cuts would lead to an elevated discharge of fluids from within the line. However, given the prior cleaning of the line, the concentration and quantity of discharge should still be low overall. Therefore, the related impact is also anticipated to be low. Vessel Discharges: This includes Ballast, Grey and Black Water, this is driven by duration of vessel operations and therefore at 282 days it is the highest of the options being evaluated.		o minimise as far as minical levels in line post uring flushing activities. o an elevated discharge for cleaning of the line, d still be low overall. o be low.	Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations (BEP) and the Best Available Techniq possible both residual hydrocarbon an flush and discharges to the marine en Cutting of line ends would lead to an exiting the concentration and quantity of discharg Therefore, the related impact is also a Vessel Discharges: This includes Ballast, Grey and Black	ues (BAT) to minimise as far as id other chemical levels in line post wirroment during flushing activities. elevated discharge of fluids from or cleaning of the line, the pe should still be low overall. inticipated to be low.	Tooling noise: O days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends and midline cuts would lead to an elevated discharge of fluids from within the line. However, given the prior cleaning of the line, the concentration and quantity of discharge should still be low overall. Therefore, the related impact is also anticipated to be low. Vessel Discharges: This includes Ballast, Grey and Black Water, this is driven by duration of vessel operations and therefore at 31 days it is higher than Option 4A, similar to Option 5 and much lower than Option 2A.	Tooling noise: 0 days Operational Discharges:				
		W	W	W	N	N	N				
Sur		Option 2A is assessed a All other options are asse	essed as being Neutral to	partial removal options du each other as the impac		noval options.	nd the noise generated by the extended durations of vessels on site.				

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	024	- Cut and Lift (Full Ren	noval)		as of Spans / Exposure / Shallow		re, O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	
			novary	Burial (Lea	ive, Minor)	Minor)		
⋛	Vessel Emissions (in tor	ines):		Vessel Emissions (in tonnes):		Vessel Emissions (in tonnes):	Vessel Emissions (in tonnes):	
P.	Fuel: 8,070			Fuel: 518		Fuel: 1,264	Fuel: 1,065	
Ē	CO2: 25,581			CO2: 1,642		CO2: 4,007	CO2: 3,375	
•ర	NOx: 479.35			NOx: 30.77		NOx: 75.08	NOx: 63.24	
ᅙ	SO2: 32.28			SO2: 2.07		SO2: 5.06	SO2: 4.26	
Emissions, Fuel & Energy	Vessel Energy Use: 347,	,003 GJ		Vessel Energy Use: 22,277 GJ		Vessel Energy Use: 54,347 GJ	Vessel Energy Use: 45,780 GJ	
sion ptic	Material Emissions (CO2	in tonnes):		Material Emissions (CO2 in tonnes):		Material Emissions (CO2 in tonnes):	Material Emissions (CO2 in tonnes):	
i ii E	Recovered Material: 4,222			Recovered Material:		Recovered Material: 127	Recovered Material: 110	
E E	Remaining Material:			Remaining Material: 7,873		Remaining Material: 7,637	Remaining Material: 7,669	
2. Env 2.2 Atmospheric E Con	Total: 4,222			Total: 7,873		Total: 7,764	Total: 7,779	
e do	Energy Use (in GJ):			Energy Use (in GJ):		Energy Use (in GJ):	Energy Use (in GJ):	
ĕ	Recovered Material: 128,	478		Recovered Material:		Recovered Material: 1,375	Recovered Material: 1,188	
Ę Ę	Remaining Material:			Remaining Material: 104,200		Remaining Material: 101,075	Remaining Material: 101,500	
7	rtomaning material.			Tromaining Matorial: 10 1,200		Tromaining Material. 101,010	Tromaining Material: 101,000	
~	Rock: N/A			Rock: 11,200 tonnes		Rock: 1,344 tonnes	Rock: 384 tonnes	
	W	W	l w	N	N	N		
	The assessment of the A	tmospheric Emissions,	Fuel & Energy Consumpt	ions sub-criterion is as follows:				
	Option 2A is assessed a	s being Weaker than all	partial removal options as	s the emissions generated and fuel / er	ergy consumed are greater than all o	ther options.		
Summary	All other options are asse	essed as being Neutral t	to each other as, while the	ere are differences in the material cons	umed and the emissions generated by	the options, these differences were considered insufficient to express	a preference from an environmental impact perspective.	
	Overall, Option 4A, Op	tion 4C and Option 5 a	re equally preferred fro	om an Atmospheric Emissions, Fuel	& Energy Consumptions perspecti	ve.		
				In 10 1 18:11		lo di lo la lacia		
fal	Operational Seabed Dist			Operational Seabed Disturbance:		Operational Seabed Disturbance:	Operational Seabed Disturbance:	
5 g S	Short Term Disturbance: 245,020 m2			Habitat Loss (Rock Cover): 11,200 m	2	Habitat Loss (Rock Bags): 1,188 m2	Habitat Loss (Rock Cover): 506 m2	
Environment 2.3 Seabed Disturbance						Short Term Disturbance: 500 m2	Short Term Disturbance: 1,680 m2	
S S T	Legacy Seabed Disturba	nce:		Legacy Seabed Disturbance:				
2.3 Dist	N/A			Habitat Loss (Rock Cover): 11,200 m:	2	Legacy Seabed Disturbance:	Legacy Seabed Disturbance:	
						Habitat Loss (Rock Bags): 1,188 m2	Habitat Loss (Rock Cover): 506 m2	
~	107	14/	14/	14/	W	NI NI		
	W	W	W	W	VV	N		
	The assessment of the S			ie to the cignificant area and impact of	the disturbance caused by excavatin	the lines to gain access for cutting, particularly in the prevailing gente	hnical conditions, where any disturbance will take a long time period to	
	recover.	s being weaker than an	partial removal options u	de to the significant area and impact of	the disturbance caused by excavating	g the lines to gain access for cutting, particularly in the prevailing geote	fillical collditions, where any disturbance will take a long time period to	
Cumman		e haina Waakar than the	a other partial removal ont	ions due to it having the largest area of	nermanent habitat loss from the intro	duction of rock cover over the line ends.		
Summary				both operationally and for the long-term		duction of fock cover over the line ends.		
						ortion (total line length around 49km) of the seabed disturbance in all o	tions and is therefore not dominant in the assessment made	
				ed Disturbance perspective.	inio and only reprocessed a ornan p	onion (total into longin around 101111) of the boased disturbance in all o	tions and to morotor for dominant in the assessment made.	
		.,	,	property.				
53	The legacy marine impac	t from this full removal of	ption is limited to the	Line cleaning and flushing operations	will use Best Environmental Practice	Line cleaning and flushing operations will use Best Environmental Practice	tice Line cleaning and flushing operations will use Best Environmental Practice	
20	impact associated with the	he survey & monitoring of	of the single under	(BEP) and the Best Available Technic	ues (BAT) to minimise as far as	(BEP) and the Best Available Techniques (BAT) to minimise as far as	(BEP) and the Best Available Techniques (BAT) to minimise as far as	
a E	crossing which remains i	n-situ. This is expected	I to be minimal.	possible both residual hydrocarbon a	nd other chemical levels in line post	possible both residual hydrocarbon and other chemical levels in line po	st possible both residual hydrocarbon and other chemical levels in line post	
e e	-			flush.		flush.	flush.	
<u> </u>	Vessel Days:							
		12.1		The legacy marine impact from the sl	ow release of these low	The legacy marine impact from the slow release of these low	The legacy marine impact from the slow release of these low	
Mar	Survey Vessel (Legacy):	Sulvey Vessel (Legacy). 12.1			therefore expected to be low overall.	concentration / quantity discharges is therefore expected to be low over		
nvironmental sy Marine Impacts	Survey Vessel (Legacy):			, ,		, , , , , ,	, , ,	
. Enviror gacy Mar	Survey Vessel (Legacy): Total vessel days: 12.1 d	lays					Vescel Dave:	
2. Env		lays		Vessel Days:		Vessel Days:	Vessel Days:	
2. Enviror 2.4 Legacy Mar		lays		Vessel Days: Survey Vessel (Legacy): 16.1 days		Vessel Days: Suney Vessel (Legacy): 16.1 days	Vessel Days: Suney Vessel (Legacy): 15.5 days	
2. Env Legacy		lays S	S		N			
2. Env Legacy	Total vessel days: 12.1 d	S	Sub-criterion is as follows:	Survey Vessel (Legacy): 16.1 days	N	Survey Vessel (Legacy): 16.1 days		
2. Env	Total vessel days: 12.1 d	S egacy Marine Impacts s	ub-criterion is as follows:	Survey Vessel (Legacy): 16.1 days		Survey Vessel (Legacy): 16.1 days		
2. Env	Total vessel days: 12.1 d S The assessment of the L Option 2A is assessed a over a long time period.	S egacy Marine Impacts s s being Stronger than al	sub-criterion is as follows: Il partial removal options a	Survey Vessel (Legacy): 16.1 days N s removing the lines leaves limited legacy	cy marine impact. The environmenta	Survey Vessel (Legacy): 16.1 days	Suney Vessel (Legacy): 15.5 days	
2. Env	Total vessel days: 12.1 d S The assessment of the L Option 2A is assessed a over a long time period.	S egacy Marine Impacts s s being Stronger than al	sub-criterion is as follows: Il partial removal options a	Survey Vessel (Legacy): 16.1 days	cy marine impact. The environmenta	Survey Vessel (Legacy): 16.1 days	Suney Vessel (Legacy): 15.5 days	
2. Env	Total vessel days: 12.1 d S The assessment of the L Option 2A is assessed a over a long time period. All other options are assi	S egacy Marine Impacts s s being Stronger than al	sub-criterion is as follows: Il partial removal options a to each other as the legac	Survey Vessel (Legacy): 16.1 days N s removing the lines leaves limited legacy	icy marine impact. The environmenta	Survey Vessel (Legacy): 16.1 days	Suney Vessel (Legacy): 15.5 days	

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	O2A - Cut and Lift (Full Removal)		noval)	O4A - Rock Placement Over Area Burial (Lea	as of Spans / Exposure / Shallow ave, Minor)	O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)					
3. Technical 3.1 Technical Feasibility	Concept is technologically feasible. The scale is considerable and supportain and assets may require some development to accommodate the option. (Score 2) Excavation along the lines on this scale will present technical challenge on a cumulative basis, particularly with the prevailing geotechnical conditions. There are also concerns surround the ability to return the seabed to and overtrawlable status.		t to accommodate the ent technical challenges iling geotechnical	accommodated by existing supply chain. (Score 1)		Concept is technologically feasible. The scale is minimal and easily accommodated by existing supply chain and assets may require some development to accommodate the option. (Score 1)	Concept is technologically feasible. The scale is minimal and easily accommodated by existing supply chain and assets may require some development to accommodate the option. (Score 1)					
	MW	MW	MW	N	N	N						
Ť	The assessment of the Technical Feasibility sub-criterion is as follows: Option 2A is assessed as being Much Weaker than the other options due to the potential challenges excavating (necessary due to geotechnical conditions) along the lines to allow access for cutting. This is a cumulative technical concern due to the scale of the operations. There are also concerns required the ability to return the seabed to an overtrawlable status given the excavation required and the geotechnical conditions. All other options are assessed as being Neutral to each other as they employ largely routine operations. Overall, Option 4A, Option 4C and Option 5 are equally preferred from a Technical Feasibility perspective.											
3. Technical 3.2 Ease of Recovery from Excursion	Recovery is achievable v	with existing in-field equip	oment. (Score 1)	Recovery is achievable with existing i	in-field equipment. (Score 1)	Recovery is achievable with existing in-field equipment. (Score 1)	Recovery is achievable with existing in-field equipment. (Score 1)					
_	N	N	N	N	N	N						
Summary	The assessment of the Ease of Recovery from Excursion sub-criterion is as follows: ummary All options are assessed as being Neutral to each other as the ability to recover from an unplanned excursion is considered similar for all options. Overall, all options are equally preferred from an Ease of Recovery from Excursion perspective.											
3.3 Use of Proven Technology and Equipment	Standard equipment ava documented and proven		liers with well	Standard equipment available from m documented and proven track record.		Standard equipment available from multiple suppliers with well documented and proven track record. (Score 1)	Standard equipment available from multiple suppliers with well documented and proven track record. (Score 1)					
	N	N	N	N	N	N						
Summary	The assessment of the U	Use of Proven Technology d as being Neutral to eac	y and Equipment sub-criter h other as they are delivered		ment that is readily available and has							
4. Societal 4.1 Fishing	Short term disruption ma clear for fishing. (Score 2	ay occur during operation 2)		Short term disruption may occur durir clear for fishing with small amount of		Short term disruption may occur during operations. Thereafter seabed clear for fishing with small amount of additional rock. (Score 2)	Short term disruption may occur during operations. Thereafter seabed clear for fishing with small amount of additional rock. (Score 2)					
	S	N	S	W	N	S						
Summary	Option 2A is assessed a remaining in-situ in Optio Option 4A is assessed a Option 4C is assessed a	as being Stronger than O on 4C. as being Weaker than Op as being Stronger than O	tion 4C due to the rock be ption 5 due to it being pres	eing removed versus the rock berms in	(albeit with the line remaining). Option	naining areas of spans and exposures. Option 2A is assessed as being Ne on 4A is assessed as being Neutral to Option 5 due the rock berms versus ining areas of spans and exposures.	· · · · ·					

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		D2A - Cut and	Lift (Full Remo	oval)	O4A - Rock Placement Over Area Burial (Lea		O4C - Remove Areas of Spans / Exposure / Shallow Burial Minor)	(Leave, O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)			
4. Societal 4.2 Socio-economic Impacts on Amenities and Communities	5 0			an economic	Materials Returned: A S F		No impact. (Score 1) Materials Returned: Steel: 125 tonnes (recyclable) Polymer: 17 tonnes (landfill)	No impact. (Score 1) Materials Returned: Steel: 108 tonnes (recyclable) Polymer: 15 tonnes (landfill)			
	N		N	N	N	N	N				
Summar	The assessment of the Socio-economic Impacts on Amenities and Communities sub-criterion is as follows: All options are assessed as being Neutral to each other as, while there is more useful (recyclable) material returned in Option 2A (steel), this is offset by the significant quantity of material that will be likely to be destined for landfill (polymer). Overall the positive and negative societal impacts were considered to be balanced for all options. Overall, all options are equally preferred from a Socio-economic Impacts on Amenities and Communities perspective.										
5. Economic 5.1 Short-term Costs	£32.946 Million				£0.817 Million		£3.568 Million	£3.351 Million			
	VMW	١ ١	/MW	VMW	S	S	N				
Summar	more. Option 2A is Option 4A is assess Option 4C is assess	ed as being V assessed as being S ed as being N	ery Much Weak being Very Much stronger than Opt leutral to Option	er than Option 4A as the h Weaker than Option 5	as the execution cost is around 10 time cost for Option 4C is around 4 times gare similar.	es greater or around £30 million more		an Option 4C as the execution cost is almost 10 times greater or around £30 million cution cost for Option 5 is around 4 times greater or around £2.5 million more.			
nic erm	Surveys: £0.606 Mil FLTC: N/A	lion			Surveys: £0.804 Million FLTC: N/A		Surveys: £0.804 Million FLTC: N/A	Surveys: £0.775 Million FLTC: £300			
5. Economic 5.2 Long-term Costs	Total Legacy Cost: £0.606 Million				Total Legacy Cost: £0.804 Million		Total Legacy Cost: £0.804 Million	Total Legacy Cost: £0.776 Million			
	N		N	N	N	N	N				
Summar	The assessment of the Long-term Costs sub-criterion is as follows: Immary All options are assessed as being Neutral to each other as, while the legacy costs for surveying & monitoring associated with the partial removal options are greater than the full removal option, there remains the requirement to monitor the under crossings (2 off) remaining in Option 2A. Overall, all options are equally preferred from a Long-term Cost perspective.										

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Appendix C.2 **Group 1 Pairwise Comparison Matrices - Safety**

1.1 Operations Personnel	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	vmw	MW	MW	6.2%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	VMS	N	MS	MS	56.1%
O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	MS	MW	N	w	16.9%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	MS	MW	s	N	20.7%

1.2 Legacy Risk	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	s	s	MS	38.2%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	w	N	w	N	19.3%
O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	w	s	N	s	26.2%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	MW	N	w	N	16.3%

Group 1 Pairwise Comparison Matrices - Environment Appendix C.3

2.1 Operational Marine Impact	O2A - Cut and Lift (Full Removal)	04A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	w	w	w	18.2%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	s	N	N	N	27.3%
O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	s	N	N	N	27.3%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	s	N	N	N	27.3%

2.2 Atmospheric Emissions, Fuel & Energy Consumption	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	w	w	w	18.2%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	S	N	N	Ν	27.3%
O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	s	N	N	N	27.3%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	S	N	N	N	27.3%

2.3 Seabed Disturbance	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	w	w	w	18.0%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	s	N	w	w	22.1%
O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	S	s	N	N	29.9%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	s	S	N	N	29.9%

2.4 Legacy Marine Impacts	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	s	s	s	33.3%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	w	N	N	N	22.2%
O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	w	N	N	N	22.2%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	w	N	N	N	22.2%

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Appendix C.4 **Group 1 Pairwise Comparison Matrices – Technical**

3.1 Technical Feasibility	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	04C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	мw	MW	MW	10.0%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	MS	N	N	N	30.0%
O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	MS	N	N	×	30.0%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	MS	N	N	N	30.0%

3.2 Ease of Recovery from Excursion	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	N	N	N	25.0%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	N	25.0%
O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	N	25.0%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	N	N	N	N	25.0%

3.3 Use of Proven Technology and Equipment	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	N	N	N	25.0%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	z	25.0%
O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	N	25.0%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	N	N	N	N	25.0%

Appendix C.5 **Group 1 Pairwise Comparison Matrices – Societal**

4.1 Fishing	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	s	N	s	30.0%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	w	N	w	N	20.0%
O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	S	N	s	30.0%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	w	N	w	N	20.0%

4.2 Socio- economic Impacts on Amenities and Communities	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	N	N	N	25.0%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	N	25.0%
O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	z	25.0%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	N	N	N	N	25.0%

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Appendix C.6 Group 1 Pairwise Comparison Matrices - Economic

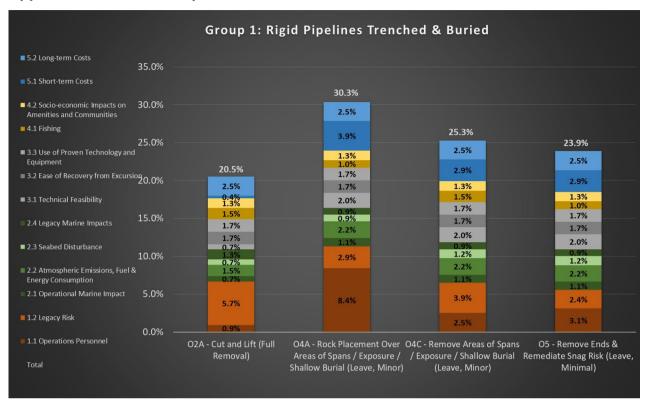
5.1 Short-term Costs	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	vmw	vmw	VMW	3.5%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	VMS	N	s	s	39.0%
O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	VMS	w	N	N	28.7%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	VMS	w	N	N	28.7%

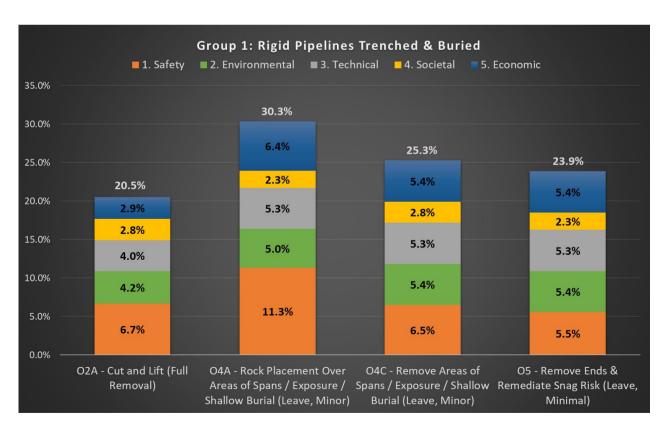
5.2 Long-term Costs	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	N	N	N	25.0%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	N	25.0%
O4C - Remove Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	N	25.0%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	N	N	N	N	25.0%

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Appendix C.7 Group 1 Results Charts







APPENDIX D GROUP 2 - DETAILED EVALUATION RESULTS

Appendix D.1 Group 2 Attributes Table

			O4A - Rock Placement Over Areas of Spans / Exposure / Shallow			
		O2B - Reverse Installation (Reel) without Deburial (Full Removal)	Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)		
		 - Lines already cut / disconnected at ends. - Line ends will be lifted and the line reverse reeled to vessel and returned to shore for processing. 	- Lines already cut / disconnected at ends Surface laid sections (out with trench) will be rock covered Rock placement at all areas of spans and exposure.	Lines already cut / disconnected at ends. Surface laid sections (out with trench) cut into sections using hydraulic shears, recovered to wessel and returned to shore for processing. Rock placement to remediate snag risk from cut ends.		
		Vessel Type: PoB / Days / Hours / PLL DSV: 110 / 14.2 / 18,704 / 1.40E-03 Divers: 18 / 14.2 / 6,121 / 5.94E-03	Vessel Type: PoB / Days / Hours / PLL Rockdump Vessel: 20 / 9.0 / 2,170 / 1.63E-04	Vessel Type: PoB / Days / Hours / PLL CSV: 76 / 19.9 / 18,158 / 1.36E-03		
		CSV: 76 / 33.1 / 30,160 / 2.26E-03 Total offshore hours: 54,986 hrs	Total offshore hours: 2,170 hrs Total offshore PLL: 1.63E-04	Total offshore hours: 18,158 hrs Total offshore PLL: 1.36E-03		
Safety	Operations Personnel	Total offshore PLL: 9.60E-03 Resource Type: Days / Hours / PLL Engineering & Management: 741.2 / 5,929 / 2.37E-05	Resource Type: Days / Hours / PLL Engineering & Management: 66.2 / 529 / 2.12E-06 Project Management: 88.0 / 704 / 2.82E-06	Resource Type: Days / Hours / PLL Engineering & Management: 248.5 / 1,988 / 7.95E-06 Project Management: 265.0 / 2,120 / 8.48E-06 Onshore Operations (includes Cleaning & Disposal): 1.0 / 64 / 7.87E-06		
1.	oerations	Project Management: 764.0 / 6,112 / 2.44E-05 Onshore Operations (includes Cleaning & Disposal): 37.0 / 2,368 / 2.91E-04	Total onshore hours: 1,233 hrs Total onshore PLL: 4,93E-06	Total onshore hours: 4,172 hrs Total onshore PLL: 2.43E-05		
	1.1	Total onshore hours: 14,409 hrs Total onshore PLL: 3.39E-04 Total operational hours: 69,395 hrs	Total operational hours: 3,403 hrs Total operational PLL: 1.68E-04	Total operational hours: 22,330 hrs Total operational PLL: 1.39E-03		
		Total operational PLL: 9.94E-03 Largely routine operations. Potential for dropped object from initiations (9 x initiations).	Largely routine operations. No potential for dropped object as no lifting with this option.	Largely routine operations. Potential for dropped object from multiple lifts through water column (56 lifts). In addition there is the offloading associated with transferring the flowline / umbilical to quayside.		
		MW W	S			
	Summary	Option 4A is assessed as being Stronger than Option 5 as the offshore scop- lifts of the lines through the water column to the vessel in Option 5.	A. Option 2B is assessed as being Weaker than Option 5 due to the higher is smaller and impacts fewer personnel due to lower PoB on the Rockdum	er risk exposure from the greater offshore scope and the use of diver in		
		Overall, Option 4A is the preferred option from a risk to Operations Pe	sonnel perspective.			
	Ţ	A small legacy risk remains with Option 2B as the under crossings (2 off) will remain.	length is fully trenched and buried as there are no areas of spans or exposure. Their surface laid line ends will be rock covered to mitigate	The lines remain in-situ with this option although they are fully trenched and buried as there are no areas of spans or exposure. Their surface laid ends will be removed.		
1. Safety	1.2 Legacy Risk	The survey & monitoring programme is committed to ensuring that the potential snap hazard from left in-situ infrastructure continues to be managed & mitigated as appropriate. The legacy risk associated with this survey and monitoring programme is:	potential snag hazard. The survey & monitoring programme is committed to ensuring that the potential snag hazard from left in-situ infrastructure continues to be managed & mitigated as appropriate. The legacy risk associated with	The survey & monitoring programme is committed to ensuring that the potential snag hazard from left in-situ infrastructure continues to be managed & mitigated as appropriate. The legacy risk associated with this survey and monitoring programme is:		
		Vessel Type: PoB / Days / Hours / PLL	this survey and monitoring programme is:			
		Suney Vessel (Legacy): 44 / 12.3 / 6,468 / 4.85E-04	Vessel Type: PoB / Days / Hours / PLL Suney Vessel (Legacy): 44 / 16.1 / 8,490 / 6.37E-04	Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 16.1 / 8,501 / 6.38E-04		
		S S				
	Summary		Survey Vessel (Legacy): 44 / 16.1 / 8,490 / 6.37E-04 W the potential for future snag risk is reduced as the lines are removed. The of rock berms from rock cover over the line ends in Option 4A. It is noted overtrawlable.	Survey Vessel (Legacy): 44 / 16.1 / 8,501 / 6.38E-04 crossings that remain shall be left overtrawlable.		
	Summary	The assessment of the Legacy Risk sub-criterion is as follows: Option 2B is assessed as being Stronger than both partial removal options as Option 4A is assessed as being Weaker than Option 5 due to the introductio monitoring programme performed to ensure that the as left condition remains	Survey Vessel (Legacy): 44 / 16.1 / 8,490 / 6.37E-04 W the potential for future snag risk is reduced as the lines are removed. The of rock berms from rock cover over the line ends in Option 4A. It is noted overtrawlable.	Survey Vessel (Legacy): 44 / 16.1 / 8,501 / 6.38E-04 crossings that remain shall be left overtrawlable.		
	Summary	S The assessment of the Legacy Risk sub-criterion is as follows: Option 2B is assessed as being Stronger than both partial removal options as Option 4A is assessed as being Weaker than Option 5 due to the introductio monitoring programme performed to ensure that the as left condition remains Overall, Option 2B is the preferred option from a risk to Other Users pe Vessel Noise (days on-site):	Survey Vessel (Legacy): 44 / 16.1 / 8,490 / 6.37E-04 W the potential for future snag risk is reduced as the lines are removed. The of rock berms from rock cover over the line ends in Option 4A. It is noted overtrawlable. rspective. Vessel Noise (days on-site):	Survey Vessel (Legacy): 44 / 16.1 / 8,501 / 6.38E-04 crossings that remain shall be left overtrawlable, that the as left condition of all options will be overtrawlable with a survey & Vessel Noise (days on-site):		
		S The assessment of the Legacy Risk sub-criterion is as follows: Option 2B is assessed as being Stronger than both partial removal options as Option 4A is assessed as being Weaker than Option 5 due to the introductio monitoring programme performed to ensure that the as left condition remains Overall, Option 2B is the preferred option from a risk to Other Users pe Vessel Noise (days on-site): 21 days Tooling noise: 8 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimities as far an opssible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities.	Survey Vessel (Legacy): 44 / 16.1 / 8,490 / 6.37E-04 W the potential for future snag risk is reduced as the lines are removed. The of rock berms from rock cover over the line ends in Option 4A. It is noted overtrawlable. rspective. Vessel Noise (days on-site): 6 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as	Survey Vessel (Legacy): 44 / 16.1 / 8,501 / 6.38E-04 crossings that remain shall be left overtrawlable. that the as left condition of all options will be overtrawlable with a survey & Vessel Noise (days on-site): 17 days Tooling noise:		
ironmental		S The assessment of the Legacy Risk sub-criterion is as follows: Option 2B is assessed as being Stronger than both partial removal options as Option 4A is assessed as being Weaker than Option 5 due to the introductio monitoring programme performed to ensure that the as left condition remains Overall, Option 2B is the preferred option from a risk to Other Users pe Vessel Noise (days on-site): 21 days Tooling noise: 8 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post	Survey Vessel (Legacy): 44 / 16.1 / 8,490 / 6.37E-04 W the potential for future snag risk is reduced as the lines are removed. The of rock berms from rock cover over the line ends in Option 4A. It is noted overtrawlable. rspective. Vessel Noise (days on-site): 6 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. There are no planned discharges from the lines under this rock cover option.	Survey Vessel (Legacy): 44 / 16.1 / 8,501 / 6.38E-04 crossings that remain shall be left overtrawlable. that the as left condition of all options will be overtrawlable with a survey & Vessel Noise (days on-site): 17 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing		
2. Environmental	2.1 Operational Marine Impact	The assessment of the Legacy Risk sub-criterion is as follows: Option 2B is assessed as being Stronger than both partial removal options as Option 4A is assessed as being Stronger than both partial removal options as Option 4A is assessed as being Weaker than Option 5 due to the introduction monitoring programme performed to ensure that the as left condition remains Overall, Option 2B is the preferred option from a risk to Other Users per Vessel Noise (days on-site): 21 days Tooling noise: 8 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends will lead to a discharge of fluids from within the lines. Reverse reeling will also result in the residual contents of the lines being evacuated to the sea. However, given the prior cleaning of the lines, the concentration and quantity of discharges should still be low overall. One notable exception to these lines being cleaned to best endeavours is the Banff Umbilical (PL1554) and the Kyle Umbilical (PL1661) which have cores that cannot be flushed and cleaned prior to decommissioning due to blockage. As such, the residual contents (Banff - Scale Inhibitor Rx6034 - 62 litres) (Kyle Vax Inhibitor Rx26094 - 2,509 litres, Rx7020- 12 litres and RX7014 - 1,138 litres) could be released to sea during reverse reeling. This is considered worst case and is permitted accordingly. This will have the most significant environmental impact of all options although is still	Survey Vessel (Legacy): 44 / 16.1 / 8,490 / 6.37E-04 W the potential for future snag risk is reduced as the lines are removed. The not rock berms from rock cover over the line ends in Option 4A. It is noted overtrawlable. Vessel Noise (days on-site): 6 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. There are no planned discharges from the lines under this rock cover option. Vessel Discharges: This includes Ballast, Grey and Black Water, this is driven by duration of vessel operations and therefore at 6 days it is the lowest of the options being evaluated.	Survey Vessel (Legacy): 44 / 16.1 / 8,501 / 6.38E-04 crossings that remain shall be left overtrawlable, that the as left condition of all options will be overtrawlable with a survey & Vessel Noise (days on-site): 17 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends will lead to a discharge of fluids from within the lines. However, given the prior cleaning of the lines, the concentration and		
2. Environmental	rational Marine Impact	S The assessment of the Legacy Risk sub-criterion is as follows: Option 2B is assessed as being Stronger than both partial removal options as Option 4A is assessed as being Weaker than Option 5 due to the introductio monitoring programme performed to ensure that the as left condition remains Overall, Option 2B is the preferred option from a risk to Other Users pe Vessel Noise (days on-site): 21 days Tooling noise: 8 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends will lead to a discharge of fluids from within the lines. Reverse reeling will also result in the residual contents of the lines being evacuated to the sea. However, given the prior cleaning of the lines, the concentration and quantity of discharges should still be low overall. One notable exception to these lines being cleaned to best endeavours is the Banf Umbilical (Pc.1554) and the Kyle Umbilical (Pc.1661) which have cores that cannot be flushed and cleaned prior to decommissioning due to blockage. As such, the residual contents (Barff - Scale Inhibitor RX-6034 - 62 litres) (Kyle - Wax Inhibitor - RX-2099 - 2,509 litres, RX-7020 - 12 litres an RX-7014 - 1,138 litres) could be released to sea during reverse reeling. This is considered worst case and is permitted accordingly. This will have the most significant environmental impact of all options although is still anticipated to be low. Vessel Discharges: This includes Ballast, Grey and Black Water, this is driven by duration of vessel operations and therefore at 21 days it is higher than Option 4A and	Survey Vessel (Legacy): 44 / 16.1 / 8,490 / 6.37E-04 W the potential for future snag risk is reduced as the lines are removed. The not rock berms from rock cover over the line ends in Option 4A. It is noted overtrawlable. Vessel Noise (days on-site): 6 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. There are no planned discharges from the lines under this rock cover option. Vessel Discharges: This includes Ballast, Grey and Black Water, this is driven by duration of vessel operations and therefore at 6 days it is the lowest of the options being evaluated.	Survey Vessel (Legacy): 44 / 16.1 / 8,501 / 6.38E-04 crossings that remain shall be left overtrawlable, that the as left condition of all options will be overtrawlable with a survey & Vessel Noise (days on-site): 17 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends will lead to a discharge of fluids from within the lines. However, given the prior cleaning of the lines, the concentration and quantity of discharge should still be low overall. One notable exception to these lines being cleaned to best endeavours is the Banff Umbilical (PL1554) and the Kyle Umbilical (PL1661) which have cores that cannot be flushed and cleaned prior to decommissioning due to blockage. As such, a small amount of the residual contents (Banff - Scale Inhibitor RX-6034 - 62 litres) (Kyle - Wax Inhibitor - RX-2099 - 2,509 litres, RX-7020 - 12 litres and RX-7014 - 1,138 litres) could be released at the cut locations and is permitted accordingly. These releases will be		
2. Environmental	rational Marine Impact	The assessment of the Legacy Risk sub-criterion is as follows: Option 2B is assessed as being Stronger than both partial removal options as Option 4A is assessed as being Stronger than both partial removal options as Option 4A is assessed as being Weaker than Option 5 due to the introduction monitoring programme performed to ensure that the as left condition remains Overall, Option 2B is the preferred option from a risk to Other Users per Vessel Noise (days on-site): 21 days Tooling noise: 8 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends will lead to a discharge of fluids from within the lines. Reverse reeling will also result in the residual contents of the lines being evacuated to the sea. However, given the prior cleaning of the lines, the concentration and quantity of discharges should still be low overall. One notable exception to these lines being cleaned to best endeavours is the Banff Umbilical (PL1554) and the Kyle Umbilical (PL1661) which have cores that cannot be flushed and cleaned prior to decommissioning due to blockage. As such, the residual contents (Banff - Scale Inhibitor RX-6034 - 65 tires) (Kyle - Wax Inhibitor - RX-2099 - 2,509 litres, RX-7020 - 12 litres and RX-7014 - 1,138 litres) could be released to sea during reverse reeling. This is considered worst case and is permitted accordingly. This will have the most significant environmental impact of all options although is still anticipated to be low. Vessel Discharges: This includes Ballast, Grey and Black Water, this is driven by duration of	Survey Vessel (Legacy): 44 / 16.1 / 8,490 / 6.37E-04 W the potential for future snag risk is reduced as the lines are removed. The not rock berms from rock cover over the line ends in Option 4A. It is noted overtrawlable. Vessel Noise (days on-site): 6 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. There are no planned discharges from the lines under this rock cover option. Vessel Discharges: This includes Ballast, Grey and Black Water, this is driven by duration of vessel operations and therefore at 6 days it is the lowest of the options being evaluated.	Survey Vessel (Legacy): 44 / 16.1 / 8,501 / 6.38E-04 crossings that remain shall be left overtrawlable, that the as left condition of all options will be overtrawlable with a survey & Vessel Noise (days on-site): 17 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends will lead to a discharge of fluids from within the lines. However, given the prior cleaning of the lines, the concentration and quantity of discharge should still be low overall. One notable exception to these lines being cleaned to best endeavours is the Banff Umbilical (PL1554) and the Kyle Umbilical (PL1661) which have cores that cannot be flushed and cleaned prior to decommissioning due to blockage. As such, a small amount of the residual contents (Banff - Scale Inhibitor RX-6034 - 62 liters) (Kyle - Wax Inhibitor - RX-2099 - 2,099 litres, RX-7020 - 12 litres and RX-7014 - 1,138 litres) could be released at the cut locations and is permitted accordingly. These releases will be small quantities and the environmental impact is anticipated to be low. Vessel Discharges: This includes Ballast, Grey and Black Water, this is driven by duration of vessel operations and therefore at 17 days it is higher than Option 4A and		
2. Environmental	2.1 Operational Marine Impact	S The assessment of the Legacy Risk sub-criterion is as follows: Option 2B is assessed as being Stronger than both partial removal options as Option 4A is assessed as being Weaker than Option 5 due to the introduction monitoring programme performed to ensure that the as left condition remains Overall, Option 2B is the preferred option from a risk to Other Users pe Vessel Noise (days on-site): 21 days Tooling noise: 8 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to miniminise as far any possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends will lead to a discharge of fluids from within the lines. Reverse recling will also result in the residual contents of the lines being evacuated to the sea. However, given the prior cleaning of the lines, the concentration and quantity of discharges should still be low overall. One notable exception to these lines being cleaned to best endeavours is the Bariff Umblical (Pc1554) and the Kyle Umblical (Pc1561) which have cores that cannot be flushed and cleaned prior to decommissioning due to blockage. As such, the residual contents (Bariff - Scale Inhistor Rx-6034 - 62 litres) (Kyle - Wax Inhistor - Rx-2099 - 2,509 litres, Rx-7020 - 12 litres an RX-7014 - 1,138 litres) could be released to sea during reverse reeling. This is considered worst case and is permitted accordingly. This will have the most significant environmental impact of all options although is still anticipated to be low. Vessel Discharges: This includes Ballast, Grey and Black Water, this is driven by duration of wessel operations and therefore at 21 days it is higher than Option 4A and similar to Option 5.	Survey Vessel (Legacy): 44 / 16.1 / 8,490 / 6.37E-04 W Interpotential for future snag risk is reduced as the lines are removed. The of rock berns from rock cover over the line ends in Option 4A. It is noted overtrawlable. Yessel Noise (days on-site): 6 days Tooling noise: 9 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. There are no planned discharges from the lines under this rock cover option. Vessel Discharges: This includes Ballast, Grey and Black Water, this is driven by duration of vessel operations and therefore at 6 days it is the lowest of the options being evaluated.	Survey Vessel (Legacy): 44 / 16.1 / 8,501 / 6.38E-04 crossings that remain shall be left overtrawlable. that the as left condition of all options will be overtrawlable with a survey & Vessel Noise (days on-site): 17 days Tooling noise: 0 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends will lead to a discharge of fluids from within the lines. However, given the prior cleaning of the lines, the concentration and quantity of discharge should still be low overall. One notable exception to these lines being cleaned to best endeavours is the Banff Umbilical (PL1554) and the Kyle Umbilical (PL1661) which have cores that cannot be flushed and cleaned prior to decommissioning due to blockage. As such, a small amount of the residual contents (Banff - Scale Inhibitor Rx-6034 - 62 litres) (Kyle - Wax Inhibitor - Rx-2099 - 2.509) litres, RX-7020 - 12 litres and RX-7014 - 1,138 litres) could be released at the cut locations and is permitted accordingly. These releases will be small quantities and the environmental impact is anticipated to be low. Vessel Discharges: This includes Ballast, Grey and Black Water, this is driven by duration of vessel operations and therefore at 17 days it is higher than Option 4A and similar to Option 2B.		

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		O2B - Reverse Installation (Reel)	without Deburial (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)
	>	Vessel Emissions (in tonnes):		Vessel Emissions (in tonnes):	Vessel Emissions (in tonnes):
	Energy	Fuel: 1,445		Fuel: 551	Fuel: 947
	ш Ж	CO2: 4,582 NOx: 85.85		CO2: 1,745 NOx: 32.70	CO2: 3,001 NOx: 56.23
	e e	SO2: 5.78		SO2: 2.20	SO2: 3.79
ıtal		Vessel Energy Use: 62,150 GJ		Vessel Energy Use: 23,672 GJ	Vessel Energy Use: 40,708 GJ
men	Emissions nsumption	Material Emissions (CO2 in tonnes):		Material Emissions (CO2 in tonnes):	Material Emissions (CO2 in tonnes):
iron	niss mns	Recovered Material: 601		Recovered Material: 5	Recovered Material: 11
Envi	ic En Cons	Remaining Material: Total: 601		Remaining Material: 1,937 Total: 1,942	Remaining Material: 1,919 Total: 1,930
2.	heri				
	dso	Energy Use (in GJ):		Energy Use (in GJ):	Energy Use (in GJ):
	Atm	Recovered Material: 11,791 Remaining Material:		Recovered Material: 61 Remaining Material: 26,300	Recovered Material: 155 Remaining Material: 26,050
	2.2				
Į.		Rock: N/A	N	Rock: 8,400 tonnes	Rock: 192 tonnes
		The assessment of the Atmospheric Em		• •	
s	ummary	All options are assessed as being Neuti	ral to each other as, while there are dif	ferences in the material consumed and the emissions generated by the opt	ions, these differences were considered insufficient to express a
J		preference from an environmental impac Overall, all option are equally prefer		s, Fuel & Energy Consumptions perspective.	
tal		Operational Seabed Disturbance: Short Term Disturbance (Reverse Install	lation w/o Doburiol): 09 330 m2	Operational Seabed Disturbance:	Operational Seabed Disturbance:
nen	nce nce	Short Term Disturbance (Reverse Install	lation w/o Debunal). 96,330 m2	Habitat Loss (Rock Cover): 8,400 m2	Habitat Loss (Rock Bags): 255 m2 Short Term Disturbance: 4,200 m2
Environm	2.3 Seabed Disturbance	Legacy Seabed Disturbance:		Legacy Seabed Disturbance:	
invi	2.3 Distr	N/A		Habitat Loss (Rock Cover): 8,400 m2	Legacy Seabed Disturbance: Habitat Loss (Rock Bags): 255 m2
2. E					riabilat 2000 (100% Dago). 200 M2
		N	N	W	
		The assessment of the Seabed Disturba			
s	ummary	All options are assessed as being Neuti areas of permanent habitat loss associa		nort-term disturbance associated with pulling the lines through existing cover	r in Option 2B was considered to have a similar impact as the smaller
		Overall, all options are equally prefe		erspective.	
	,	The legacy marine impact from this full i	removal option is limited to the impact	Line cleaning and flushing operations will use Best Environmental	Line cleaning and flushing operations will use Best Environmental
	cts	associated with the survey & monitoring		Practice (BEP) and the Best Available Techniques (BAT) to minimise as	Practice (BEP) and the Best Available Techniques (BAT) to minimise as
tal	npa	remain in-situ. This is expected to be m	ninimal.	far as possible both residual hydrocarbon and other chemical levels in line	
neu	Je Ir	Vessel Days:		post flush.	post flush.
ronn	Aariı	Survey Vessel (Legacy): 12.3		The legacy marine impact from the slow release of these low	The legacy marine impact from the slow release of these low
Environmental	در	Total vessel days: 12.3 days		concentration / quantity discharges is therefore expected to be low overall.	concentration / quantity discharges is therefore expected to be low overall.
2. E	Legacy Marine Impacts	Total vessel days. 12.3 days		overall.	overall.
	2.41			Vessel Days:	Vessel Days:
	2.4	e	e	Survey Vessel (Legacy): 16.1 days	Vessel Days: Suney Vessel (Legacy): 16.1 days
	2.41	S The assessment of the Legacy Marine Is	S Impacts sub-criterion is as follows:		
	2.41	The assessment of the Legacy Marine In Option 2B is assessed as being Stronge	Impacts sub-criterion is as follows: er than the partial removal options as r	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental is	Survey Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low
s	ummary	The assessment of the Legacy Marine In Option 2B is assessed as being Stronge	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove	Survey Vessel (Legacy): 16.1 days	Survey Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low
s	ummary	The assessment of the Legacy Marine In Option 2B is assessed as being Strong as any residual contents and degradatic being left in-situ. The legacy marine im Option 4A is assessed as being Neutral	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impa	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental ir a long time period. It is noted that PL1554 and PL1661 have residual Waract of the lines remaining in-situ is similar for both options.	Survey Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low
s	ummary	The assessment of the Legacy Marine In Option 2B is assessed as being Strongras any residual contents and degradation being left in-situ. The legacy marine im	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impa	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental ir a long time period. It is noted that PL1554 and PL1661 have residual Waract of the lines remaining in-situ is similar for both options.	Survey Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low
s	ummary	The assessment of the Legacy Marine is Option 2B is assessed as being Strough as any residual contents and degradatic being left in-situ. The legacy marine importion 4h Option 4h is assessed as being Neutral Overall, Option 2B is the preferred of Concept is technologically feasible. The	Impacts sub-criterion is as follows: er than the partial removal options as ro no products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impa- option from a Legacy Marine Impac	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental ir a long time period. It is noted that PL1554 and PL1661 have residual Waract of the lines remaining in-situ is similar for both options. Is perspective. Concept is technologically feasible. The scale is comparable with similar	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar
iical	ummary	The assessment of the Legacy Marine II Option 2B is assessed as being Strong as any residual contents and degradatic being left in-situ. The legacy marine im Option 4A is assessed as being Neutral Overall, Option 2B is the preferred o Concept is technologically feasible. The scopes completed. (Score 1)	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove pact is still considered low. I to Option 5 as the environmental importion from a Legacy Marine Impact e scale is comparable with similar	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental ir a long time period. It is noted that PL1554 and PL1661 have residual Wasact of the lines remaining in-situ is similar for both options. Is perspective.	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the
schnical	ummary	The assessment of the Legacy Marine Is Option 2B is assessed as being Stroug as any residual contents and degradatic being left in-situ. The legacy marine imp Option 4A is assessed as being Neutral Overall, Option 2B is the preferred of Concept is technologically feasible. This scopes completed. (Score 1) There remains concern re: ability to Rev cover without deburial first which provide cover without deburial first which provide	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impa- pition from a Legacy Marine Impact e scale is comparable with similar werse Reel these lines through existing	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental ir a long time period. It is noted that PL1554 and PL1661 have residual Waract of the lines remaining in-situ is similar for both options. Is perspective. Concept is technologically feasible. The scale is comparable with similar	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar
3. Technical o	ummary	The assessment of the Legacy Marine is Option 2B is assessed as being Stross as any residual contents and degradatic being left in-situ. The legacy marine im Option 4A is assessed as being Neutral Overall, Option 2B is the preferred o Concept is technologically feasible. The scopes completed. (Score 1) There remains concern re: ability to Rev cover without deburial first which provide challenges.	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impa- ption from a Legacy Marine Impact es cale is comparable with similar uerse Reel these lines through existing as additional technical risks /	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental ir a long time period. It is noted that PL1554 and PL1661 have residual Waract of the lines remaining in-situ is similar for both options. Is perspective. Concept is technologically feasible. The scale is comparable with similar	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar
3. Technical o	3.1 Technical 3 2.4 Feasibility 2.4	The assessment of the Legacy Marine Is Option 2B is assessed as being Stroug as any residual contents and degradatic being left in-situ. The legacy marine imp Option 4A is assessed as being Neutral Overall, Option 2B is the preferred of Concept is technologically feasible. This scopes completed. (Score 1) There remains concern re: ability to Rev cover without deburial first which provide cover without deburial first which provide	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impa- ption from a Legacy Marine Impact es cale is comparable with similar uerse Reel these lines through existing as additional technical risks /	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental ir a long time period. It is noted that PL1554 and PL1661 have residual Waract of the lines remaining in-situ is similar for both options. Is perspective. Concept is technologically feasible. The scale is comparable with similar	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar
3. Technical	3.1 Technical 3 2.4 Feasibility 2.4	The assessment of the Legacy Marine is Option 2B is assessed as being Strous as any residual contents and degradatic being left in-situ. The legacy marine importion 4h is assessed as being Neutral Overall, Option 2B is the preferred of Concept is technologically feasible. The scopes completed. (Score 1) There remains concern re: ability to Rev cover without deburial first which provide challenges. Assessed as Neutral to other options his	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impa- ption from a Legacy Marine Impact es cale is comparable with similar uerse Reel these lines through existing as additional technical risks /	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental ir a long time period. It is noted that PL1554 and PL1661 have residual Waract of the lines remaining in-situ is similar for both options. Is perspective. Concept is technologically feasible. The scale is comparable with similar	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar
3. Technical	3.1 Technical 3 2.4 Feasibility 2.4	The assessment of the Legacy Marine is Option 2B is assessed as being Stroug as any residual contents and degradatic being left in-situ. The legacy marine importion 4N assessed as being Neutral Overall, Option 2B is the preferred of Concept is technologically feasible. The scopes completed. (Score 1) There remains concern re: ability to Revover without deburial first which provide challenges. Assessed as Neutral to other options he Weaker than other options. N The assessment of the Technical Feasil	Impacts sub-criterion is as follows: ar than the partial removal options as r on products will be released slowly ove pact is still considered low. It to Option 5 as the environmental impaction from a Legacy Marine Impacties acale is comparable with similar werse Reel these lines through existing as additional technical risks / owever run sensitivity to change to Nobility sub-criterion is as follows:	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental if a long time period. It is noted that PL1554 and PL1661 have residual War act of the lines remaining in-situ is similar for both options. Is perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1)	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1)
3. Technical	3.1 Technical m Feasibility b	The assessment of the Legacy Marine is Option 2B is assessed as being Stroug as any residual contents and degradatic being left in-situ. The legacy marine importion 4N assessed as being Neutral Overall, Option 2B is the preferred of Concept is technologically feasible. The scopes completed. (Score 1) There remains concern re: ability to Revover without deburial first which provide challenges. Assessed as Neutral to other options he Weaker than other options. N The assessment of the Technical Feasil	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impi post of the control of the control of the control es cale is comparable with similar uerse Reel these lines through existing es additional technical risks / owever run sensitivity to change to N billity sub-criterion is as follows: ral to each other. There are residual or	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental i r a long time period. It is noted that PL1554 and PL1661 have residual War act of the lines remaining in-situ is similar for both options. Is perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) N oncerns regarding the ability to Reverse Reel these lines through existing c	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1)
3. Technical	3.1 Technical and S.4 Feasibility and A.2.4	The assessment of the Legacy Marine in Option 2B is assessed as being Strong as any residual contents and degradatic being left in-situ. The legacy marine imported in the property of the pro	Impacts sub-criterion is as follows: ar than the partial removal options as ro products will be released slowly owe pact is still considered low. It to Option 5 as the environmental importion from a Legacy Marine Impact escale is comparable with similar werse Reel these lines through existing as additional technical risks / owever run sensitivity to change to Nobility sub-criterion is as follows: ral to each other. There are residual conducted using largely routine operation of the producted using largely routine operation.	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental is raily a long time period. It is noted that PL1554 and PL1661 have residual Wars act of the lines remaining in-situ is similar for both options. Is perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) N oncerns regarding the ability to Reverse Reel these lines through existing cons.	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1)
3. Technical	3.1 Technical am Feasibility am A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.	The assessment of the Legacy Marine is Option 2B is assessed as being Stroug as any residual contents and degradatic being left in-situ. The legacy marine importion 4A is assessed as being Neutral Overall, Option 2B is the preferred of Concept is technologically feasible. The scopes completed. (Score 1) There remains concern re: ability to Revover without deburial first which provide challenges. Assessed as Neutral to other options he Weaker than other options. N The assessment of the Technical Feasi All options are assessed as being Neutriemained as Neutral. All options are assessed as being Neutriemained as Neutral. All options are completed in the second of the	Impacts sub-criterion is as follows: er than the partial removal options as ro products will be released slowly ove pact is still considered low. It to Option 5 as the environmental importation of the control of the	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental is raily a long time period. It is noted that PL1554 and PL1661 have residual Wars act of the lines remaining in-situ is similar for both options. Is perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) N oncerns regarding the ability to Reverse Reel these lines through existing cons.	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1)
cal 3. Technical	of 3.1 Technical am Feasibility by Alam	The assessment of the Legacy Marine is Option 2B is assessed as being Strous as any residual contents and degradatic being left in-situ. The legacy marine imported to the property of the pro	Impacts sub-criterion is as follows: er than the partial removal options as ro products will be released slowly ove pact is still considered low. It to Option 5 as the environmental importation of the control of the	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental ir a long time period. It is noted that PL1554 and PL1661 have residual Waract of the lines remaining in-situ is similar for both options. Its perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) N oncerns regarding the ability to Reverse Reel these lines through existing costs. erspective.	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1)
cal 3. Technical	of 3.1 Technical am Feasibility by Alam	The assessment of the Legacy Marine is Option 2B is assessed as being Strous as any residual contents and degradatic being left in-situ. The legacy marine imported to the property of the pro	Impacts sub-criterion is as follows: er than the partial removal options as ro products will be released slowly ove pact is still considered low. It to Option 5 as the environmental importation of the control of the	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental ir a long time period. It is noted that PL1554 and PL1661 have residual Waract of the lines remaining in-situ is similar for both options. Its perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) N oncerns regarding the ability to Reverse Reel these lines through existing costs. erspective.	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1)
cal 3. Technical	of 3.1 Technical am Feasibility by Alam	The assessment of the Legacy Marine is Option 2B is assessed as being Strous as any residual contents and degradatic being left in-situ. The legacy marine imported to the property of the pro	Impacts sub-criterion is as follows: er than the partial removal options as ro products will be released slowly ove pact is still considered low. It to Option 5 as the environmental importation of the control of the	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental ir a long time period. It is noted that PL1554 and PL1661 have residual Waract of the lines remaining in-situ is similar for both options. Its perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) N oncerns regarding the ability to Reverse Reel these lines through existing costs. erspective.	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1)
cal 3. Technical	3.1 Technical am Feasibility am A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.	The assessment of the Legacy Marine is Option 2B is assessed as being Stroug as any residual contents and degradatic being left in-situ. The legacy marine imported to the property of the contents and the contents are seen as a sesses and as being Neutral Overall, Option 2B is the preferred of Concept is technologically feasible. The scopes completed. (Score 1) There remains concern re: ability to Revover without deburial first which provide challenges. Assessed as Neutral to other options he weaker than other options. N The assessment of the Technical Feasil All options are assessed as being Neutremained as Neutral. All options are cooverall, all options are equally preference of the provided of the content of the second of t	Impacts sub-criterion is as follows: ar than the partial removal options as ro products will be released slowly ove pact is still considered low. It to Option 5 as the environmental importation of the control of the	Survey Vessel (Legacy): 16.1 days Nemoving the lines leaves limited legacy marine impact. The environmental if a long time period. It is noted that PL1554 and PL1661 have residual War act of the lines remaining in-situ is similar for both options. Its perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) Noncerns regarding the ability to Reverse Reel these lines through existing costs. Prespective. Recovery is achievable with existing in-field equipment. (Score 1)	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1)
cal 3. Technical	of 3.1 Technical am Feasibility by Alam	The assessment of the Legacy Marine body option 2B is assessed as being Strong as any residual contents and degradatic being left in-situ. The legacy marine imported in the sacessed as being Neutral Overall, Option 2B is the preferred of Concept is technologically feasible. The scopes completed (Score 1) There remains concern re: ability to Revover without deburial first which provide challenges. Assessed as Neutral to other options he weaker than other options. N The assessment of the Technical Feasil All options are assessed as being Neutremained as Neutral. All options are coverall, all options are equally preference of the Neutral	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impription from a Legacy Marine Impact es cale is comparable with similar uerse Reel these lines through existing es additional technical risks / owever run sensitivity to change to N billity sub-criterion is as follows: ral to each other. There are residual or onducted using largely routine operation erred from a Technical Feasibility p field equipment. (Score 1)	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental if a long time period. It is noted that PL1554 and PL1661 have residual War act of the lines remaining in-situ is similar for both options. Is perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) N oncerns regarding the ability to Reverse Reel these lines through existing costs. Recovery is achievable with existing in-field equipment. (Score 1)	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1)
3. Technical o 3. Technical	3.2 Ease of Recovery from Expression 2.4 Feasibility At Expression 2.1	The assessment of the Legacy Marine is Option 2B is assessed as being Stronging as any residual contents and degradatic being left in-situ. The legacy marine imported to the property of the	Impacts sub-criterion is as follows: are than the partial removal options as ro products will be released slowly owe pact is still considered low. It to Option 5 as the environmental importance of the control of the	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental if a long time period. It is noted that PL1554 and PL1661 have residual Warsact of the lines remaining in-situ is similar for both options. Is perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) N oncerns regarding the ability to Reverse Reel these lines through existing cost. erspective. Recovery is achievable with existing in-field equipment. (Score 1) N llows: to requirement to locate and connect to the line end for continued recovery.	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) over due to uncertain residual integrity however the assessment has Recovery is achievable with existing in-field equipment. (Score 1)
3. Technical o 3. Technical	3.2 Ease of a 3.1 Technical and Recovery from the Feasibility and Feasibility And Page 1.24	The assessment of the Legacy Marine is Option 2B is assessed as being Strong as any residual contents and degradatic being left in-situ. The legacy marine imported to the property of the contents and segment of the contents and the contents are seen as the contents of t	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impu- pition from a Legacy Marine Impact es cale is comparable with similar uerse Reel these lines through existing sa additional technical risks / owever run sensitivity to change to N bility sub-criterion is as follows: ral to each other. There are residual conducted using largely routine operation erred from a Technical Feasibility p field equipment. (Score 1) w ry from Excursion sub-criterion is as fo or than both partial removal options due to Option 5 as recovery is similar in b	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental is a long time period. It is noted that PL1554 and PL1661 have residual Warsact of the lines remaining in-situ is similar for both options. Its perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) N Oncerns regarding the ability to Reverse Reel these lines through existing constance in the scale is comparable with similar scopes completed. (Score 1) N Incomparable with existing in-field equipment. (Score 1) Illows: N Illows:	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) over due to uncertain residual integrity however the assessment has Recovery is achievable with existing in-field equipment. (Score 1)
3. Technical o 3. Technical	3.2 Ease of 3.1 Technical um Ecursion ka Feasibility ka	The assessment of the Legacy Matrine by Option 2B is assessed as being Strong as any residual contents and degradatic being left in-situ. The legacy marine important of the seasons of th	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impu- pition from a Legacy Marine Impact es cale is comparable with similar uerse Reel these lines through existing es additional technical risks / owever run sensitivity to change to N bility sub-criterion is as follows: ral to each other. There are residual conducted using largely routine operation erred from a Technical Feasibility p field equipment. (Score 1) W ry from Excursion sub-criterion is as for trian both partial removal options due to Option 5 as recovery is similar in b equally preferred from an Ease of	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental is a long time period. It is noted that PL1554 and PL1661 have residual Warsact of the lines remaining in-situ is similar for both options. Its perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) N oncerns regarding the ability to Reverse Reel these lines through existing constructions. Recovery is achievable with existing in-field equipment. (Score 1) N llows: to requirement to locate and connect to the line end for continued recovery oth options. Recovery from Excursion perspective.	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) over due to uncertain residual integrity however the assessment has Recovery is achievable with existing in-field equipment. (Score 1) by reverse reeling should it be dropped during an unplanned excursion.
3. Technical o 3. Technical	3.1 Technical aum Recovery from Excursion At	The assessment of the Legacy Marine is Option 2B is assessed as being Strough as any residual contents and degradatic being left in-situ. The legacy marine imported to the property of the pr	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impu- pition from a Legacy Marine Impact es cale is comparable with similar uerse Reel these lines through existing es additional technical risks / owever run sensitivity to change to N bility sub-criterion is as follows: ral to each other. There are residual conducted using largely routine operation erred from a Technical Feasibility p field equipment. (Score 1) W ry from Excursion sub-criterion is as for trian both partial removal options due to Option 5 as recovery is similar in b equally preferred from an Ease of	Survey Vessel (Legacy): 16.1 days Nemoving the lines leaves limited legacy marine impact. The environmental is a long time period. It is noted that PL1554 and PL1661 have residual War act of the lines remaining in-situ is similar for both options. Its perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) Noncerns regarding the ability to Reverse Reel these lines through existing costs. Prespective. Recovery is achievable with existing in-field equipment. (Score 1) Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Proportions. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs.	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) over due to uncertain residual integrity however the assessment has Recovery is achievable with existing in-field equipment. (Score 1) by reverse reeling should it be dropped during an unplanned excursion.
3. Technical o 3. Technical	3.1 Technical aum Recovery from Excursion At	The assessment of the Legacy Matrine by Option 2B is assessed as being Strong as any residual contents and degradatic being left in-situ. The legacy marine important of the sassessed as being Neutral Overall, Option 2B is the preferred of Concept is technologically leasible. The scopes completed (Score 1) There remains concern re: ability to Revover without deburial first which provide challenges. Assessed as Neutral to other options he weaker than other options. N The assessment of the Technical Feasible and I options are assessed as being Neutremained as Neutral. All options are coverall, all options are equally preference of the option of the opti	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impu- pition from a Legacy Marine Impact es cale is comparable with similar uerse Reel these lines through existing es additional technical risks / owever run sensitivity to change to N bility sub-criterion is as follows: ral to each other. There are residual conducted using largely routine operation erred from a Technical Feasibility p field equipment. (Score 1) W ry from Excursion sub-criterion is as for trian both partial removal options due to Option 5 as recovery is similar in b equally preferred from an Ease of	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental is a long time period. It is noted that PL1554 and PL1661 have residual Warsact of the lines remaining in-situ is similar for both options. Its perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) N oncerns regarding the ability to Reverse Reel these lines through existing constructions. Recovery is achievable with existing in-field equipment. (Score 1) N llows: to requirement to locate and connect to the line end for continued recovery oth options. Recovery from Excursion perspective.	Survey Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) over due to uncertain residual integrity however the assessment has Recovery is achievable with existing in-field equipment. (Score 1) by reverse reeling should it be dropped during an unplanned excursion.
3. Technical o 3. Technical	3.1 Technical aum Recovery from Excursion At	The assessment of the Legacy Marine is Option 2B is assessed as being Strough as any residual contents and degradatic being left in-situ. The legacy marine imported to the property of the pr	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impu- pition from a Legacy Marine Impact es cale is comparable with similar uerse Reel these lines through existing es additional technical risks / owever run sensitivity to change to N bility sub-criterion is as follows: ral to each other. There are residual conducted using largely routine operation erred from a Technical Feasibility p field equipment. (Score 1) W ry from Excursion sub-criterion is as for trian both partial removal options due to Option 5 as recovery is similar in b equally preferred from an Ease of	Survey Vessel (Legacy): 16.1 days Nemoving the lines leaves limited legacy marine impact. The environmental is a long time period. It is noted that PL1554 and PL1661 have residual War act of the lines remaining in-situ is similar for both options. Its perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) Noncerns regarding the ability to Reverse Reel these lines through existing costs. Prespective. Recovery is achievable with existing in-field equipment. (Score 1) Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Proportions. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs.	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) over due to uncertain residual integrity however the assessment has Recovery is achievable with existing in-field equipment. (Score 1) by reverse reeling should it be dropped during an unplanned excursion.
3. Technical o 3. Technical	3.1 Technical aum Recovery from Excursion At	The assessment of the Legacy Marine is Option 2B is assessed as being Strough as any residual contents and degradatic being left in-situ. The legacy marine imported to the property of the pr	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impu- pition from a Legacy Marine Impact es cale is comparable with similar uerse Reel these lines through existing es additional technical risks / owever run sensitivity to change to N bility sub-criterion is as follows: ral to each other. There are residual conducted using largely routine operation erred from a Technical Feasibility p field equipment. (Score 1) W ry from Excursion sub-criterion is as for trian both partial removal options due to Option 5 as recovery is similar in b equally preferred from an Ease of	Survey Vessel (Legacy): 16.1 days Nemoving the lines leaves limited legacy marine impact. The environmental is a long time period. It is noted that PL1554 and PL1661 have residual War act of the lines remaining in-situ is similar for both options. Its perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) Noncerns regarding the ability to Reverse Reel these lines through existing costs. Prespective. Recovery is achievable with existing in-field equipment. (Score 1) Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Proportions. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs.	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) over due to uncertain residual integrity however the assessment has Recovery is achievable with existing in-field equipment. (Score 1) by reverse reeling should it be dropped during an unplanned excursion.
3. Technical o 3. Technical	3.1 Technical aum Recovery from Excursion At	The assessment of the Legacy Marine is Option 2B is assessed as being Strough as any residual contents and degradatic being left in-situ. The legacy marine imported to the property of the pr	Impacts sub-criterion is as follows: er than the partial removal options as r on products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impu- pition from a Legacy Marine Impact es cale is comparable with similar uerse Reel these lines through existing es additional technical risks / owever run sensitivity to change to N bility sub-criterion is as follows: ral to each other. There are residual conducted using largely routine operation erred from a Technical Feasibility p field equipment. (Score 1) W ry from Excursion sub-criterion is as for trian both partial removal options due to Option 5 as recovery is similar in b equally preferred from an Ease of	Survey Vessel (Legacy): 16.1 days Nemoving the lines leaves limited legacy marine impact. The environmental is a long time period. It is noted that PL1554 and PL1661 have residual War act of the lines remaining in-situ is similar for both options. Its perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) Noncerns regarding the ability to Reverse Reel these lines through existing costs. Prespective. Recovery is achievable with existing in-field equipment. (Score 1) Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Proportions. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs. Noncerns regarding the ability to Reverse Reel these lines through existing costs.	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) over due to uncertain residual integrity however the assessment has Recovery is achievable with existing in-field equipment. (Score 1) by reverse reeling should it be dropped during an unplanned excursion.
3. Technical o 3. Technical	3.1 Technical aum 3.2 Ease of aum 3.1 Technical aum Recovery from the Excursion aum Feasibility Aum 2.4	The assessment of the Legacy Marine is Option 2B is assessed as being Stroug as any residual contents and degradatic being left in-situ. The legacy marine imported in the property of the provided in the pro	Impacts sub-criterion is as follows: er than the partial removal options as ro products will be released slowly ove pact is still considered low. It to Option 5 as the environmental importation of the control of the	Survey Vessel (Legacy): 16.1 days Nemoving the lines leaves limited legacy marine impact. The environmental is a long time period. It is noted that PL1554 and PL1661 have residual Warsact of the lines remaining in-situ is similar for both options. Its perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) Noncerns regarding the ability to Reverse Reel these lines through existing costs. Prespective. Recovery is achievable with existing in-field equipment. (Score 1) Noncerns regarding the ability to Reverse Reel these lines through existing costs. Prespective. Recovery from Excursion perspective. Standard equipment available from multiple suppliers with well documented and proven track record. (Score 1)	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) over due to uncertain residual integrity however the assessment has Recovery is achievable with existing in-field equipment. (Score 1) by reverse reeling should it be dropped during an unplanned excursion.
3. Technical 3. Technical 0.	3.3 Use of Proven 3.2 Ease of Technical and Technical and Technical and Excursion can be easibility to the Expursion can be easibility to the easibility to the easibility can be easibility to the easibility to	The assessment of the Legacy Marine is Option 2B is assessed as being Strose point of the Control of the Contro	Impacts sub-criterion is as follows: er than the partial removal options as ro products will be released slowly ove pact is still considered low. I to Option 5 as the environmental impact is still considered low. I to Option 5 as the environmental impact is still considered low. I to Option 5 as the environmental impact is still considered low. I will be still be stil	Survey Vessel (Legacy): 16.1 days Nemoving the lines leaves limited legacy marine impact. The environmental is raily a long time period. It is noted that PL1554 and PL1661 have residual War act of the lines remaining in-situ is similar for both options. Its perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) Noncerns regarding the ability to Reverse Reel these lines through existing constant in the scale is comparable with similar scopes completed. (Score 1) Noncerns regarding the ability to Reverse Reel these lines through existing constant in the scale is comparable with similar scopes completed. (Score 1) Noncerns regarding the ability to Reverse Reel these lines through existing constant in the score is score in the scale is comparable with similar scopes completed. (Score 1) Noncerns regarding the ability to Reverse Reel these lines through existing constant in the score is score in the score in the scale is comparable with similar scopes completed. (Score 1)	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low or and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) over due to uncertain residual integrity however the assessment has Recovery is achievable with existing in-field equipment. (Score 1) by reverse reeling should it be dropped during an unplanned excursion. Standard equipment available from multiple suppliers with well documented and proven track record. (Score 1)
3. Technical 3. Technical 0.	3.3 Les of Proven 3.2 Ease of 3.1 Technology and Recovery from 5 Feasibility 4.2 Equipment 2.4	The assessment of the Legacy Marine is Option 2B is assessed as being Strose point of the Control of the Contro	Impacts sub-criterion is as follows: er than the partial removal options as re products will be released slowly ove pact is still considered low. It to Option 5 as the environmental impact of the option option of the option of the option of the option op	Survey Vessel (Legacy): 16.1 days N emoving the lines leaves limited legacy marine impact. The environmental if a long time period. It is noted that PL1554 and PL1661 have residual War act of the lines remaining in-situ is similar for both options. Is perspective. Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) N oncerns regarding the ability to Reverse Reel these lines through existing costs. Properties. Recovery is achievable with existing in-field equipment. (Score 1) Illows: to requirement to locate and connect to the line end for continued recovery oth options. Recovery from Excursion perspective. Standard equipment available from multiple suppliers with well documented and proven track record. (Score 1)	Suney Vessel (Legacy): 16.1 days mpacts associated with the lines remaining in-situ are expected to be low or and Scale Inhibitor in blocked cores that cannot be flushed prior to the Concept is technologically feasible. The scale is comparable with similar scopes completed. (Score 1) over due to uncertain residual integrity however the assessment has Recovery is achievable with existing in-field equipment. (Score 1) by reverse reeling should it be dropped during an unplanned excursion. Standard equipment available from multiple suppliers with well documented and proven track record. (Score 1)



	O2B - Reverse Installation (Reel)		O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)
4. Societal	Short term disruption may occur during for fishing. (Score 2)	operations. Thereafter seabed clear	Short term disruption may occur during operations. Thereafter seabed generally clear for fishing, small amount of additional rock profiled to accommodate trawling. (Score 2)	Short term disruption may occur during operations. Thereafter seabed clear for fishing, small amount of rock on pipeline ends, profiled to accommodate trawling. (Score 2)
	S	S	W	
	situ in both partial removal options.	ger than both partial removal options as er than option 5 as while the lines rema	the lines are fully removed whereas, the introduction of rock cover over the in in-situ in both options, the additional of the rock berms in Option 4A res shing perspective.	•
cts	Short term impact on communities, po-	sitive from an economic perspective.	No impact on communities. (Score 1)	No impact on communities. (Score 1)
atal mic Impa es and nities	(Score 2) Materials Returned: Steel: 532 tonnes (recyclable)		Materials Returned: Steel: 4 tonnes (recyclable) Copper: 1 tonnes (recyclable)	Materials Returned: Steel: 10 tonnes (recyclable) Copper: 3 tonnes (recyclable)
4. Societal 4.2 Socio-economic Impacts on Amenities and Communities	Copper: 133 tonnes (récyclable) Polymer: 431 tonnes (landfill)		Polymer: 3 tonnes (landfill) '	Polymer: 8 tonnes (landfill)
	N	N	N	
5. Economic 5.1 Short-term Costs	destined for landfill (polymer). Overall t	he positive and negative societal impac	e useful (recyclable) material returned in Option 25 (steel and copper), this ts were considered to be balanced for all options. cts on Amenities and Communities perspective.	£2.764 Million
	MW	w	S	
Summary	is almost 3 times greater or around £4.	Weaker than Option 4A as the cost to 8 million more. ger than Option 5 as the execution cost	execute the option is more than 7 times greater or around £6.6 million more for option 5 is more than double or around £1.7 million more. scrive.	re. Option 2B is assessed as Weaker than Option 5 as the execution cost
υΕ	Surveys: £0.613 Million		Surveys: £0.804 Million	Surveys: £0.805 Million
5. Economic 5.2 Long-term Costs	FLTC: N/A Total Legacy Cost: £0.613 Million		FLTC: N/A Total Legacy Cost: £0.804 Million	FLTC: £225 Total Legacy Cost: £0.805 Million
	N	N	N	
Summary	The assessment of the Long-term Cost All options are assessed as being Neu monitor the under crossings (2 off) rem Overall, all options are equally pref	tral to each other as, while the legacy of aining in Option 2B.	costs for surveying & monitoring associated with the partial removal options	are greater than the full removal option, there remains the requirement to

Appendix D.2 Group 2 Pairwise Comparison Matrices - Safety

1.1 Operations Personnel	O2B - Reverse Installation (Reel) without Deburial (Full Removal)	04A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting	1.2 Legacy Risk	O2B - Reverse Installation (Reel) without Deburial (Full Removal)	04A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2B - Reverse Installation (Reel) without Deburial (Full Removal)	N	MW	w	18.6%	O2B - Reverse Installation (Reel) without Deburial (Full Removal)	N	s	s	42.6%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	MS	N	S	50.7%	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	w	N	w	24.8%
05 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	s	w	N	30.7%	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	w	s	N	32.5%

Report: Banff and Kyle Phase 2 and 3 Decommissioning Support – Comparative Assessment Report

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33.3%

33.3%

33.3%

69

Appendix D.3 Group 2 Pairwise Comparison Matrices - Environment

2.1 Operational Marine Impact	O2B - Reverse Installation (Reel) without Deburial (Full Removal)	04A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2B - Reverse Installation (Reel) without Deburial (Full Removal)	N	×	×	25.0%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	s	N	N	37.5%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	s	N	N	37.5%

2.2 Atmospheric Emissions, Fuel & Energy Consumption	O2B - Reverse Installation (Reel) without Deburial (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)
O2B - Reverse Installation (Reel) without Deburial (Full Removal)	N	N	N
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	N	N	N

2.3 Seabed Disturbance	O2B - Reverse Installation (Reel) without Deburial (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2B - Reverse Installation (Reel) without Deburial (Full Removal)	N	N	N	33.1%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	w	28.9%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	N	S	N	37.9%

2.4 Legacy Marine Impacts	O2B - Reverse Installation (Reel) without Deburial (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2B - Reverse Installation (Reel) without Deburial (Full Removal)	N	s	s	42.9%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	w	N	N	28.6%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	w	N	z	28.6%



Appendix D.4 Group 2 Pairwise Comparison Matrices – Technical

3.1 Technical Feasibility	O2B - Reverse Installation (Reel) without Deburial (Full Removal)	04A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2B - Reverse Installation (Reel) without Deburial (Full Removal)	N	N	z	33.3%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	33.3%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	N	N	N	33.3%

3.2 Ease of Recovery from Excursion	O2B - Reverse Installation (Reel) without Deburial (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2B - Reverse Installation (Reel) without Deburial (Full Removal)	N	w	w	25.0%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	s	N	Z	37.5%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	s	N	N	37.5%

3.3 Use of Proven Technology and Equipment	O2B - Reverse Installation (Reel) without Deburial (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	
O2B - Reverse Installation (Reel) without Deburial (Full Removal)	N	N	N	
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	N	N	N	

33.3% 33.3%

Appendix D.5 Group 2 Pairwise Comparison Matrices - Societal

4.1 Fishing	O2B - Reverse Installation (Reel) without Deburial (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2B - Reverse Installation (Reel) without Deburial (Full Removal)	N	s	s	42.6%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	w	N	w	24.8%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	w	S	N	32.5%

4.2 Socio- economic Impacts on Amenities and Communities	O2B - Reverse Installation (Reel) without Deburial (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2B - Reverse Installation (Reel) without Deburial (Full Removal)	N	N	N	33.3%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	33.3%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	N	N	N	33.3%

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Appendix D.6 Group 2 Pairwise Comparison Matrices - Economic

5.1 Short-term Costs	O2B - Reverse Installation (Reel) without Deburial (Full Removal)	04A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2B - Reverse Installation (Reel) without Deburial (Full Removal)	N	MW	8	18.6%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	MS	N	s	50.7%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	s	w	N	30.7%

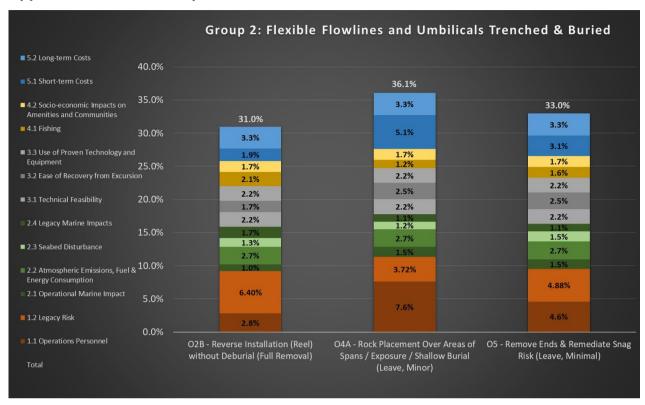
Weighting	
18.6%	02
50.7%	Ex
30.7%	

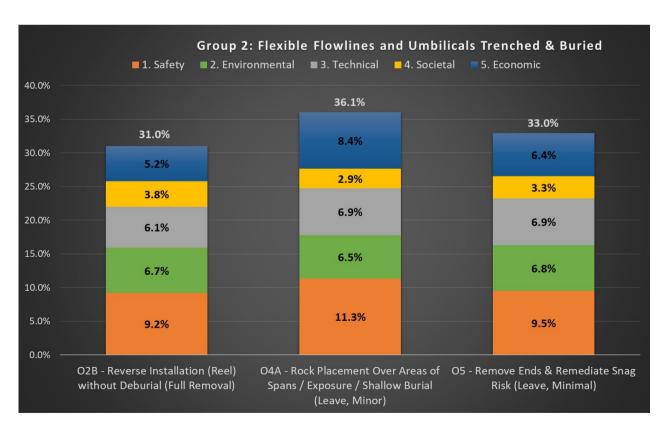
5.2 Long-term Costs	O2B - Reverse Installation (Reel) without Deburial (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure , Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2B - Reverse Installation (Reel) without Deburial (Full Removal)	N	N	N	33.3%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	33.3%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	N	N	N	33.3%

Assignment Number: A400315-S00



Appendix D.7 Group 2 Results Charts







APPENDIX E GROUP 4 - DETAILED EVALUATION RESULTS

Appendix E.1 Group 4 Attributes Table

		O2A - Cut and Lift	t (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)				
		- Lines already cut / disconnected at e		- Lines already cut / disconnected at ends.	- Lines already cut / disconnected at ends.				
		 Lines will be deburied where required cutting. 	by bucket excavation to access for	Surface laid sections (out with trench) will be rock covered. Rock placement at all areas of spans and exposure.	Surface laid sections (out with rock cover) cut into sections using hydraulic shears, recovered to vessel and returned to shore for				
		Lines cut into sections using hydrauli	ic shears recovered to vessel and	- Nook placement at all aleas of spans and exposure.	processing.				
		returned to shore for processing.			- Rock placement to remediate snag risk from cut ends.				
		Vessel Type: PoB / Days / Hours / PL	L	Vessel Type: PoB / Days / Hours / PLL	Vessel Type: PoB / Days / Hours / PLL				
		DSV: 110 / 9.2 / 12,104 / 9.08E-04		Rockdump Vessel: 20 / 6.7 / 1,610 / 1.21E-04	CSV: 76 / 9.1 / 8,290 / 6.22E-04				
		Divers: 18 / 9.2 / 3,961 / 3.84E-03 CSV: 76 / 104.4 / 95,222 / 7.14E-03		Total offshore hours: 1,610 hrs	Total offshore hours: 8,290 hrs				
		•		Total offshore PLL: 1.21E-04	Total offshore PLL: 6.22E-04				
		Total offshore hours: 111,288 hrs Total offshore PLL: 1.19E-02		December Times Davis / House / DLI	Descriptor Times Design / House / PUI				
	ᅙ	Total disrible PLL. 1.19E-02		Resource Type: Days / Hours / PLL Engineering & Management: 48.5 / 388 / 1.55E-06	Resource Type: Days / Hours / PLL Engineering & Management: 110.3 / 882 / 3.53E-06				
Ę	Operations Personnel	Resource Type: Days / Hours / PLL		Project Management: 60.0 / 480 / 1.92E-06	Project Management: 123.0 / 984 / 3.94E-06				
ő	8	Engineering & Management: 1,527.9 / Project Management: 1,484.0 / 11,872		Total onshore hours: 868 hrs	Onshore Operations (includes Cleaning & Disposal): 1.0 / 64 / 7.87E-06				
_	io	Onshore Operations (includes Cleaning			Total onshore hours: 1,930 hrs				
	erat	04		Total operational hours: 2,479 hrs	Total onshore PLL: 1.53E-05				
	Ö	Total onshore hours: 25,248 hrs		Total operational PLL: 1.24E-04	Total operational hours: 10,220 hrs				
	÷	Total onshore PLL: 2.38E-04			Total operational PLL: 6.37E-04				
		Total operational hours: 136,535 hrs							
		Total operational PLL: 1.21E-02							
		Largely routine operations. Potential for through water column (1102 (184 if burn	or dropped object from multiple lifts	Largely routine operations. No potential for dropped object as no lifting with this option.	Largely routine operations. Potential for dropped object from multiple lifts through water column (20 (4 if bundled) lifts). In addition there is the				
		offloading associated with transferring t	the pipeline to quayside.	with this option.	offloading associated with transferring the pipeline to quayside.				
		VMW	MW	S					
		The assessment of the Operations Per							
				erisk exposure is much higher due to the extended offshore operations and ial in Option 4A. Option 2A is assessed as being Much Weaker than Optio					
	Summary	use of divers and the high number of of			in 5 due to the higher lisk exposure from the greater dishlore scope, the				
		Option 4A is assessed as being Strong	ger than Option 5 as the offshore sco	ope is smaller and impacts fewer personnel due to lower PoB on the Rockd	ump Vessel versus the CSV. There is also offshore lifts of the lines				
		through the water column to the vessel in Option 5. Overall, Option 4A is the preferred option from a risk to Operations Personnel perspective.							
		A small legacy risk remains with Option 2A as a single under crossing will remain.		The lines remain in-situ with this option although the majority of their length is fully trenched and buried as there are no areas of spans or	The lines remain in-situ with this option although they are fully trenched and buried as there are no areas of spans or exposure. Their surface laid				
		leman.		exposure. Their surface laid line ends will be rock covered to mitigate	ends will be removed.				
	Risk	The survey & monitoring programme is committed to ensuring that the		potential snag hazard.					
fety	R	potential snag hazard from left in-situ infrastructure continues to be managed & mitigated as appropriate. The legacy risk associated with this		The survey & monitoring programme is committed to ensuring that the	The survey & monitoring programme is committed to ensuring that the potential snag hazard from left in-situ infrastructure continues to be				
Sa	ğ	survey and monitoring programme is:		potential snag hazard from left in-situ infrastructure continues to be	managed & mitigated as appropriate. The legacy risk associated with				
	Ø.	duritoy and morntoning programmo to.							
-	I.2 Legacy		1	managed & mitigated as appropriate. The legacy risk associated with	this survey and monitoring programme is:				
-	1.2 Le	Vessel Type: PoB / Days / Hours / PL Survey Vessel (Legacy): 44 / 12.1 / 6,4		this survey and monitoring programme is:	Vessel Type: PoB / Days / Hours / PLL				
-	1.2 Le	Vessel Type: PoB / Days / Hours / PL		this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL					
_	1.2 Le	Vessel Type: PoB / Days / Hours / PLI Survey Vessel (Legacy): 44 / 12.1 / 6,4	405 / 4.80E-04	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,065 / 5.30E-04	Vessel Type: PoB / Days / Hours / PLL				
_	1.2 Le	Vessel Type: PoB / Days / Hours / PL	405 / 4.80E-04 S	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL	Vessel Type: PoB / Days / Hours / PLL				
_	1.2 Le	Vessel Type: PoB / Days / Hours / PL Survey Vessel (Legacy): 44 / 12.1 / 6,6 The assessment of the Legacy Risk st Option 2A is assessed as being Strong	\$ ub-criterion is as follows:	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,065 / 5.30E-04	Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5,29E-04				
-	Summary	Vessel Type: PoB / Days / Hours / PL Survey Vessel (Legacy): 44 / 12.1 / 6.4 S The assessment of the Legacy Risk su Option 2A is assessed as being Strong condition.	\$ ub-criterion is as follows: ger than both partial removal options	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7.065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. T	Vessel Type: PoB / Days / Hours / PLL. Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 he crossing that remains in Option 2A shall be left in an overtrawlable				
-	1.2	Vessel Type: PoB / Days / Hours / PL Survey Vessel (Legacy): 44 / 12.1 / 6.4 S The assessment of the Legacy Risk st Option 2A is assessed as being Strong condition. Option 4A is assessed as being Neutro Option 5A. is assessed as being Neutro	405 / 4.80E-04 S ub-criterion is as follows: ger than both partial removal options al to Option 5 as the lines are fully tr nonitoring programme will be perform	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. T enched and buried. The introduction of rock berms over the ends of the 2 lied to ensure that the as left condition of the partial removal options remains	Vessel Type: PoB / Days / Hours / PLL Suney Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 he crossing that remains in Option 2A shall be left in an overtrawlable hes (4 berms) in Option 4A was insufficient to express a preference for				
-	1.2	Vessel Type: PoB / Days / Hours / PL Suney Vessel (Legacy): 44 / 12.1 / 6.4 S The assessment of the Legacy Risk st Option 2A is assessed as being Strong condition. Option 4A is assessed as being Neutro	405 / 4.80E-04 S ub-criterion is as follows: ger than both partial removal options al to Option 5 as the lines are fully tr nonitoring programme will be perform	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. T enched and buried. The introduction of rock berms over the ends of the 2 lied to ensure that the as left condition of the partial removal options remains perspective.	Vessel Type: PoB / Days / Hours / PLL Suney Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 he crossing that remains in Option 2A shall be left in an overtrawlable hes (4 berms) in Option 4A was insufficient to express a preference for				
-	1.2	Vessel Type: PoB / Days / Hours / PL Survey Vessel (Legacy): 44 / 12.1 / 6.4 S The assessment of the Legacy Risk to Option 2A is assessed as being Stron condition. Option 4A is assessed as being Neutr Option 5. It is noted that a survey & m Overall, Option 2A is the preferred	405 / 4.80E-04 S ub-criterion is as follows: ger than both partial removal options al to Option 5 as the lines are fully tr nonitoring programme will be perform	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. T enched and buried. The introduction of rock berms over the ends of the 2 li ed to ensure that the as left condition of the partial removal options remains perspective. Vessel Noise (days on-site):	Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 ne crossing that remains in Option 2A shall be left in an overtrawlable nes (4 berms) in Option 4A was insufficient to express a preference for overtrawlable. Vessel Noise (days on-site):				
-	1.2	Vessel Type: PoB / Days / Hours / PL Survey Vessel (Legacy): 44 / 12.1 / 6.4 S The assessment of the Legacy Risk st Option 2A is assessed as being Strong condition. Option 4A is assessed as being Neutr Option 5. It is noted that a survey & m Overall, Option 2A is the preferred	405 / 4.80E-04 S ub-criterion is as follows: ger than both partial removal options al to Option 5 as the lines are fully tr nonitoring programme will be perform	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. T enched and buried. The introduction of rock berms over the ends of the 2 lied to ensure that the as left condition of the partial removal options remains perspective.	Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 ne crossing that remains in Option 2A shall be left in an overtrawlable nes (4 berms) in Option 4A was insufficient to express a preference for overtrawlable.				
	1.2	Vessel Type: PoB / Days / Hours / PL Suney Vessel (Legacy): 44 / 12.1 / 6.4 S The assessment of the Legacy Risk st Option 2A is assessed as being Strong condition. Option 4A is assessed as being Neutra Option 5. It is noted that a suney & m Overall, Option 2A is the preferred of Vessel Noise (days on-site): 96 days Tooling noise:	405 / 4.80E-04 S ub-criterion is as follows: ger than both partial removal options al to Option 5 as the lines are fully tr nonitoring programme will be perform	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. T enched and buried. The introduction of rock berms over the ends of the 2 li ed to ensure that the as left condition of the partial removal options remains perspective. Vessel Noise (days on-site): 3 days Tooling noise:	Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 ne crossing that remains in Option 2A shall be left in an overtrawlable nes (4 berms) in Option 4A was insufficient to express a preference for overtrawlable. Vessel Noise (days on-site): 7 days Tooling noise:				
	1.2	Vessel Type: PoB / Days / Hours / PL Survey Vessel (Legacy): 44 / 12.1 / 6.4 S The assessment of the Legacy Risk st Option 2A is assessed as being Strong condition. Option 4A is assessed as being Neutro Option 5. It is noted that a survey & m Overall, Option 2A is the preferred of the state of the sta	405 / 4.80E-04 S ub-criterion is as follows: ger than both partial removal options al to Option 5 as the lines are fully tr nonitoring programme will be perform	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy); 44 / 13.4 / 7,065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. T enched and buried. The introduction of rock berms over the ends of the 2 li ed to ensure that the as left condition of the partial removal options remains perspective. Vessel Noise (days on-site): 3 days	Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 the crossing that remains in Option 2A shall be left in an overtrawlable thes (4 berms) in Option 4A was insufficient to express a preference for overtrawlable. Vessel Noise (days on-site): 7 days				
:	Summary	Vessel Type: PoB / Days / Hours / PL Suney Vessel (Legacy): 44 / 12.1 / 6.4 S The assessment of the Legacy Risk st Option 2A is assessed as being Strong condition. Option 4A is assessed as being Neutra Option 5. It is noted that a suney & m Overall, Option 2A is the preferred of Vessel Noise (days on-site): 96 days Tooling noise:	405 / 4.80E-04 S ub-criterion is as follows: ger than both partial removal options al to Option 5 as the lines are fully tr nonitoring programme will be perform	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. T enched and buried. The introduction of rock berms over the ends of the 2 li ed to ensure that the as left condition of the partial removal options remains perspective. Vessel Noise (days on-site): 3 days Tooling noise:	Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 he crossing that remains in Option 2A shall be left in an overtrawlable hes (4 berms) in Option 4A was insufficient to express a preference for overtrawlable. Vessel Noise (days on-site): 7 days Tooling noise: 0 days Operational Discharges:				
	Summary	Vessel Type: PoB / Days / Hours / PL Survey Vessel (Legacy): 44 / 12.1 / 6.4 S The assessment of the Legacy Risk st Option 2A is assessed as being Strong condition. Option 4A is assessed as being Neutr Option 5. It is noted that a survey & m Overall, Option 2A is the preferred of Vessel Noise (days on-site): 96 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations v	S ub-criterion is as follows: ger than both partial removal options al to Option 5 as the lines are fully tr nonitoring programme will be perform option from a risk to Other Users	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy); 44 / 13.4 / 7,065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. T enched and buried. The introduction of rock berms over the ends of the 2 li ed to ensure that the as left condition of the partial removal options remains perspective. Vessel Noise (days on-site): 3 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental	Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 he crossing that remains in Option 2A shall be left in an overtrawlable nes (4 berms) in Option 4A was insufficient to express a preference for overtrawlable. Vessel Noise (days on-site): 7 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental				
iental	Summary	Vessel Type: PoB / Days / Hours / PL Survey Vessel (Legacy): 44 / 12.1 / 6,4 Began Selection of the Legacy Risk st Option 2A is assessed as being Strong condition. Option 4A is assessed as being Neutra Option 5. It is noted that a survey & m Overall, Option 2A is the preferred of Vessel Noise (days on-site): 96 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations v (BEP) and the Best Available Techniqu	405 / 4.80E-04 S ub-criterion is as follows: ger than both partial removal options al to Option 5 as the lines are fully tr nonitoring programme will be perform option from a risk to Other Users will use Best Environmental Practice use (BAT) to minimise as far as	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. T enched and buried. The introduction of rock berms over the ends of the 2 li ed to ensure that the as left condition of the partial removal options remains perspective. Vessel Noise (days on-site): 3 days Tooling noise: 0 days Operational Discharges: Line cleaning and fushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as	Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 ne crossing that remains in Option 2A shall be left in an overtrawlable nes (4 berms) in Option 4A was insufficient to express a preference for overtrawlable. Vessel Noise (days on-site): 7 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as				
onmental	Summary	Vessel Type: PoB / Days / Hours / PL Survey Vessel (Legacy): 44 / 12.1 / 6.4 S The assessment of the Legacy Risk st Option 2A is assessed as being Strong condition. Option 4A is assessed as being Neutr Option 5. It is noted that a survey & m Overall, Option 2A is the preferred of Vessel Noise (days on-site): 96 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations v	S ub-criterion is as follows: ger than both parial removal options al to Option 5 as the lines are fully tr nonitoring programme will be perform option from a risk to Other Users will use Best Environmental Practice use (BAT) to minimise as far as d other chemical levels in line post	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. T enched and buried. The introduction of rock berms over the ends of the 2 li ed to ensure that the as left condition of the partial removal options remains perspective. Vessel Noise (days on-site): 3 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing	Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 ne crossing that remains in Option 2A shall be left in an overtrawlable nes (4 berms) in Option 4A was insufficient to express a preference for overtrawlable. Vessel Noise (days on-site): 7 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing				
nvironmental	Summary	Vessel Type: PoB / Days / Hours / PL Survey Vessel (Legacy): 44 / 12.1 / 6.4 S The assessment of the Legacy Risk st Option 2A is assessed as being Strong condition. Option 4A is assessed as being Neutro Option 5A is assessed as being Neutro Option 5. It is noted that a survey & m Overall, Option 2A is the preferred of Vessel Noise (days on-site): 96 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations v (BEP) and the Best Available Technic	S ub-criterion is as follows: ger than both partial removal options al to Option 5 as the lines are fully tr nonitoring programme will be perform option from a risk to Other Users will use Best Environmental Practice use (BAT) to minimise as far as d other chemical levels in line post dronment during flushing activities.	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy); 44 / 13.4 / 7,065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. T enched and buried. The introduction of rock berms over the ends of the 2 li ed to ensure that the as left condition of the partial removal options remains perspective. Vessel Noise (days on-site): 3 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line	Vessel Type: PoB / Days / Hours / PLL. Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 the crossing that remains in Option 2A shall be left in an overtrawlable nes (4 berms) in Option 4A was insufficient to express a preference for overtrawlable. Vessel Noise (days on-site): 7 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line				
2. Environmental	1.2	Vessel Type: PoB / Days / Hours / PL Survey Vessel (Legacy): 44 / 12.1 / 6,4 Section 1.	\$ ub-criterion is as follows: ger than both partial removal options al to Option 5 as the lines are fully tr nonitoring programme will be perform option from a risk to Other Users will use Best Environmental Practice use (BAT) to minimise as far as d other chemical levels in line post dironment during flushing activities. uould lead to an elevated discharge given the prior cleaning of the line,	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. The enched and buried. The introduction of rock berms over the ends of the 2 lied to ensure that the as left condition of the partial removal options remains perspective. Vessel Noise (days on-site): 3 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends would lead to an elevated discharge of fluids from	Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 ne crossing that remains in Option 2A shall be left in an overtrawlable nes (4 berms) in Option 4A was insufficient to express a preference for overtrawlable. Vessel Noise (days on-site): 7 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends and midline cuts would lead to an elevated discharge				
2. Environmental	Operational Marine Impact and Control of Con	Vessel Type: PoB / Days / Hours / PL Suney Vessel (Legacy): 44 / 12.1 / 6.4 S The assessment of the Legacy Risk st Option 2A is assessed as being Strong condition. Option A1 is assessed as being Neutro Option 5. It is noted that a suney & m Overall, Option 2A is the preferred of Vessel Noise (days on-site): 96 days Tooling noise: 0 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations v (BEP) and the Best Available Techniqu possible both residual hydrocarbon and flush and discharges to the marine env Cutting of line ends and midline cuts w of fluids from within the line. However, the concentration and quantity of disch	S ub-criterion is as follows: ger than both partial removal options al to Option 5 as the lines are fully tr nonitoring programme will be perform option from a risk to Other Users will use Best Environmental Practice use (BAT) to minimise as far as other chemical levels in line post dronment during flushing activities. would lead to an elevated discharge gleated to an elevated of the line, harge should still be low overall.	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy); 44 / 13.4 / 7,065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. T enched and buried. The introduction of rock berms over the ends of the 2 li ed to ensure that the as left condition of the partial removal options remains perspective. Vessel Noise (days on-site): 3 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends would lead to an elevated discharge of fluids from within the line. However, given the prior cleaning of the line, the	Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 the crossing that remains in Option 2A shall be left in an overtrawlable nes (4 berns) in Option 4A was insufficient to express a preference for overtrawlable. Vessel Noise (days on-site): 7 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends and midline cuts would lead to an elevated discharge of fluids from within the line. However, given the prior cleaning of the line,				
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2. Environmental	Operational Marine Impact and Control of Con	Vessel Type: PoB / Days / Hours / PL Suney Vessel (Legacy): 44 / 12.1 / 6.4 The assessment of the Legacy Risk st Option 2A is assessed as being Strong condition. Option A is assessed as being Neutro Option 5. It is noted that a suney & m Overall, Option 2A is the preferred of Vessel Noise (days on-site): 96 days Tooling noise: 0 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations v (BEP) and the Best Available Technique possible both residual hydrocarbon and flush and discharges to the marine env Cutting of line ends and midline cuts w of fluids from within the line. However, the related impact is also an Vessel Discharges:	S ub-criterion is as follows: ger than both partial removal options all to Option 5 as the lines are fully tr nonitoring programme will be perform option from a risk to Other Users will use Best Environmental Practice less (BAT) to minimise as far as d other chemical levels in line post dromment during flushing activities, would lead to an elevated discharge given the prior cleaning of the line, narge should still be low overall. Inticipated to be low.	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. T enched and buried. The introduction of rock berms over the ends of the 2 li ed to ensure that the as left condition of the partial removal options remains perspective. Vessel Noise (days on-site): 3 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends would lead to an elevated discharge of fluids from within the line. However, given the prior cleaning of the line, the concentration and quantity of discharge should still be low overall. Therefore, the related impact is also anticipated to be low.	Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 ne crossing that remains in Option 2A shall be left in an overtrawlable nes (4 berms) in Option 4A was insufficient to express a preference for overtrawlable. Vessel Noise (days on-site): 7 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends and midline cuts would lead to an elevated discharge of fluids from within the line. However, given the prior cleaning of the line, the concentration and quantity of discharge should still be low overall. Therefore, the related impact is also anticipated to be low.				
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2. Environmental	Operational Marine Impact and Control of Con	Vessel Type: PoB / Days / Hours / PL Survey Vessel (Legacy): 44 / 12.1 / 6,4 S S S C	S ub-criterion is as follows: ger than both partial removal options al to Option 5 as the lines are fully tr nonitoring programme will be perform option from a risk to Other Users will use Best Environmental Practice use (BAT) to minimise as far as d other chemical levels in line post vironment during flushing activities. would lead to an elevated discharge given the prior cleaning of the line, harge should still be low overall. inticipated to be low. Water, this is driven by duration of flays it is the highest of the options	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. The enched and buried. The introduction of rock berms over the ends of the 2 lies of the end of the state	Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 The crossing that remains in Option 2A shall be left in an overtrawlable nes (4 berms) in Option 4A was insufficient to express a preference for overtrawlable. Vessel Noise (days on-site): 7 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends and midline cuts would lead to an elevated discharge of fluids from within the line. However, given the prior cleaning of the line, the concentration and quantity of discharge should still be low overall. Therefore, the related impact is also anticipated to be low. Vessel Discharges: This includes Ballast, Grey and Black Water, this is driven by duration of				
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2. Environmental	2.1 Operational Marine Impact tree to the tree tree tree tree tree tree tree	Vessel Type: PoB / Days / Hours / PL Suney Vessel (Legacy): 44 / 12.1 / 6.4 S The assessment of the Legacy Risk st Option 2A is assessed as being Strong condition. Option 5. It is noted that a survey & m Overall, Option 2A is the preferred of the condition. Overall, Option 2A is the preferred of the condition	S ub-criterion is as follows: ger than both partial removal options all to Option 5 as the lines are fully tr nonitoring programme will be perform option from a risk to Other Users will use Best Environmental Practice use (BAT) to minimise as far as of other chemical levels in line post stronment during flushing activities. would lead to an elevated discharge given the prior cleaning of the line, narge should still be low overall. Inticipated to be low. Water, this is driven by duration of lays it is the highest of the options W arine Impact sub-criterion is as follow ter than both patrial removal options.	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7.065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. T enched and buried. The introduction of rock berms over the ends of the 2 li ed to ensure that the as left condition of the partial removal options remains perspective. Vessel Noise (days on-site): 3 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends would lead to an elevated discharge of fluids from within the line. However, given the prior cleaning of the line, the concentration and quantity of discharge should still be low overall. Therefore, the related impact is also anticipated to be low. Vessel Discharges: This includes Ballast, Grey and Black Water, this is driven by duration of vessel operations and therefore at 3 days it is the lowest of the options being evaluated. N s: due to a combination of the low impact releases from the cutting of the lines.	Vessel Type: PoB / Days / Hours / PLL. Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 ne crossing that remains in Option 2A shall be left in an overtrawlable nes (4 berms) in Option 4A was insufficient to express a preference for overtrawlable. Vessel Noise (days on-site): 7 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends and midline cuts would lead to an elevated discharge of fluids from within the line. However, given the prior cleaning of the line, the concentration and quantity of discharge should still be low overall. Therefore, the related impact is also anticipated to be low. Vessel Discharges: This includes Ballast, Grey and Black Water, this is driven by duration of vessel operations and therefore at 7 days it is similar to Option 4A and much lower than Option 2A.				
z. Environmental	Operational Marine Impact and Control of Con	Vessel Type: PoB / Days / Hours / PL Suney Vessel (Legacy): 44 / 12.1 / 6.4 S The assessment of the Legacy Risk st Option 2A is assessed as being Strong condition. Option A is assessed as being Neutro Option 5. It is noted that a survey & m Overall, Option 2A is the preferred of Overall Option 2A is the preferred of Overall Option 2A is an overall Option 2A is a overall Option 2A is a overall Option 2A is assessed as heing Weak Option 2A is assessed as heing	S ub-criterion is as follows: ger than both partial removal options al to Option 5 as the lines are fully tr nonitoring programme will be perform option from a risk to Other Users will use Best Environmental Practice use (BAT) to minimise as far as d other chemical levels in line post romment during flushing activities. would lead to an elevated discharge given the prior cleaning of the line, narge should still be low overall. inticipated to be low. Water, this is driven by duration of days it is the highest of the options W arine Impact sub-criterion is as follow ere than both partial removal options.	this survey and monitoring programme is: Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,065 / 5.30E-04 N as the potential for future snag risk is reduced as the lines are removed. The enched and buried. The introduction of rock berms over the ends of the 2 lied to ensure that the as left condition of the partial removal options remains perspective. Vessel Noise (days on-site): 3 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends would lead to an elevated discharge of fluids from within the line. However, given the prior cleaning of the line, the concentration and quantity of discharge should still be low overall. Therefore, the related impact is also anticipated to be low. Vessel Discharges: This includes Ballast, Grey and Black Water, this is driven by duration of vessel operations and therefore at 3 days it is the lowest of the options being evaluated. N s: due to a combination of the low impact releases from the cutting of the lines inlier and low for both options.	Vessel Type: PoB / Days / Hours / PLL Survey Vessel (Legacy): 44 / 13.4 / 7,054 / 5.29E-04 ne crossing that remains in Option 2A shall be left in an overtrawlable nes (4 berms) in Option 4A was insufficient to express a preference for overtrawlable. Vessel Noise (days on-site): 7 days Tooling noise: 0 days Operational Discharges: Line cleaning and flushing operations will use Best Environmental Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line post flush and discharges to the marine environment during flushing activities. Cutting of line ends and midline cuts would lead to an elevated discharge of fluids from within the line. However, given the prior cleaning of the line, the concentration and quantity of discharge should still be low overall. Therefore, the related impact is also anticipated to be low. Vessel Discharges: This includes Ballast, Grey and Black Water, this is driven by duration of vessel operations and therefore at 7 days it is similar to Option 4A and much lower than Option 2A.				

Report: Banff and Kyle Phase 2 and 3 Decommissioning Support – Comparative Assessment Report

Assignment Number: A400315-S00



		O2A - Cut and Lif	ft (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)					
	2	Vessel Emissions (in tonnes):		Vessel Emissions (in tonnes): Fuel: 423	Vessel Emissions (in tonnes):					
	nerç	Fuel: 3,341 CO2: 10,593		CO2: 1,342	Fuel: 555 CO2: 1,761					
	«б	NOx: 198.48 SO2: 13.37		NOx: 25.14 SO2: 1.69	NOx: 32.99 SO2: 2.22					
=	2.2 Atmospheric Emissions, Fuel & Energy Consumption	Vessel Energy Use: 143,684 GJ		Vessel Energy Use: 18,200 GJ	Vessel Energy Use: 23,881 GJ					
Environmenta	ons, tion	Material Emissions (CO2 in tonnes):		Material Emissions (CO2 in tonnes):	Material Emissions (CO2 in tonnes):					
muo.	issi	Recovered Material: 522		Recovered Material:	Recovered Material: 10					
invir	Em ons	Remaining Material: Total: 522		Remaining Material: 979 Total: 979	Remaining Material: 962 Total: 972					
2. E	heric									
	osb	Energy Use (in GJ): Recovered Material: 6,572		Energy Use (in GJ): Recovered Material:	Energy Use (in GJ): Recovered Material: 93					
	Α	Remaining Material:		Remaining Material: 12,950	Remaining Material: 12,725					
	2.2	Rock: N/A		Rock: 2,800 tonnes	Rock: 96 tonnes					
		W	W	N						
		The assessment of the Atmospheric E	Emissions, Fuel & Energy Consumpti	ons sub-criterion is as follows:						
5	Summary	Option 2A is assessed as being Weal Option 4A is assessed as being Neut	ker than both partial removal options a ral to Option 5 as the small difference	as the emissions generated and fuel / energy consumed are greater and sul is in emissions generated and fuel / energy used were insufficient to expres	ficient to express a small preference for the partial removal options. s a preference.					
		Overall, Option 4A and Option 5 ar	e equally preferred from an Atmo	spheric Emissions, Fuel & Energy Consumptions perspective.	.,					
a		Operational Seabed Disturbance:		Operational Seabed Disturbance:	Operational Seabed Disturbance:					
Environmenta	ed nce	Habitat Loss (Rock Cover): 165,200 m		Habitat Loss (Rock Cover): 3,200 m2	Habitat Loss (Rock Bags): 85 m2					
ronn	2.3 Seabed Disturbance	Short Term Disturbance (Deburial): 33	5,040 III2	Legacy Seabed Disturbance:	Short Term Disturbance: 1,400 m2					
Envi	2.3 (Distu	Legacy Seabed Disturbance: Habitat Loss (Rock Cover): 165,200 m	2	Habitat Loss (Rock Cover): 3,200 m2	Legacy Seabed Disturbance: Habitat Loss (Rock Bags): 85 m2					
2.		Trabitat Loss (Nock Cover). 100,200 II	12		Habitat Loss (Nock Bags). 65 Hz					
		MW	MW	W						
				otions due to the impact associated with the deburial operations and the larg	er area of impact from depositing the existing rock cover along the					
\$	Summary	corridor of the lines. Ontion 4A is assessed as being Weal	ker than Ontion 5 as there is a larger	area of habitat loss associated with the rock cover in Option 4A.						
		Overall, Option 5 is the preferred of								
	,	The legacy marine impact from this fu			Line cleaning and flushing operations will use Best Environmental					
_	pact	impact associated with the survey & r crossing which remains in-situ. This i		Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line	Practice (BEP) and the Best Available Techniques (BAT) to minimise as far as possible both residual hydrocarbon and other chemical levels in line					
enta	Legacy Marine Impacts	_		post flush.	post flush.					
Environmenta		Vessel Days: Survey Vessel (Legacy): 12.1		The legacy marine impact from the slow release of these low	The legacy marine impact from the slow release of these low					
nvir		, , , , , , , , , , , , , , , , , , , ,		concentration / quantity discharges is therefore expected to be low	concentration / quantity discharges is therefore expected to be low					
2. E		Total vessel days: 12.1 days		overall.	overall.					
	2.4			Vessel Days: Survey Vessel (Legacy): 13.4 days	Vessel Days: Survey Vessel (Legacy): 13.4 days					
		S	S	N	54110y 100000 (Edgady). 10.1 days					
		The assessment of the Legacy Marine		The section of the Board Company of the Section of	discount of the death of the Property of the P					
\$	Summary	low as any residual contents and degr		as removing the lines leaves limited legacy marine impact. The environment wly over a long time period.	al impacts associated with the lines remaining in-situ are expected to be					
		Option 4A is assessed as being Neutral to Option 5 as the environmental impact of the lines remaining in-situ is similar for both options. Overall, Option 2A is the preferred option from a Legacy Marine Impacts perspective.								
					Consent is technologically faceible. The cools is minimal and cools.					
cal	z z	Concept is technologically feasible. T chain and assets may require some d		Concept is technologically feasible. The scale is minimal and easily accommodated by existing supply chain and assets may require some	Concept is technologically feasible. The scale is minimal and easily accommodated by existing supply chain and assets may require some					
Technica	3.1 Technical Feasibility	option. (Score 2)		development to accommodate the option. (Score 1)	development to accommodate the option. (Score 1)					
3. Te	.1 Te									
69	κi									
		W The assessment of the Technical Fea	cibility cub critorion is as follows:	N						
		Option 2A is assessed as being Weal	ker than both partial removal options	as, while the operations conducted for all options are largely routine, there a	re challenges associated with the deburial of the lines in Option 2A due to					
\$	Summary	the excavation required to gain access Option 4A is assessed as being Neut		lic shears. enges are minimal and similar for both options.						
		Overall, Option 4A and Option 5 ar								
	_	Recovery is achievable with existing in	n-field equipment. (Score 1)	Recovery is achievable with existing in-field equipment. (Score 1)	Recovery is achievable with existing in-field equipment. (Score 1)					
ical	3.2 Ease of Recovery from Excursion									
3. Technic	Eas very curs									
3. T	3.2 R 60 E X									
		N	ŅI .	N						
		The assessment of the Ease of Recov	N very from Excursion sub-criterion is as							
		All options are assessed as being Ne	utral to each other as the ability to re-	cover from an unplanned excursion is considered similar for all options.						
		Overall, all options are equally pre								
=	oven and	Standard equipment available from mu documented and proven track record.		Standard equipment available from multiple suppliers with well documented and proven track record. (Score 1)	Standard equipment available from multiple suppliers with well documented and proven track record. (Score 1)					
nica	f Pro ogy a	'		, , ,	, , ,					
Tech	se o mok quip									
က်	3.3 Use of Proven Technology and Equipment									
	**	N	N	N						
		The assessment of the Use of Proven	Technology and Equipment sub-crite	rion is as follows:						
	Summary			ed using routine operations with equipment that is readily available and has hnology and Equipment perspective.	an extensive track record.					
		,pnouro oquany pre								



	O2A - Cut and Lif	t (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)
4. Societal			Short term disruption may occur during operations. Thereafter seabed clear for fishing with small amount of additional rock. (Score 2)	Short term disruption may occur during operations. Thereafter seabed clear for fishing with small amount of additional rock. (Score 2)
N The assessment of the Societal impact on Fishing sub-criterion is as follows: Summary the 2 lines (4 berms) in Option 4A was insufficient to express a preference for Overall, all options are equally preferred from a Societal impact on Fish			are removed in Option 2A, the lines are fully trenched and buried under the for the other options.	partial removal options. The introduction of rock berms over the ends of
4. Societal 4.2 Socio-economic Impacts on Ameritles and Communities	Short term impact on communities, pr perspective. (Score 2) Materials Returned: Steel: 518 tonnes (recyclable) Polymer: 7 tonnes (landfill)	sitive from an economic	No impact. (Score 1) Materials Returned:	No impact. (Score 1) Materials Returned: Steel: 9 tonnes (recyclable) Polymer: 1 tonnes (landfill)
	N	N	N	
5. Economic 5.1 Short-term mm Costs	landfill (polymer). Overall the positive	utral to each other as, while there is r and negative societal impacts were c	unities sub-criterion is as follows: more useful (recyclable) material returned in Option 2A (steel), this is offset onsidered to be balanced for all options. pacts on Amenities and Communities perspective. £0.777 Million	by the significant quantity of material that will be likely to be destined for £1.389 Million
5. E				
	MW	MW	N	
Summary	execution cost is more than 10 times	n Weaker than Option 4A as the cost greater or around £13 million more. ral to Option 5 as while the execution	to execute the option is more than 18 times greater or around £14 million to cost for option 5 is around double that of Option 4A, the low cost of both o erm Cost perspective.	
mic g- sts	Surveys: £0.606 Million FLTC: N/A		Surveys: £0.669 Million FLTC: N/A	Surveys: £0.668 Million FLTC: £0 Million
5. Economic 5.2 Long- term Costs	Total Legacy Cost: £0.606 Million		Total Legacy Cost: £0.669 Million	Total Legacy Cost: £0.668 Million
	N	N	N	
Summary	The assessment of the Long-term Cos All options are assessed as being Nei no long-term costs for Option 2A was Overall, all options are equally pre	utral to each other as, while there are insufficient to express a preference.		al options, these are low costs and the differential between these costs and

Appendix E.2 Group 4 Pairwise Comparison Matrices - Safety

1.1 Operations Personnel	O2A - Cut and Lift (Full Removal)	04A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	vmw	MW	8.4%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	VMS	N	s	59.9%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	MS	w	N	31.7%

1.2 Legacy Risk	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure. Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	s	s	42.9%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	w	N	N	28.6%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	w	N	N	28.6%

Report: Banff and Kyle Phase 2 and 3 Decommissioning Support – Comparative Assessment Report

Assignment Number: A400315-S00



Appendix E.3 Group 4 Pairwise Comparison Matrices - Environment

2.1 Operational Marine Impact	O2A - Cut and Lift (Full Removal)	04A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	w	w	25.0%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	S	N	N	37.5%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	s	N	N	37.5%

2.2 Atmospheric Emissions, Fuel & Energy Consumption	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	w	w	25.0%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	S	N	N	37.5%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	s	N	N	37.5%

2.3 Seabed Disturbance	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	MW	MW	14.2%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	MS	N	w	37.1%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	MS	S	N	48.7%

2.4 Legacy Marine Impacts	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	s	s	42.9%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	w	N	N	28.6%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	w	N	N	28.6%



Appendix E.4 Group 4 Pairwise Comparison Matrices – Technical

3.1 Technical Feasibility	O2A - Cut and Lift (Full Removal)	04A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	w	8	25.0%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	S	N	N	37.5%
05 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	S	N	N	37.5%

3.2 Ease of Recovery from Excursion	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	N	N	33.3%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	33.3%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	N	N	N	33.3%

3.3 Use of Proven Technology and Equipment	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	
O2A - Cut and Lift (Full Removal)	N	N	N	
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	N	N	N	

33.3% 33.3%

Appendix E.5 Group 4 Pairwise Comparison Matrices - Societal

4.1 Fishing	02A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	N	N	33.3%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	33.3%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	N	N	N	33.3%

4.2 Socio- economic Impacts on Amenities and Communities	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	N	N	33.3%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	33.3%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	N	N	N	33.3%

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Appendix E.6 **Group 4 Pairwise Comparison Matrices - Economic**

5.1 Short-term Costs	02A - Cut and Lift (Full Removal)	04A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	MW	MW	14.3%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	MS	N	N	42.9%
O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	MS	N	N	42.9%

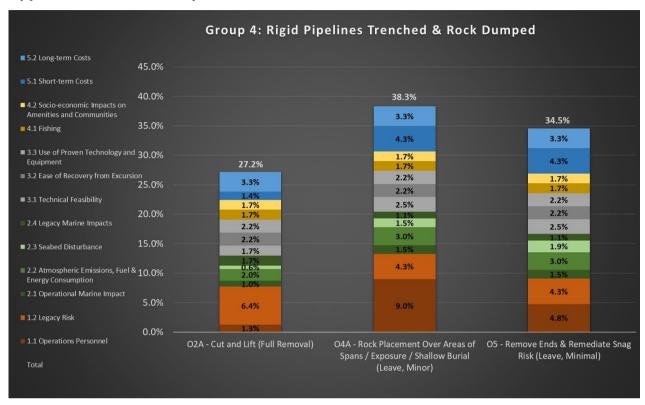
Weighting	5.2 Long-term Costs	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)
.3%	O2A - Cut and Lift (Full Removal)	N	N	Z
.9%	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	Ν
.9%	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	N	N	N

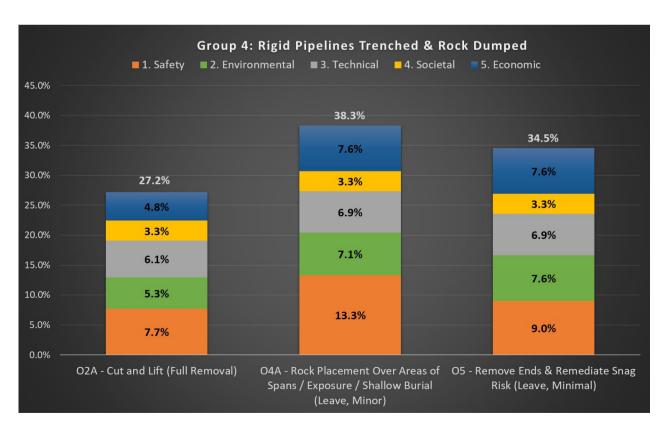
5.2 Long-term Costs	O2A - Cut and Lift (Full Removal)	O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	O5 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	Weighting
O2A - Cut and Lift (Full Removal)	N	z	z	33.3%
O4A - Rock Placement Over Areas of Spans / Exposure / Shallow Burial (Leave, Minor)	N	N	N	33.3%
05 - Remove Ends & Remediate Snag Risk (Leave, Minimal)	N	N	N	33.3%

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Appendix E.7 Group 4 Results Charts







APPENDIX F DECOMMISSIONING METHODOLGIES & DATASHEETS

Appendix F.1 Group 1 – Option 2a

PROJECT
CLIBIT
CURIT
CURIT
SUBJECT
ASSIGNMENT NUMBER
ASSIGNMENT NUMBER
A-00315-S00
CALCULATION NUMBER
A-00315-S00-CALC-001
R02
Group 1 Option 2A: Full Removal: Cut and Lift with Deburial

STATUTALS STAT		GRAND TOTAL	£33,552,326				
200 Project Street, 200 Project Street							
100							
The content		Project Services					
19			11-14	OTV.	V1		
Michael CREF 1.00			Unit	QIY	Vessei	Rate £K	I Otal £K
Column C	101		Day	1.00	DSV	140	140
Descript Change		Transit to Field (117nm @ 10kts)					
Description		Dredge Crossings - 200m of 8" Kyle North to Riser Base Prod pipe which crosses over the Fulmar					
Marcal Control Contr							
Seatleway - Triple Seatleway - Seatl		4hrs/cut)	Day	2.35	DSV	140	329
Description			Day	1.15	DSV	140	161
Description of Exercision of Exercision Description							
Machine CTV Total to 10							
Transect D-Field (TTTM ® 1862) 175 33 177 18	102						
Description Control							
Based on 15 Service of Sparkers, New 20th of 17 Culture Production for left of 15 Culture Production for l		DP Trials					
Cold Cold of projects (27mm to 22mm in dismoster) for this section. Note: 30mm of 17 Colder Production law for an excluder distribute lowery does 16 on section sections. Note: 30mm of 17 Colder Production law for a resident distribute lowery does 16 on section sections. Note: 30mm of 17 Colder Production law for a resident distribute lowery for 15m sections (Bag and tag of NORM positive propriets & sestimating of second page (2882 lamphs of page in total at 210 lamphships)		(based on 1.5m3/m of pipeline). Note: 200m of 12*Curlew Production line left undisturbed in vicinity	Day	90.04	CSV	75	6,753
Production for with or seasted undersidented in early where its crossed by forth Section 1 to 4 of 10 control (1 contro							
Peter Pete			Day	60.03	CSV	75	4,502
Peter Pete		2.					
Day 2.00 CSV 75 150 Trans to Perform (17mm (18s) Day 0.50 CSV 75 38 150 Day 1.00 CSV 75 38 38 Day 1.00 CSV 75 75 38 38 Day 1.00 CSV 75 75 38 Day 1.00 CSV 75 75 38 Day D		Recovery of 15m sections (Bag and tag of NORM positive pipelines & seafastening -45 mins/pipe)	Day	90.04	CSV	75	6,753
Transit Se Pedinaced (11 From 15 Octob) Day 0.00 CSV 75 75 75 75 75 75 75 7		Interim portcalls x 14 for offloading of recovered pipe (2882 lengths of pipe in total at 210 lengths/trip)	Day	28.00	CSV	75	2,100
Dig		Debris Recovery and As Left Surveys					
10 Officiare weather allowance December allow			Day Day				
10 Officiare weather allowance December allow							
12 Decominationing Contractors Engineering and Management Dx (5.5) 10%	110						
Based on 10% of total cost Dk (S) 10%		Offshore weather allowance	£k (LS)	15%	-	-	
SUB-TOTAL Offshore Operations	120		Ct. (I C)	400/			2 406
TEM Onshore Operations & Equipment Hire		Based on 10% of total cost	žK (LS)	10%	-		
TEM Onshore Operations & Equipment Hire							
Reycling & Disposal Rigid Steel Pipe	S08-10	TIAL Offshore Operations					27,460
Section Page Page	ITEM	Onshore Operations & Equipment Hire	Ulmia	170			
202 Equipment Procurement, Hire & Fabrication Day 93.71 -		onaiore operations a equipment rine	Onit	QIT	Vessel	Rate £k	Total £k
Subsection (Profusion) Profusion Pro		Recycling & Disposal			Vessel		
Section Devider Project Services Day 11.17 0.95 11 1.50 8 1.50 1.		Recycling & Disposal			Vessel -		-125
Hydraulic Shears Day 5.15 0.80 4	201	Recycling & Disposal Rigid Steel Pipe			Vessel -		-125
Pope Handling Tool Daw S.15 Daw O.80 A Daw	201	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab)	£k / Te	4,167 93.71	Vessel -	-0.03 5.00	-125 -125 469
Diamond Wire Cutter	201	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (RCV-Grab) Suction Dredger	£k / Te Day Day	4,167 93.71 11.17	Vessel	-0.03 5.00 0.95	-125 -125 469 11
Sub-ToTAL Onshore Costs (Port charges, storage etc.) LS 1 - 100.00 100	201	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Subcison Deedger Hydraulic Shears Pipe Handling Tool	£k / Te Day Day Day Day Day	93.71 11.17 5.15 5.15	Vessel	-0.03 5.00 0.95 1.50 0.80	-125 -125 469 11 8 4
Misc. Onshore Costs (Port charges, storage etc.) LS 1 - 100.00 100 100	201	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subseas Excavator (ROV-Grab) Suction Dredger Hydrautic Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe	£k / Te Day Day Day Day Day Ek - LS	93.71 11.17 5.15 5.15 1.00	Vessel	-0.03 5.00 0.95 1.50 0.80 75.00	-125 -125 -469 -11 -8 -4 -75
SUB-TOTAL Conshore Operations & Equipment Hire	201	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subseas Excavator (ROV-Grab) Suction Dredger Hydrautic Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe	£k / Te Day Day Day Day Day Ek - LS	93.71 11.17 5.15 5.15 1.00	Vessel	-0.03 5.00 0.95 1.50 0.80 75.00	-125 -125 469 11 8 4 75
SUB-TOTAL Conshore Operations & Equipment Hire	201	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavetor (ROV-Grab) Subtion Divedger Hydraulic Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe Diamond Wire Cutter Miscellaneous	£k / Te Day Day Day Day Day Ek - LS Day	93.71 11.17 5.15 5.15 1.00 11.17	Vessel	-0.03 5.00 0.95 1.50 0.80 75.00 0.95	-125 -125 -125 -469 -11 -8 -4 -75 -11 -577
TIEM Project Services Unit QTY Vessel Rate Ek Total Ek	201	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavetor (ROV-Grab) Subtion Divedger Hydraulic Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe Diamond Wire Cutter Miscellaneous	£k / Te Day Day Day Day Day Ek - LS Day	93.71 11.17 5.15 5.15 1.00 11.17	Vessel	-0.03 5.00 0.95 1.50 0.80 75.00 0.95	-125 -125 -125 -469 -11 -8 -4 -75 -11 -577
301 Owner Project Management Costs	201 202	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Sutcino Dredger Hydraluic Shears Plydraluic Shears Plye Handling Tool Deck Corrals for handling of recovered pipe Diamond Wire Cutter Miscellaneous Misc. Onshore Costs (Port charges, storage etc.)	£k / Te Day Day Day Day Day Ek - LS Day	93.71 11.17 5.15 5.15 1.00 11.17	Vessel	-0.03 5.00 0.95 1.50 0.80 75.00 0.95	-125 -125 -125 -125 -125 -111 -111 -111
Project Management / Supervision / Owner Costs LS 12% - -	201 202	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Sutcino Dredger Hydraluic Shears Plydraluic Shears Plye Handling Tool Deck Corrals for handling of recovered pipe Diamond Wire Cutter Miscellaneous Misc. Onshore Costs (Port charges, storage etc.)	£k / Te Day Day Day Day Day Ek - LS Day	93.71 11.17 5.15 5.15 1.00 11.17	Vessel	-0.03 5.00 0.95 1.50 0.80 75.00 0.95	-125 -125 -125 -125 -125 -111 -111 -111
Project Management / Supervision / Owner Costs LS 12% - -	201 202 203 SUB-TO	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Subsea Excavator (ROV-Grab) Suction Dredger Hydraufic Shears Pipe Handling Tool Deak Corrals for handling of recovered pipe Diamond Wire Cutter Miscellaneous Misc. Onshore Costs (Port charges, storage etc.)	£k / Te Day Day Day Day Day £k - LS Day LS	4,167 93.71 11.17 5.15 5.15 1.00 11.17		-0.03 5.00 0.95 1.50 0.80 75.00 0.95	-125 -125 -125 -469 -11 -8 -4 -75 -11 -577 -100 -100
302 307 Party Verification LS 1 - 200.00 200	201 202 203 SUB-TO	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Suction Dredger Hydraulic Shears Pipe Handling Tool Deak Corrals for handling of recovered pipe Diamond Wire Cutter Miscellaneous Misc. Onshore Costs (Port charges, storage etc.)	£k / Te Day Day Day Day Day £k - LS Day LS	4,167 93.71 11.17 5.15 5.15 1.00 11.17		-0.03 5.00 0.95 1.50 0.80 75.00 0.95	-125 -125 -125 -469 -11 -8 -4 -75 -11 -577 -100 -100
3rd Party Verification	201 202 203 SUB-TO	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Exceedor (RCV-Grab) Subsea Exceedor (RCV-Grab) Subsea Exceedor (RCV-Grab) Subsea Pepe Handling Tool Deck Corrals for handling of recovered pipe Diamond Wire Cutter Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs	Day Day Day Day Day LS Day	4,167 93.71 11.17 5.15 5.15 1.00 11.17		-0.03 5.00 0.95 1.50 0.80 75.00 0.95	-125 -125 -126 -127 -128 -129 -111 -11 -12 -11 -17 -17 -100 -100 -100 -100 -100 -1
1	201 202 203 SUB-TO	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Exceutor (ROV-Grab) Subtion Dredger Hydraluic Shears Plye Handling Tool Deck Corrals for handling of recovered pipe Diamond Wire Cutter Miscellaneous Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management Costs	Day Day Day Day Day LS Day	4,167 93.71 11.17 5.15 5.15 1.00 11.17		-0.03 5.00 0.95 1.50 0.80 75.00 0.95	-125 -125 -126 -127 -128 -129 -111 -11 -12 -11 -17 -17 -100 -100 -100 -100 -100 -1
Insurance	201 202 203 SUB-TO	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excarator (ROV-Grab) Subse	Ek / Te Day Day Day Day Day LS LS	4,167 93.71 11.17 5.15 5.15 1.00 11.17 1		-0.03 5.00 0.95 1.50 0.80 75.00 0.95 100.00	-125 -125 -126 -127 -128 -129 -111 -128 -111 -137 -100 -100 -100 -100 -100 -100 -100 -10
1,373 1,374 1,37	201 202 203 SUB-TC ITEM 301 302	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea & Excavator (ROV-Grab) Subsea & Excavator (ROV-Grab) Subsea & Excavator (ROV-Grab) Subtrion Pedgerr Hydraluit Shears Pepe Handling Tool Dack Corrals for handling of recovered pipe Diamond Wire Cutter Miscellaneous Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification	Ek / Te Day Day Day Day Day LS LS	4,167 93.71 11.17 5.15 5.15 1.00 11.17 1		-0.03 5.00 0.95 1.50 0.80 75.00 0.95 100.00	-125 -125 -125 -126 -127 -128 -128 -138 -14 -15 -17 -100 -100 -552
UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC)	201 202 203 SUB-TC ITEM 301 302	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Subseal Steel S	Ek/Te Day Day Day Day Sk-LS Day LS Unit	4,167 93.71 11.17 5.15 5.15 1.00 11.17 1		-0.03 5.00 0.95 1.50 0.80 75.00 0.95 100.00	-125 -125 -125 -1469 -111 -8 -4 -75 -11 -577 -100 -100
0	201 202 203 SUB-TC ITEM 301 302 303	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Subseal Steel Pipe Harding Tool Dismond Wire Cutter Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) ITAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management (Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance	Ek/Te Day Day Day Day Sk-LS Day LS Unit	4,167 93.71 11.17 5.15 5.15 1.00 11.17 1		-0.03 5.00 0.95 1.50 0.80 75.00 0.95 100.00	-125 -125 -125 -126 -127 -128 -128 -129 -111 -128 -128 -128 -128 -128 -128 -128
TEM Long Term Liability	201 202 203 SUB-TC ITEM 301 302 303	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Subsea Description of Procured Pr	Ek / Te Day Day Day Day Sk - LS Day LS Unit LS LS	4,167 93.71 11.17 5.15 5.15 1.00 11.17 1 1 1 2TY 12%		-0.03 5.00 0.95 1.50 0.80 75.00 0.95 100.00	-125 -125 -125 -126 -469 -11 -8 -4 -75 -11 -577 -100 -100 -100
TEM Long Term Liability	201 202 203 SUB-TC ITEM 301 302 303	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Subsea Description of Procured Pr	Ek / Te Day Day Day Day Sk - LS Day LS Unit LS LS	4,167 93.71 11.17 5.15 5.15 1.00 11.17 1 1 1 2TY 12%		-0.03 5.00 0.95 1.50 0.80 75.00 0.95 100.00	-125 -125 -126 -127 -128 -129 -111 -11 -12 -11 -12 -11 -12 -11 -12 -11 -12 -12
401 Long Term Liability Surveys No. Off 3 Survey Vessel (Legacy) 50 300 Transit to Folied Day 3.0 Survey Vessel (Legacy) 50 150 Survey Operations - 1 crossings Day 0.1 Survey (Legacy) 50 6 Survey Operations - 1 crossings Day 3.0 Survey (Vessel (Legacy) 50 6 Survey Operations - 1 crossings Day 3.0 Survey (Vessel (Legacy) 50 150 Operations - 1 crossings Day 3.0 Survey (Vessel (Legacy) 50 150 Operations - 1 crossings Day 3.0 Survey (Vessel (Legacy) 50 Operations - 1 crossings Day Day	201 202 203 SUB-TC ITEM 301 302 303 304	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Subse	Ek / Te Day Day Day Day Sk - LS Day LS Unit LS LS	4,167 93.71 11.17 5.15 5.15 1.00 11.17 1 1 1 2TY 12%		-0.03 5.00 0.95 1.50 0.80 75.00 0.95 100.00	-125 -125 -125 -126 -127 -128 -118 -118 -119 -119 -119 -119 -119 -11
Mob/ Demob Day 6.0 Survey Vessel (Legacy) 50 300 Transit to Fold Day 3.0 Survey Vessel (Legacy) 50 150 Survey Operations - 1 crossings Day 0.1 Survey Vessel (Legacy) 50 6 Survey Constitution	201 202 203 SUB-TC ITEM 301 302 303 304	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Subsea Excavator (ROV-Grab) Subsea Excavator (ROV-Grab) Subtrion Prodger Hydraluic Shears Pepe Handling Tool Deck Corrals for handling of recovered pipe Diamond Wire Cutter Miscellaneous	Ek / Te Day Day Day Day Sk - LS Day LS Unit LS LS	4,167 93.71 11.17 5.15 5.15 1.00 11.17 1 1 1 2TY 12%		-0.03 5.00 0.95 1.50 0.80 75.00 0.95 100.00	-125 -125 -125 -126 -127 -128 -118 -118 -119 -119 -119 -119 -119 -11
Mob/ Demob Day 6.0 Suney Vessel (Legacy) 50 300 Transit to Field Day 3.0 Suney Vessel (Legacy) 50 150 Suney Operations - 1 crossings Day 0.1 Suney Vessel (Legacy) 50 6 Suney Companies 50 50 50 50 50 50 50 5	201 202 203 SUB-TC ITEM 301 302 303 304	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Subsea Excavator (ROV-Grab) Subsea Excavator (ROV-Grab) Subtrion Prodger Hydraluic Shears Pepe Handling Tool Deck Corrals for handling of recovered pipe Diamond Wire Cutter Miscellaneous	Ek / Te Day Day Day Day Ek - LS Day LS Unit LS LS LS Ek / km	4,167 93.71 11.17 5.15 5.15 1.00 11.17 1 1 2TY 12% 0	Vessel	-0.03 5.00 0.95 1.50 0.80 75.00 0.95 100.00 Rate Ek - 200.00 - 3.00	-125 -125 -125 -125 -126 -127 -128 -128 -128 -128 -128 -128 -128 -11 -1377 -100 -100 -100 -100 -100 -100 -100 -1
Sunny Operations - 1 crossings Day 0.1 Sunny Vessel (Legacy) 50 6	201 202 203 SUB-TC 301 302 303 304 SUB-TC	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (RCV-Grab) Subsea Excavator (RCV-Grab) Subsea Excavator (RCV-Grab) Subset Despayer Hydraluic Shears Pleye Handling Tool Deck Cornals for handling of recovered pipe Diamond Wire Cutter Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance Insurance FLTC Legacy Cost UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC) TTAL Project Services Long Term Liability Long Term Liability Surveys	Ek / Te Day Day Day Day Ek - LS Day LS Unit LS Sk / km	4,167 93.71 11.17 5.15 5.15 1.00 11.17 1 1 QTY 12% 0 QTY 3	Vessel Vessel	-0.03 5.00 0.95 1.50 0.80 75.00 0.95 100.00 Rate £k - 200.00 - 3.00	-125 -125 -125 -126 -127 -128 -129 -129 -111 -129 -129 -129 -129 -129
606	201 202 203 SUB-TC 301 302 303 304 SUB-TC	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Subsea Excavator (ROV-Grab) Subsea Excavator (ROV-Grab) Subtrion Pedger Hydraluic Shears Pepe Handling Tool Deck Corrals for handling of recovered pipe Diamond Wire Cutter Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supendision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance Insurance PLTC Legacy Cost UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC) TTAL Project Services Long Term Liability Surveys Mob / Demob	Ek / Te Day Day Day Day Ek - LS Day LS LS LS LS LS No. Off Day	4,167 93.71 11.17 5.15 5.15 1.00 11.17 1 1 2TY 12% 0 QTY 3 6.0	Vessel Vessel Vessel Survey Vessel (Legacy)	-0.03 5.00 0.95 1.50 0.80 75.00 0.95 100.00 Rate £k - 200.00 - 3.00	-125 -125 -125 -126 -127 -128 -129 -111 -8 -4 -75 -111 -577 -100 -100 -100 -100 -100 -100 -100 -1
SUB-TOTAL Long Term Liability	201 202 203 SUB-TC 301 302 303 304 SUB-TC	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Subsea Excavator (ROV-Grab) Subsea Excavator (ROV-Grab) Subtrion Prodger Hydralufi Shears Pepe Handling Tool Deck Corrals for handling of recovered pipe Diamond Wire Cutter Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Mire Project Services Owner Project Management Costs Project Management / Supendision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance Insurance PLTC Legacy Cost UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC) ITAL Project Services Long Term Liability Long Term Liability Surveys Most / Demob Timast to Field Survey Operations - 1 crossings	Ek / Te Day Day Day Day Ek - LS Day LS LS LS LS Sk / km Unit No. Off Day	4,167 93.71 11.17 5.15 5.15 1.00 11.17 1 1 1 2TY 12% 0 QTY 3 6.0 3.0 0.1	Vessel Vessel Surey Vessel (Lagacy) Surey Vessel (Lagacy) Surey Vessel (Lagacy)	-0.03 5.00 0.95 1.50 0.80 75.00 0.95 100.00 Rate £k - 200.00 - 3.00	-125 -125 -125 -126 -127 -128 -129 -111 -8 -4 -75 -11 -77 -100 -100 -100 -100 -100 -100 -
	201 202 203 SUB-TC 301 302 303 304 SUB-TC	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Subsea Excavator (ROV-Grab) Subsea Excavator (ROV-Grab) Subtrion Prodger Hydralufi Shears Pepe Handling Tool Deck Corrals for handling of recovered pipe Diamond Wire Cutter Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Mire Project Services Owner Project Management Costs Project Management / Supendision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance Insurance PLTC Legacy Cost UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC) ITAL Project Services Long Term Liability Long Term Liability Surveys Most / Demob Timast to Field Survey Operations - 1 crossings	Ek / Te Day Day Day Day Ek - LS Day LS LS LS LS Sk / km Unit No. Off Day	4,167 93.71 11.17 5.15 5.15 1.00 11.17 1 1 1 2TY 12% 0 QTY 3 6.0 3.0 0.1	Vessel Vessel Surey Vessel (Lagacy) Surey Vessel (Lagacy) Surey Vessel (Lagacy)	-0.03 5.00 0.95 1.50 0.80 75.00 0.95 100.00 Rate £k - 200.00 - 3.00	-125 -125 -125 -125 -126 -127 -128 -128 -128 -128 -128 -128 -128 -128

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SAFETY				
Offshore Personnel	Number of	186	Man Hours	261,336
Diver Requirement	Number of	18	Man Hours	3,961
Onshore Personnel	Number of	14	Man Hours	180,194
Legacy Risk	Number of	44	Man Hours	6,405
Impact to Other Users of the Sea (operational)	Number of	2	Duration of Operations (Days)	282.5
Impact to Other Users of the Sea (Legacy)	Number of	1	Duration of Operations (Days)	12.13
Operational Risk Offshore	PLL	1.96E-02		
Operational Risk Diver	PLL	3.84E-03		
Operational Risk Onshore	PLL	1.78E-03		
Legacy Risk	PLL	4.80E-04		
Overall Risk	ΣPLL	2.57E-02		

ENVIRONMENTAL				
	Vessel Type	Number off	Duration (Days)	Activity
	Survey Vessel	0	0.0	N/A
	Trenching Vessel	0	0.0	N/A
Marine Impact (Vessels)	Rockdump Vessel	0	0.0	N/A
	DSV	1	9.2	Dive Ops / Destruct
	CSV	1	273.3	Unburial / Destruct
	Reel Vessel	0	0.0	N/A
	Trawler	0	0.0	N/A
	Vessel Type	Number off	Duration (Days)	Activity
Marine Impact (Vessel Legacy)	Survey Vessel (Legacy)	1	12.13	Survey
	Rockdump Vessel (Legacy)	0	0	N/A
Energy Use	Fuel (Te)	CO2 (Te)	Nox (Te)	SO2 (Te)
(Total = Ops + Legacy)	8,070	25,581	479	32
Life Cycle Emissions	CO2 - Disposal Ops (Te)	CO2 - Replacement Ops (Te)	Energy - Disposal Ops (GJ)	Energy - Replacement Ops
(Disposal / Replacement of Material)	4,222	0	128,478	0
	Activity	Area (m²)	Resources	
	Habitat Loss (Rock Cover)	N/A	N/A	
Marine Impact (Seabed)	Habitat Loss (Rock Bags)	N/A	N/A	
marine impact (Seaueu)	Short Term Disturbance (Trench and Bury)	N/A	N/A	
	Short Term Disturbance (Reverse Installation w/o Deburial)	N/A	N/A	
	Short Term Disturbance	245,020	N/A	
	Material	Recovered Weight (Te)	Remaining Weight (Te)	
	Steel	4,168	0	
	Aluminium Alloy	0	0	
Materials	Copper	0	0	
	Concrete	0	0	
	Polymer	559	0	
	Mattress/Grout Bag	0	0	

TECHNICAL						
	Sub-Criterion	Scoring	Comments			
Technical Considerations	Technical Feasibility		Concept is technologically feasible. The scale is considerable and supply chain and assets may require some development to accommodate the option.			
	Ease of Recovery from Excursion	1	Recovery is achievable with existing in-field equipment.			
	Use of proven technology and equipment		Standard equipment available from multiple suppliers with well documented and proven track record.			

SOCIETAL						
	Sub-Criterion	Scoring	Comments			
Societal Factors	Fishing	2	Short term disruption may occur during operations. Thereafter seabed clear for fishing.			
	Socio-Economic Impacts	2	Short term impact on communities, positive from an economic perspective.			

ECONOMIC				
Economic Considerations	Comparative Cost Operational	£32.95	М	
	Comparative Cost Legacy	£0.61	М	
	Comparative Cost Total	£33.55	М	



Appendix F.2 Group 1 – Option 4a

PROJECT CLIENT SUBJECT ASSIGNMENT NUMBER CALCULATION NUMBER REVISION

Banff and Kyle Decommissioning CNRI Decommissioning Method Statements A400315-S00 A-400315-S00-CALC-001 R02



Group 1: Option 4A - Leave In Situ Rock Cover Exposures

	Group 1: Option 4A - Leave In Situ Rock Cover Exposures							
	GRAND TOTAL				£1,7	797,100		
	SUB-TOTALS							
100	Offshore Operations					67,522		
200 300	Onshore Operations & Equipment Hire Project Services					45,555 03,945		
400	Long Term Liability					80,078		
ITEM	Offshore Operations	Unit	QTY	Vessel	Rate £k	Total £k		
101	Remedial Rock Placement Over Exposures							
	Mobilise Vessel	Day	1.00 1.00	Rockdump Vessel	45 45	45 45		
	Transit to Field (238nm @ 10kts) DP Trials	Day Day	0.17	Rockdump Vessel Rockdump Vessel	45 45	45 8		
	As found surveys 1500m/hr	Day	1.20 0.47	Rockdump Vessel	45 45	54 21		
	Rock dump pipeline end transitions, 70m per end Rock Placement over exposures - 10 te/m, 23 exposures, 345 m total length	Day Day	0.47	Rockdump Vessel Rockdump Vessel	45 45	6		
	As Left Surveys	Day	1.00	Rockdump Vessel	45	45		
	Transit to Halsvik Quarry (238nm @ 10kts)	Day	1.00	Rockdump Vessel	45	45		
	Demobilisation of Vessel	Day	1.00	Rockdump Vessel	45	45		
110	Offshore weather allowance					314		
110	Offshore weather allowance	£k (LS)	15%	-	-	20		
						20		
120	Decommissioning Contractors Engineering and Management							
	Based on 10% of total cost	£k (LS)	10%	-	-	33 33		
SOR-10	OTAL Offshore Operations					368		
ITEM	Onshore Operations & Equipment Hire	Unit	QTY	Vessel	Rate £k	Total £k		
201	Recycling & Disposal							
	Rigid Steel Pipe	£k / Te	0.00		-0.03	0		
						0		
202	Equipment Procurement, Hire & Fabrication							
	Rockdump (£k/Te dumped)	£k / Te	14,660		0.02	246		
						246		
203	Miscellaneous Misc. Onshore Costs (Port charges, storage etc.)	LS	1	_	100.00	100		
	miles. Charles Cooks (1 on Charges, sterlage ster.)				100.00	100		
CUD TO	DTAL Onshore Operations & Equipment Hire					346		
ITEM	Project Services	Unit	QTY	Vessel	Rate £k	Total £k		
301	Owner Project Management Costs							
	Project Management / Supervision / Owner Costs	LS	12%	-	-	86		
302	3rd Party Verification					86		
302	3rd Party Verification	LS	1	_	200.00	200		
						200		
303	Insurance Insurance	LS	5%		_	18		
			070		-	18		
304	FLTC Legacy Cost	01. 11	_		0			
	UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC)	£k / km	0	-	3.00	0 0		
SUB-TO	OTAL Project Services					304		
ITEM	Long Term Liability	Unit	QTY	Vessel	Rate £k	Total £k		
401	Long Term Liability Surveys	No. Off	3					
	Mob / Demob Transit to Field	Day Day	6.0 3.0	Survey Vessel (Legacy) Survey Vessel (Legacy)	50 50	300 150		
	Survey Operations (1500 m/hr)	Day	3.6	Survey Vessel (Legacy)	50	180		
	Transit to Shore	Day	3.0	Survey Vessel (Legacy)	50	150 780		
						780		
SUB-TO	JB-TOTAL Long Term Liability							

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SAFETY				
Offshore Personnel	Number of	20	Man Hours	1,675
Diver Requirement	Number of	0	Man Hours	0
Onshore Personnel	Number of	14	Man Hours	2,976
Legacy Risk	Number of	44	Man Hours	8,242
Impact to Other Users of the Sea (operational)	Number of	1	Duration of Operations (Days)	7.0
Impact to Other Users of the Sea (Legacy)	Number of	1	Duration of Operations (Days)	15.61
Operational Risk Offshore	PLL	1.26E-04		
Operational Risk Diver	PLL	0.00E+00		
Operational Risk Onshore	PLL	1.19E-05		
Legacy Risk	PLL	6.18E-04		
Overall Risk	ΣPLL	7.56E-04		

ENVIRONMENTAL				
	Vessel Type	Number off	Duration (Days)	Activity
	Survey Vessel	0	0.0	N/A
	Trenching Vessel	0	0.0	N/A
Marine Impact (Vessels)	Rockdump Vessel	1	7.0	Rockdump
marine impact (vessels)	DSV	0	0.0	N/A
	CSV	0	0.0	N/A
	Reel Vessel	0	0.0	N/A
	Trawler	0	0.0	N/A
	Vessel Type	Number off	Duration (Days)	Activity
Marine Impact (Vessel Legacy)	Survey Vessel (Legacy)	1	15.61	Survey
	Rockdump Vessel (Legacy)	0	0	N/A
Energy Use	Fuel (Te)	CO2 (Te)	Nox (Te)	SO2 (Te)
(Total = Ops + Legacy)	500	1,585	30	2
Life Cycle Emissions	CO2 - Disposal Ops (Te)	CO2 - Replacement Ops (Te)	Energy - Disposal Ops (GJ)	Energy - Replacement Ops
(Disposal / Replacement of Material)	0	7,873	0	104,200
	Activity	Area (m²)	Resources	
	Habitat Loss (Rock Cover)	14,660	14660 Te	
Marine Impact (Seabed)	Habitat Loss (Rock Bags)	N/A	N/A	
marine impact (deaded)	Short Term Disturbance (Trench and Bury)	N/A	N/A	
	Short Term Disturbance (Reverse Installation w/o Deburial)	N/A	N/A	
	Short Term Disturbance	N/A	N/A	
	Material	Recovered Weight (Te)	Remaining Weight (Te)	
	Steel	0	4,167	
	Aluminium Alloy	0	0	
Materials	Copper	0	0	
	Concrete	0	0	
	Polymer	0	559	
	Mattress/Grout Bag	0	0	

TECHNICAL			
	Sub-Criterion	Scoring	Comments
	Technical Feasibility		Concept is technologically feasible. The scale is minimal and easily accommodated by existing supply chain.
Technical Considerations	Ease of Recovery from Excursion	1	Recovery is achievable with existing in-field equipment.
	Use of proven technology and equipment		Standard equipment available from multiple suppliers with well documented and proven track record.

SOCIETAL			
	Sub-Criterion	Scoring	Comments
Societal Factors	Fishing		Short term disruption may occur during operations. Thereafter seabed clear for fishing with small amount of additional rock.
	Socio-Economic Impacts	1	No impact.

ECONOMIC			
	Comparative Cost Operational	£1.02	М
Economic Considerations	Comparative Cost Legacy	£0.78	М
	Comparative Cost Total	£1.80 M	М



Appendix F.3 Group 1 – Option 4c

PROJECT CLIENT SUBJECT ASSIGNMENT NUMBER CALCULATION NUMBER REVISION Banff and Kyle Decommissioning CNRI Decommissioning Method Statements A400315-S00 A400315-S00-CALC-001 R02



Group 1: Option 4C - Leave in-situ - Minor Intervention (Remove Areas of Exposures)

	GRAND TOTAL				£4,	372,146
	SUB-TOTALS					
100	Offshore Operations					597,826
200 300	Onshore Operations & Equipment Hire Project Services					93,309 76,828
	Long Term Liability					04,183
ITEM	Offshore Operations	Unit	QTY	Vessel	Rate £k	Total £k
101	Cut and Lift Pipelines					
	Mobilise Vessel Transit to Field (117nm @ 10kts)	Day Day	1.00 0.50	CSV CSV	75 75	75 38
	DP Trials	Day	0.17	CSV	75	13
	As found surveys 1500m/hr Deburial at product ends/tansitions -16 ends (273mm to 323mm in diameter) at 12hrs/end using	Day	1.36	CSV	75	102
	Subsea ROV-Grab (based on 1.0m³/m of pipeline, 70m of pipeline to be deburied and recovered at each end)	Day	8.00	CSV	75	600
	Deburial at exposures using Subsea ROV-Grab 23 exposures - 6hrs each	Day	5.75	CSV	75	431
	Cut product at exposures and recover sections, 110 sections As Left Surveys	Day Day	5.00 1.00	CSV CSV	75 75	375 75
	Transit to Peterhead (117nm @ 10kts) Demobilisation of Vessel	Day Day	0.50 1.00	CSV CSV	75 75	38 75
		Day	1.00	CSV	75	75
	Spot Rock on Cut Ends Mobilise Vessel	Day	1.00	Rockdump Vessel	45	45
	Transit to Field (238nm @ 10kts) DP Trials	Day	1.00 0.17	Rockdump Vessel Rockdump Vessel	45 45	45 8
	As found surveys, 0.5 hours per site	Day Day	0.48	Rockdump Vessel	45	22
	Rock placement at pipeline cut ends, 24 te/end, 16 ends, 3 hrs/end Rock Placement at exposure cut ends - 24 te/end, 46 ends, 3 hrs/end	Day Day	2.00 5.75	Rockdump Vessel Rockdump Vessel	45 45	90 259
	As Left Surveys	Day	1.00	Rockdump Vessel	45	45
	Transit to Halsvik Quarry (238nm @ 10kts) Demobilisation of Vessel	Day Day	1.00 1.00	Rockdump Vessel Rockdump Vessel	45 45	45 45
						1,821
110	Offshore weather allowance					
	Offshore weather allowance	£k (LS)	15%	•		239
						239
120	Decommissioning Contractors Engineering and Management Based on 10% of total cost	£k (LS)	10%			236
	Based on 10% of total cost	ER (LS)	10%		•	236
SUB-TO	DTAL Offshore Operations			<u> </u>		2,598
ITEM	Onshore Operations & Equipment Hire	Unit	QTY	Vessel	Rate £k	Total £k
		Jiiit	QII	¥ 6.8561	Nate In	TOTAL EK
201	Recycling & Disposal	CL / T-	405		0.00	
	Rigid Steel Pipe	£k / Te	125		-0.03	-4 - 4
	Equipment Procurement, Hire & Fabrication					
	Subsea Excavator (ROV-Grab) Hydraulic Shears	Day Day	26.28 26.28		5.00 1.50	131 39
	Pipe Grab	Day	26.28		0.05	1
	Rockdump (£k/Te dumped)	£k - LS	1,488		0.02	25
203	Miscellaneous					197
200	Misc. Onshore Costs (Port charges, storage etc.)	LS	1		100.00	100
						100
SUB-TO	DTAL Onshore Operations & Equipment Hire					293
ITEM	Project Services	Unit	QTY	Vessel	Rate £k	Total £k
	Owner Project Management Costs		45			0:-
	Project Management / Supervision / Owner Costs	LS	12%	-	-	347 347
	3rd Party Verification					
	3rd Party Verification	LS	1	-	200.00	200
303	Insurance					200
	Insurance	LS	5%	-	-	130
304	ELTC Laggery Cost					130
304	FLTC Legacy Cost UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC)	£k / km	0	-	3.00	0
						0
SUB-TO	DTAL Project Services	<u> </u>				677
		11-24	OTY	Vorrel	Pot- O-	Total £k
IIEM	Long Term Liability	Unit	QTY	Vessel	Rate £k	TOTAL EK
401	Long Term Liability Surveys	No. Off	3			0.55
	Mob / Demob Transit to Field	Day Day	6.0 3.0	Survey Vessel (Legacy) Survey Vessel (Legacy)	50 50	300 150
	Survey Operations (1500 m/hr)	Day	4.1	Survey Vessel (Legacy)	50	204
	Transit to Shore	Day	3.0	Survey Vessel (Legacy)	50	150 804
CUD TO	OTAL Long Toyn Lighility	<u> </u>				
SUB-TO	OTAL Long Term Liability					804

Report: Banff and Kyle Phase 2 and 3 Decommissioning Support – Comparative Assessment Report

Assignment Number: A400315-S00



SAFETY				
Offshore Personnel	Number of	96	Man Hours	25,359
Diver Requirement	Number of	0	Man Hours	0
Onshore Personnel	Number of	14	Man Hours	17,025
Legacy Risk	Number of	44	Man Hours	8,496
Impact to Other Users of the Sea (operational)	Number of	2	Duration of Operations (Days)	37.7
Impact to Other Users of the Sea (Legacy)	Number of	1	Duration of Operations (Days)	16.09
Operational Risk Offshore	PLL	1.90E-03		
Operational Risk Diver	PLL	0.00E+00		
Operational Risk Onshore	PLL	1.06E-04		
Legacy Risk	PLL	6.37E-04		
Overall Risk	ΣPLL	2.65E-03		

ENVIRONMENTAL				
	Vessel Type	Number off	Duration (Days)	Activity
	Survey Vessel	0	0.0	N/A
	Trenching Vessel	0	0.0	N/A
	Rockdump Vessel	1	13.4	Rockdump
Marine Impact (Vessels)	DSV	0	0.0	N/A
	CSV	1	24.3	Unburial / Destruct
	Reel Vessel	0	0.0	N/A
	Trawler	0	0.0	N/A
	Vessel Type	Number off	Duration (Days)	Activity
Marine Impact (Vessel Legacy)	Survey Vessel (Legacy)	1	16.09	Survey
	Rockdump Vessel (Legacy)	0	0	N/A
Energy Use	Fuel (Te)	CO2 (Te)	N/A	SO2 (Te)
(Total = Ops + Legacy)	1,264	4,007	75	5
Life Cycle Emissions	CO2 - Disposal Ops (Te)	CO2 - Replacement Ops (Te)	Energy - Disposal Ops (GJ)	Energy - Replacement Ops
(Disposal / Replacement of Material)	127	7,637	1375	101,075
	Activity	Area (m²)	Resources	
	Habitat Loss (Rock Cover)	N/A	N/A	
Marine Impact (Seabed)	Habitat Loss (Rock Bags)	1,188	168 x 8 Te Tock Bags	
marine impact (deaued)	Short Term Disturbance (Trench and Bury)	N/A	N/A	
	Short Term Disturbance (Reverse Installation w/o Deburial)	N/A	N/A	
	Short Term Disturbance	500	N/A	
	Material	Recovered Weight (Te)	Remaining Weight (Te)	
	Steel	125	4,043	
	Aluminium Alloy	0	0	
Materials	Copper	0	0	
materiaio	Concrete	0	0	
	Polymer	17	543	
	Mattress/Grout Bag	0	0	
	Life Cycle	Value		

TECHNICAL		
Technical Considerations	Use of proven technology and equipment	Standard equipment available from multiple suppliers with well documented and proven track record.

SOCIETAL			
	Sub-Criterion	Scoring	Comments
Societal Factors	Fishing		Short term disruption may occur during operations. Thereafter seabed clear for fishing with small amount of additional rock.
	Socio-Economic Impacts	1	No impact.

ECONOMIC			
	Comparative Cost Operational	£3.57	М
Economic Considerations	Comparative Cost Legacy	20.80	м
	Comparative Cost Total	£4.37	м

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Appendix F.4 Group 1 – Option 5

PROJECT CLIENT SUBJECT ASSIGNMENT NUMBER CALCULATION NUMBER REVISION Banff and Kyle Decommissioning CNRI Decommissioning Method Statements A400315-S00-CALC-001 R02



Group 1: Option 5 - Leave in-situ - Minimal Intervention (Remove Ends & Remediate Snag Risk)

GRAND TO	TAL				£4,	128,807
SUB-TOTA						
00 Offshore 0 00 Onshore 0						396,813 11,451
00 Project Se						45,132
00 Long Term						75,411
EM Offshore Ope		Unit	QTY	Vessel	Rate £k	Total £k
		Oiiit	<u> </u>	700001	nato an	TOTAL EN
Pipeline End Mobilise CSV	Removal & Rockdump	Day	1.00	CSV	75	75
Transit to Field	(117nm @ 10kts)	Day	0.50	CSV	75	38
DP Trials	duct ends/tansitions -16 ends (273mm to 323mm in diameter) at 12hrs/end using	Day	0.17	CSV	75	13
	and thus rails turns are thus (273 mill to 323 mill to thus rails turns end of the same state of the s	Day	8.00	CSV	75	600
	eline (273mm to 323mm in diameter) into 15m sections at each of the 16 ends (Each ploy/recover shear, 4hrs to make 5 cuts, 2hrs for vessel relocation).	Day	6.00	CSV	75	450
Recovery of 15	m sections (Bag and tag of NORM positive pipelines & seafastening -(45 mins/pipe	Day	2.50		75	188
section)		· ·		CSV		
	y and As Left Surveys rhead (117nm @ 10kts)	Day Day	2.00 0.50	CSV CSV	75 75	150 38
Demobilisation		Day	1.00	CSV	75	75
02 Rock Cover 1	ransitions					1
Mobilise Rock		Day	1.00	Rockdump Vessel	45	45
Transit to Field	(238nm @ 10kts)	Day	1.00	Rockdump Vessel	45	45
DP Trials Rock placeme	nt at pipeline cut ends, 24 te/end, 16 ends, 3 hrs/end	Day Day	0.17 2.00	Rockdump Vessel Rockdump Vessel	45 45	8 90
As Left Survey	S	Day	1.00	Rockdump Vessel	45	45
	ik Quarry (238nm @ 10kts) of Demob of Rock Dump Vessel	Day Day	1.00 1.00	Rockdump Vessel Rockdump Vessel	45 45	45 45
		Day	1.00	Nookaanip vessei	40	45 1,948
	ther allowance	Cl. (1.0)	450/			
Offshore weati	er allowance	£k (LS)	15%	-	-	231 231
20 Decommissio	ning Contractors Engineering and Management					
Based on 10%		£k (LS)	10%			218
						218
B-TOTAL Offshore	Operations					2,397
						•
EM Onshore Ope	ations & Equipment Hire	Unit	QTY		Rate £k	Total £k
1 Recycling & I	visposal					
Rigid Steel Pi		£k / Te	0.00	-	-0.02	0
						0
	ocurement, Hire & Fabrication					
	ator (ROV-Grab)	Day	23.67	-	5.00	118
Hydraulic She Pipe Grab	IIS	Day Day	23.67 23.67		1.50 0.05	36 1
	r handling of recovered pipe	Day	1.00		50.00	50
Rockdump (£k		£k - LS	384.00	Rockdump (£k/Te dumped)	0.02	6
						211
03 Miscellaneou						
Misc. Onshore	Costs (Port charges, storage etc.)	LS	1	-	100	100
						400
I						100
B-TOTAL Onshore	Operations					100 311
						311
		Unit	QTY		Rate £k	
EM Project Servi	ces t Management Costs				Rate £k	311 Total £k
EM Project Servi	DOS .	Unit	QTY 12%		Rate £k	311 Total £k 325
Project Servi Owner Project Project Manag	t Management Costs ement / Supenision / Owner Costs				Rate £k -	311 Total £k
Owner Project Manage 2 3rd Party Ver	t Management Costs sment / Supervision / Owner Costs fication	LS				311 Total £k 325 325
Project Servi Owner Project Project Manag	t Management Costs sment / Supervision / Owner Costs fication				Rate £k	311 Total £k 325
Owner Project Manage 20 3rd Party Veri	t Management Costs sment / Supervision / Owner Costs fication	LS				311 Total Ek 325 325 200
Owner Project Manage Project Manage Office Project Manage Office Array Verification Office Array Verification	t Management Costs sment / Supervision / Owner Costs fication	LS				311 Total Ek 325 325 200 200
Project Servi Owner Project Manag Project Manag 23 3rd Party Veri 3rd Party Veri 3rd Insurance	t Management Costs sment / Supervision / Owner Costs fication cation	LS LS	12%		- 200.00	311 Total £k 325 325 200 200
Project Servi Owner Project Project Manag 22 3rd Party Veri 3rd Party Veri 3rd Insurance Insurance	t Management Costs ment / Supervision / Owner Costs fication Cost	LS LS	12% 1 5%		- 200.00 -	311 Total Ek 325 325 200 200 120 120
Project Servi Owner Project Project Manag 22 3rd Party Veri 3rd Party Veri 3rd Insurance Insurance	t Management Costs sment / Supervision / Owner Costs fication cation	LS LS	12%		- 200.00	311 Total Ek 325 325 200 200
Project Servi Owner Project Project Manag 23 rd Party Ver 3rd Party Veri 303 Insurance Insurance UK Fisheries (t Management Costs sment / Supervision / Owner Costs fication cation Cost #fishere Oil & Gas Legacy Trust Fund (FLTC)	LS LS	12% 1 5%		- 200.00 -	311 Total Ek 325 325 200 200 120 120 0.30 0
Project Servi Owner Project Project Manag 23 and Party Veri 3rd Party Veri 303 Insurance Insurance UK Fisheries (t Management Costs sment / Supervision / Owner Costs fication cation Cost #fishere Oil & Gas Legacy Trust Fund (FLTC)	LS LS	12% 1 5%		- 200.00 -	311 Total Ek 325 325 200 200 120 120 0.30
Project Servi Owner Proje Project Mana Proj	t Management Costs ment / Supervision / Owner Costs fication cation Cost ###################################	LS LS	12% 1 5%		- 200.00 -	311 Total Ek 325 325 200 200 120 120 0.30 0
Project Servi On Owner Proje Project Manag 20 3rd Party Veri 3rd Party Veri 303 Insurance Insurance UK Fisheries (B-TOTAL Project S EM Long Term L	t Management Costs ement / Supervision / Owner Costs fication cation Cost Ost Ost Legacy Trust Fund (FLTC) Dervices	LS LS LS LS Unit	12% 1 5% 0.10		- 200.00 - 3.00	311 Total Ek 325 325 200 200 120 120 0.30 0
Project Servi Out Owner Project Project Manag 22 3rd Party Veri 3rd Party Veri 303 Insurance Insurance UK Fisheries (UK Fishe	t Management Costs ment / Supervision / Owner Costs fication cation Cost ###################################	LS LS LS LS Unit No. Off	12% 1 5% 0.10	Suney Vessel (I enany)	. 200.00	311 Total Ek 325 325 200 200 120 120 0.30 0 645
Project Manag 22 3rd Party Veri 4rd Party Veri 4rd Party Veri 4rd Party Veri 5rd Party Veri 5rd Party Veri 5rd Party Veri 6rd	t Management Costs sment / Supervision / Owner Costs fication cation Cost pfishere Oil & Gas Legacy Trust Fund (FLTC) services ability ability Surveys	LS LS LS Ek / km Unit No. Off Day Day	12% 1 5% 0.10 QTY 3 6.0 3.0	Suney Vessel (Legacy) Suney Vessel (Legacy)	. 200.00	311 Total Ek 325 325 200 200 120 120 0.30 0 645 Total Ek
Project Servi On Owner Project Project Manag O2 3rd Party Veri 3rd Party Veri O3 Insurance Insurance UK Fisheries of UK Fisher	t Management Costs ment / Supervision / Owner Costs fication Cost Cost ### Cost #### Cost ### Cost ### Cost ### Cost ### Cost #### Cost ##### Cost #### Cost ###	LS LS LS £k / km Unit No. Off Day Day Day	12% 1 5% 0.10 QTY 3 6.0 3.0 3.5	Survey Vessel (Legacy) Survey Vessel (Legacy)	200.00 - 3.00 Rate £k 50 50	311 Total Ek 325 325 200 200 120 120 120 545 Total Ek
Project Servi Owner Project Project Manag Srd Party Veri Insurance Insurance UK Fisheries t TOTAL Project S M Long Term L Mob / Demob Transit to Fiele	t Management Costs ment / Supervision / Owner Costs fication Cost Cost ### Cost #### Cost ### Cost ### Cost ### Cost ### Cost #### Cost ##### Cost #### Cost ###	LS LS LS Ek / km Unit No. Off Day Day	12% 1 5% 0.10 QTY 3 6.0 3.0	Survey Vessel (Legacy)	. 200.00	311 Total Ek 325 200 200 120 120 0.30 645 Total Ek

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SAFETY				
Offshore Personnel	Number of	96	Man Hours	21,484
Diver Requirement	Number of	0	Man Hours	0
Onshore Personnel	Number of	14	Man Hours	15,459
Legacy Risk	Number of	44	Man Hours	8,189
Impact to Other Users of the Sea (operational)	Number of	2	Duration of Operations (Days)	28.8
Impact to Other Users of the Sea (Legacy)	Number of	1	Duration of Operations (Days)	15.51
Operational Risk Offshore	PLL	1.61E-03		
Operational Risk Diver	PLL	0.00E+00		
Operational Risk Onshore	PLL	6.18E-05		
Legacy Risk	PLL	6.14E-04		
Overall Risk	ΣPLL	2.29E-03		

ENVIRONMENTAL								
	Vessel Type	Number off	Duration (Days)	Activity				
	Survey Vessel	0	0.0	N/A				
	Trenching Vessel	0	0.0	N/A				
	Rockdump Vessel	1	7.2	Rockdump				
Marine Impact (Vessels)	DSV	0	0.0	N/A				
	CSV	1	21.7	Unburial / Destruct				
	Reel Vessel	0	0.0	N/A				
	Trawler	0	0.0	N/A				
	Vessel Type	Number off	Duration (Days)	Activity				
Marine Impact (Vessel Legacy)	Survey Vessel (Legacy)	1	15.51	Survey				
	Rockdump Vessel (Legacy)	0	0	N/A				
Energy Use	Fuel (Te)	CO2 (Te)	Nox (Te)	SO2 (Te)				
(Total = Ops + Legacy)	1,065	3,375	63	4				
Life Cycle Emissions	CO2 - Disposal Ops (Te)	CO2 - Replacement Ops (Te)	Energy - Disposal Ops (GJ)	Energy - Replacement				
(Disposal / Replacement of Material)	110	7,669	1188	101,500				
	Activity	Area (m²) N/A						
	Habitat Loss (Rock Cover)	506	384 Te of Rock					
Marine Impact (Seabed)	Habitat Loss (Rock Bags)	N/A	N/A					
marine impact (deabed)	Short Term Disturbance (Trench and Bury)	N/A	N/A					
	Short Term Disturbance (Reverse Installation w/o Deburial)	N/A	N/A					
	Short Term Disturbance	1,680	N/A					
	Material	Recovered Weight (Te)	Remaining Weight (Te)					
	Steel	108.00	4,059.20					
	Aluminium Alloy	0.00	0.00]				
Materials	Copper	0.00	0.00]				
	Concrete	0.00	0.00					
	Polymer	14.50	544.70					
	Mattress/Grout Bag	0	0]				

TECHNICAL						
	Sub-Criterion	Scoring	Comments			
	Technical Feasibility	1	Concept is technologically feasible. The scale is minimal and easily accommodated by existing supply chain and assets may require some development to accommodate the option.			
Technical Considerations	Ease of Recovery from Excursion	1	Recovery is achievable with existing in-field equipment.			
	Use of proven technology and equipment	1	Standard equipment available from multiple suppliers with well documented and proven track record.			

SOCIETAL					
Sub-Criterion Scoring Comments					
	Fishing		Short term disruption may occur during operations. Thereafter seabed clear for fishing with small amount of additional rock.		
Societal Factors	Socio-Economic Impacts	1	No impact.		

ECONOMIC					
	Comparative Cost Operational	£3.35	М		
Economic Considerations	Comparative Cost Legacy	£0.78	М		
	Comparative Cost Total	£4.13	М		



Appendix F.5 Group 2 – Option 2b

PROJECT CLIENT SUBJECT ASSIGNMENT NUMBER CALCULATION NUMBER REVISION Banff and Kyle Decommissioning CNRI Decommissioning Method Statements A400315-S00 A400315-S00-CALC-001 R02



Group 2: Option 2B - Full Removal - Reverse Installation (Reel) without Deburial

	GRAND TOTAL				£8,22	28,369
	SUB-TOTALS					
00	Offshore Operations				£5.53	39,374
	Onshore Operations					3,484
	Project Services					10,512
100	Long Term Liability				£62	5,000
ГЕМ	Offshore Operations	Unit	QTY	Vessel	Rate £k	Total £k
101	Reverse Reeling Preparation and Execution					
	Mobilise Vessel	Day	1.00	CSV	75	75
	Transit to Field (117nm @ 10kts) DP Trials	Day Day	0.50 0.17	CSV CSV	75 75	38 13
	As found surveys 1500m/hr	Day	1.37	CSV	75	102
	Cut 8" Kyle North to Riser Base Prod line, 4" Banff to Kyle North GL line and Curlew Control Umbilical at		0.50	CSV	75	38
	either side of crossings (4hrs x 3 - leaving approx 200m x 3 on seabed) Initiation of first ends (9 off at 6hrs/end - this includes 3 additional initiations for re-initiating following cut at	Day				
	crossings)	Day	2.25	CSV	75	169
	Recovery of 6 off products totaling 49km at 150m/hr (utilising tensioner and carousel). Note: 200m of Curlew Control Umbilical left undisturbed in vicinity where it is crossed by NorthSea Link cables x 2.	Day	13.61	CSV	75	1,021
	Interim portcalls x 5 for offloading of recovered product (44hrs/portcall, 7.5k of product on carousel)	Day	9.17	CSV	75	688
	Debris Recovery and As Left Surveys to determine requirement for further remediation (any areas of	,				
	potential snag risk/ berms will be over trawled and remediated at a later date if required- the overtrawl		3.00	CSV	75	225
	footprint would be within the footprint of the line) excavation activity Transit to Peterhead (117nm @ 10kts)	days Day	0.50	CSV	75	38
	Demobilisation of Vessel	Day	1.00	CSV	75	75
	Remove Crossing (at a later date) Mobilise DSV	Day	1.00	DSV	140	140
	Transit to Field (117nm @ 10kts)	Day	0.50	DSV	140	70
	DP Trials	Day	0.17	DSV	140	23
	Dredge Crossings - 200m of 8" Kyle North to Riser Base Prod pipe and 200m of 4" Banff to Kyle North GL Diver cut of 2 x 200m crossings of the Fulmar lines (28 x 15m sections cut with Diamond Wire Saw -	Day Day	3.00 4.70	DSV DSV	140 140	420 658
	Manual rig and recovery of 28 x 15m sections (Bag and tag of NORM positive pipelines & seafastening - 2h	Day	2.30	DSV	140	322
	Debris Recovery and As Left Surveys	Day	1.00	DSV	140	140
	Transit to Peterhead (117nm @ 10kts) Demobilisation of DSV	Day Day	0.50 1.00	DSV DSV	140 140	70 140
		,				4,463
0	Offshore weather allowance Offshore weather allowance	£k (LS)	15%		-	573
						573
20	Decommissioning Contractors Engineering and Management	Ch (1 C)	109/			E04
20	Decommissioning Contractors Engineering and Management Based on 10% of total cost	£k (LS)	10%			504 504
	Based on 10% of total cost	£k (LS)	10%			504
		£k (LS)	10%			
в-тс	Based on 10% of total cost	£k (LS)	10% QTY		Rate £k	504
B-TC	Based on 10% of total cost DTAL Offshore Operations				Rate £k	504 5,539
B-TC	Based on 10% of total cost OTAL Offshore Operations Onshore Operations & Equipment Hire				Rate £k	504 5,539 Total £k
B-T0	Based on 10% of total cost OTAL Offshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables	Unit	QTY			504 5,539 Total £k
3-T(Based on 10% of total cost Onshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication	Unit £k / Te	QTY 1093.88		0.35	504 5,539 Total £k 383 383
B-T0	Based on 10% of total cost OTAL Offshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables	Unit	QTY			5,539 Total £k 383 383 341
EM 01 02	Based on 10% of total cost OTAL Offshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Deck Reel / Reel Drive System / Tensioner	Unit £k / Te	QTY 1093.88		0.35	504 5,539 Total £k 383 383
B-TC EM 01	Based on 10% of total cost Onshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Deck Reel / Reel Drive System / Tensioner Miscellaneous	Unit £k / Te Day	QTY 1093.88 34.06		0.35	504 5,539 Total £k 383 383 341 341
3-T(EM)1	Based on 10% of total cost OTAL Offshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Deck Reel / Reel Drive System / Tensioner	Unit £k / Te	QTY 1093.88		0.35	5,539 Total £k 383 383 341
EM 11 12 13 13 13 13 13 13 13 13 13 13 13 13 13	Based on 10% of total cost Onshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Deck Reel / Reel Dive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.)	Unit £k / Te Day	QTY 1093.88 34.06		0.35	504 5,539 Total £k 383 383 341 341 100 100
EM 11 12 13 13 13 13 13 13 13 13 13 13 13 13 13	Based on 10% of total cost Onshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Deck Reel / Reel Drive System / Tensioner Miscellaneous	Unit £k / Te Day	QTY 1093.88 34.06		0.35	504 5,539 Total Ek 383 383 341 341
B-TC EM 01 02 03	Based on 10% of total cost Onshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Deck Reel / Reel Dive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.)	Unit £k / Te Day	QTY 1093.88 34.06		0.35	504 5,539 Total £k 383 383 341 341 100 100
B-TC EM 01 02 03	Based on 10% of total cost OTAL Offshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Dock Real / Real Drive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.)	Unit £k / Te Day LS	QTY 1093.88 34.06		0.35 10.00 100.00	504 5,539 Total £k 383 383 341 341 100 100 823
B-TC EM 01 02 03	Based on 10% of total cost Onshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Dock Reel / Reel Dine System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) DTAL Onshore Operations Project Services	Unit £k / Te Day LS	QTY 1093.88 34.06	· ·	0.35 10.00 100.00	504 5,539 Total £k 383 383 341 341 100 100 823
B-TC EM 01 02 03	Based on 10% of total cost OTAL Offshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Dock Real / Real Drive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations Project Services Owner Project Management Costs	Unit £k / Te Day LS	1093.88 34.06		0.35 10.00 100.00	504 5,539 Total £k 383 383 341 100 100 823 Total £k
EM 01 02 03 EM 01 01	Based on 10% of total cost OTAL Offshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Dock Real / Real Drive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification	Unit £k / Te Day LS Unit	QTY 1093.88 34.06 1 QTY		0.35 10.00 100.00 Rate £k	504 5,539 Total £k 383 383 341 100 100 823 Total £k
3-TC EM 01 02 03 3-TC	Based on 10% of total cost Onshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Dock Reel / Reel Drive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations Project Services Owner Project Management Costs Project Management / Supen/sion / Owner Costs	Unit £k / Te Day LS	1093.88 34.06		0.35 10.00 100.00	504 5,539 Total £k 383 383 341 341 100 100 823 Total £k
3-TC EM D1 D2 D3 EM D1	Based on 10% of total cost Onshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Dock Reel / Reel Drive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) DTAL Onshore Operations Project Services Owner Project Management Costs Project Management / Supension / Owner Costs 3rd Party Verification 3rd Party Verification	Unit £k / Te Day LS Unit	QTY 1093.88 34.06 1 QTY		0.35 10.00 100.00 Rate £k	504 5,539 Total £k 383 383 341 100 100 823 Total £k
3-TC EM D1 D2 D3 EM D1	Based on 10% of total cost OTAL Offshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Deck Real / Real Drive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance	Unit £k / Te Day LS Unit	QTY 1093.88 34.06 1 QTY		0.35 10.00 100.00 Rate £k	504 5,539 Total £k 383 383 341 100 100 823 Total £k 764 764
B-TC EM 01 02 03 B-TC EM 01 02	Based on 10% of total cost Onshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Dock Reel / Reel Drive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) DTAL Onshore Operations Project Services Owner Project Management Costs Project Management / Supension / Owner Costs 3rd Party Verification 3rd Party Verification	Unit £k / Te Day LS Unit	QTY 1093.88 34.06 1 QTY 12%		0.35 10.00 100.00 Rate £k	504 5,539 Total £k 383 383 341 100 100 823 Total £k 764 200 200
B-TC EM D1 D2 D3 EM D1 D2	Based on 10% of total cost OTAL Offshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Deck Real / Real Drive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance	Unit £k / Te Day LS Unit	QTY 1093.88 34.06 1 QTY 12%		0.35 10.00 100.00 Rate £k	504 5,539 Total £k 383 383 341 100 100 823 Total £k 764 764 200 200
B-TC EM 01 02 03 B-TC EM 01 01 02	Based on 10% of total cost Onshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Dock Reel / Reel Drive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) DTAL Onshore Operations Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance	Unit £k / Te Day LS Unit	QTY 1093.88 34.06 1 QTY 12%		0.35 10.00 100.00 Rate £k	504 5,539 Total Ek 383 383 341 100 100 823 Total Ek 764 764 200 200 277 277
B-TC EM 01 02 03 B-TC EM 01 01 02	Based on 10% of total cost OTAL Offshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Deck Reel / Reel Drive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance Insurance FLTC Legacy Cost	Unit £k / Te Day LS Unit LS LS	QTY 1093.88 34.06 1 1 274 12% 1		0.35 10.00 100.00 Rate £k - 200	504 5,539 Total £k 383 383 341 341 100 100 823 Total £k 764 200 207 277
B-TC EM 01 02 03 EM 01 02 03	Based on 10% of total cost Onshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Deck Reel / Reel Drive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance	Unit £k / Te Day LS Unit LS LS	QTY 1093.88 34.06 1 1 274 12% 1		0.35 10.00 100.00 Rate £k - 200	504 5,539 Total £k 383 383 341 100 100 823 Total £k 764 200 200 277 277 0
3-TC EM	Based on 10% of total cost Oral Offshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Dock Real / Real Drive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance Insurance Insurance Insurance Insurance Offshore Oil & Gas Legacy Trust Fund (FLTC)	Unit £k / Te Day LS Unit LS LS £k / km	QTY 1093.88 34.06 1 1 QTY 12% 1 5% 0.00		0.35 10.00 100.00 Rate Ek - 200 - 3	504 5,539 Total £k 383 383 341 400 100 100 823 Total £k 764 764 200 207 277 0 0
B-TC EM 01 02 03 B-TC EM 01 02 03 04	Based on 10% of total cost Onshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Deck Reel / Reel Drive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance	Unit £k / Te Day LS Unit LS LS	QTY 1093.88 34.06 1 1 274 12% 1		0.35 10.00 100.00 Rate £k - 200	504 5,539 Total £k 383 383 341 100 100 823 Total £k 764 764 200 207 277 277
B-TC EM 01 02 03 B-TC 01 02 03 04 B-TC EM	Based on 10% of total cost Onshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Deck Reel / Reel Drive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance	Unit £k / Te Day LS Unit LS LS £k / km Unit No. Off	QTY 1093.88 34.06 1 1 277 12% 1 5% 0.00		0.35 10.00 100.00 Rate Ek 200 3	504 5,539 Total £k 383 383 341 341 100 100 823 Total £k 764 764 200 207 277 277 0 0 1,241
B-TC EM	Based on 10% of total cost Onshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Dock Reel / Reel Dine System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations Project Services Owner Project Management Costs Project Management / Supension / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance FLTC Legacy Cost UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC) OTAL Project Services Long Term Liability Long Term Liability Surveys Mob / Demob	Unit £k / Te Day LS Unit LS £k / km	1 12% 1 2% 1 2% 1 2% 1 3 6.0	Suney Vessel (Legacy)	0.35 10.00 100.00 Rate Ek - 200 - 3 Rate Ek	504 5,539 Total Ek 383 383 341 341 100 100 823 Total Ek 764 764 200 207 277 0 0 1,241 Total Ek
B-TC EM 01 02 03 EM 01 02 EM 01 02 03 04 B-TC EM 01	Based on 10% of total cost OrAL Offshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Dock Reel / Reel Drive System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance Insurance UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC) OTAL Project Services Long Term Liability Long Term Liability Surveys Mob / Demob Transit to Field	Unit £k / Te Day LS Unit LS LS LS LS Pay Unit No. Off Day Day	QTY 1093.88 34.06 1 1 277 12% 1 5% 0.00	Survey Vessel (Legacy) Survey Vessel (Legacy)	0.35 10.00 100.00 Rate Ek 200 3	504 5,539 Total £k 383 383 341 341 100 100 823 Total £k 764 764 200 200 277 277 0 0 1,241
B-TC EM 01 02 03 B-TC EM 01 02 03 04	Based on 10% of total cost Onshore Operations Onshore Operations & Equipment Hire Recycling & Disposal Flexibles / Umbilicals / Cables Equipment Procurement, Hire & Fabrication Dock Reel / Reel Dine System / Tensioner Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations Project Services Owner Project Management Costs Project Management / Supension / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance FLTC Legacy Cost UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC) OTAL Project Services Long Term Liability Long Term Liability Surveys Mob / Demob	Unit £k / Te Day LS Unit LS £k / km	1093.88 34.06 1 12% 12% 1 5% 0.00		0.35 10.00 100.00 Rate Ek - 200 - 3 Rate Ek	504 5,539 Total £k 383 383 341 341 100 100 823 Total £k 764 764 200 207 277 277 0 0 1,241 Total £k

 ${\bf Report: Banff\ and\ Kyle\ Phase\ 2\ and\ 3\ Decommissioning\ Support\ -Comparative\ Assessment\ Report\ -Comparative\ Assessment\ -Comparative\ Assessment\ -Comparative\ Assessment\ -Comparative\ -Comparative\$

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SAFETY	AFETY					
Offshore Personnel	Number of	186	Man Hours	48,864		
Diver Requirement	Number of	18	Man Hours	6,121		
Onshore Personnel	Number of	14	Man Hours	38,310		
Legacy Risk	Number of	44	Man Hours	6,600		
Impact to Other Users of the Sea (operational)	Number of	2	Duration of Operations (Days)	47.2		
Impact to Other Users of the Sea (Legacy)	Number of	1	Duration of Operations (Days)	12.5		
Operational Risk Offshore	PLL	3.66E-03				
Operational Risk Diver	PLL	5.94E-03				
Operational Risk Onshore	PLL	4.35E-04				
Legacy Risk	PLL	4.95E-04				
Overall Risk	ΣPLL	1.05E-02				

ENVIRONMENTAL				
	Vessel Type	Number off	Duration (Days)	Activity
	Survey Vessel	0	0.0	N/A
	Trenching Vessel	0	0.0	N/A
	Rockdump Vessel	0	0.0	N/A
Marine Impact (Vessels)	DSV	1	14.2	Dive Ops / Destruct
	CSV	1	33.1	Unburial / Destruct
	Reel Vessel	0	0.0	N/A
	Trawler	0	0.0	N/A
	Vessel Type	Number off	Duration (Days)	Activity
Marine Impact (Vessel Legacy)	Survey Vessel (Legacy)	1	12.5	Survey
	Rockdump Vessel (Legacy)	0	0	N/A
Energy Use	Fuel (Te)	CO2 (Te)	N/A	SO2 (Te)
(Total = Ops + Legacy)	1,453	4,607	86	6
c Cycle Emissions	CO2 - Disposal Ops (Te)	CO2 - Replacement Ops (Te)	Energy - Disposal Ops (GJ)	Energy - Replacement Ops (GJ)
(Disposal / Replacement of Material)	601	0	11,791	0
	Activity	Area (m²)	N/A	
	Habitat Loss (Rock Cover)	N/A	N/A	
Marine Impact (Seabed)	Habitat Loss (Rock Bags)	N/A	N/A	
marine impact (Seabed)	Short Term Disturbance (Trench and Bury)	N/A	N/A	
	Short Term Disturbance (Reverse Installation w/o Deburial)	98,330	Reverse Install	
	Short Term Disturbance	N/A	N/A	
	Material	Recovered Weight (Te)	Remaining Weight (Te)	
	Steel	531	0	
	Aluminium Alloy	0	0	
	Copper	132	0	
Materials	Concrete	0	0	
materials	Polymer	430	0	
	Mattress/Grout Bag	0	0	
	Life Cycle	Value		I
	Disposal Time	43 days		
	Persistence	Hundreds of years		

TECHNICAL					
	Sub-Criterion	Scoring	Comments		
	Technical Feasibility	1	Concept is technologically feasible. The scale is comparable with similar scopes completed.		
Technical Considerations	Ease of Recovery from Excursion	1	Recovery is achievable with existing in-field equipment.		
	Use of proven technology and equipment	1	Standard equipment available from multiple suppliers with well documented and proven track record.		

SOCIETAL					
	Sub-Criterion	Scoring	Comments		
Societal Factors	Fishing	2	Short term disruption may occur during operations. Thereafter seabed clear for fishing.		
Societal Factors	Socio-Economic Impacts	2	Short term impact on communities, positive from an economic perspective.		

ECONOMIC					
	Comparative Cost Operational	£7.60	М		
Economic Considerations	Comparative Cost Legacy	£0.63	М		
	Comparative Cost Total	£8.23	м		

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Appendix F.6 Group 2 – Option 4a

PROJECT CLIENT SUBJECT ASSIGNMENT NUMBER CALCULATION NUMBER REVISION Banff and Kyle Decommissioning CNRI Decommissioning Method Statements A400315-S00 A400315-S00-CALC-001 R02



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Group 1: Option 4A - Leave In Situ Rock Cover Exposures

	Group 1. Option 4A - Leave III Situ Noux Cover Exposures							
	GRAND TOTAL				£1,£	340,037		
	SUB-TOTALS							
100	Offshore Operations				£4:	84,486		
200	Onshore Operations & Equipment Hire				£240,700			
300	Project Services					11,247 03,604		
	Long Term Liability							
ITEM	Offshore Operations	Unit	QTY	Vessel	Rate £k	Total £k		
101	Remedial Rock Placement Over Exposures							
	Mobilise Vessel Transit to Field (238nm @ 10kts)	Day Day	1.00 1.00	Rockdump Vessel Rockdump Vessel	45 45	45 45		
	DP Trials	Day	0.17	Rockdump Vessel	45	8		
	As found surveys 1500m/hr Rock Placement over 12 pipeline ends (70m at each end 5hrs duration - 10Te/m = 6m3/m approx)	Day Day	1.37 2.50	Rockdump Vessel Rockdump Vessel	45 45	61 113		
	As Left Surveys	Day	1.00	Rockdump Vessel	45	45		
	Transit to Halsvik Quarry (238nm @ 10kts) Demobilisation of Vessel	Day Day	1.00 1.00	Rockdump Vessel Rockdump Vessel	45 45	45 45		
	Demounisation of vesser	Day	1.00	Nockdump vesser	45	45		
110	Offichara weather allowance					406		
110	Offshore weather allowance Offshore weather allowance	£k (LS)	15%	-	-	34		
120	Decommissioning Contractors Engineering and Management					34		
120	Based on 10% of total cost	£k (LS)	10%	-	-	44		
						44		
SUR-TO	DTAL Offshore Operations					484		
002	THE ORGANIC SPORGHOLD					101		
ITEM	Onshore Operations & Equipment Hire	Unit	QTY	Vessel	Rate £k	Total £k		
201	Recycling & Disposal							
	Flexibles / Umbilicals / Cables	£k / Te	0.00	-	0.35	0		
202	Equipment Procurement, Hire & Fabrication					0		
202	Rockdump (£k/Te dumped)	£k - LS	8400.00		0.02	141		
						141		
203	Miscellaneous Misc. Onshore Costs (Port charges, storage etc.)	LS	1		100.00	100		
	inist. Orisinae Costs (Fait Glarges, storage etc.)	Lo	'	-	100.00	100		
SUB-TO	OTAL Onshore Operations & Equipment Hire					241		
ITEM	Project Services	Unit	QTY	Vessel	Rate £k	Total £k		
301	Owner Project Management Costs							
301	Project Management / Supervision / Owner Costs	LS	12%	-	-	87		
						87		
302	3rd Party Verification 3rd Party Verification	LS	1	_	200.00	200		
	out any volitional of		·		200.00	200		
303	Insurance Insurance	LS	5%			24		
	insurance	LS	5%	-	-	24		
304	FLTC Legacy Cost							
	UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC)	£k / km	0	-	3.00	0 0		
						0		
SUB-TO	DTAL Project Services					311		
ITEM	Long Term Liability	Unit	QTY	Vessel	Rate £k	Total £k		
401	Long Term Liability Surveys Mob / Demob	No. Off Day	3 6.0	Survey Vessel (Legacy)	50	300		
	Transit to Field	Day	3.0	Survey Vessel (Legacy)	50	150		
	Suney Operations (1500 m/hr) Transit to Shore	Day Day	4.1 3.0	Survey Vessel (Legacy) Survey Vessel (Legacy)	50 50	204 150		
						804		
SUB-TO	DTAL Long Term Liability					804		

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SAFETY				
Offshore Personnel	Number of	20	Man Hours	2,170
Diver Requirement	Number of	0	Man Hours	0
Onshore Personnel	Number of	14	Man Hours	3,526
Legacy Risk	Number of	44	Man Hours	8,490
Impact to Other Users of the Sea (operational)	Number of	1	Duration of Operations (Days)	9.0
Impact to Other Users of the Sea (Legacy)	Number of	1	Duration of Operations (Days)	16.08
Operational Risk Offshore	PLL	1.63E-04		
Operational Risk Diver	PLL	0.00E+00		
Operational Risk Onshore	PLL	1.41E-05		
Legacy Risk	PLL	6.37E-04		
Overall Risk	ΣPLL	8.14E-04		

ENVIRONMENTAL				
	Vessel Type	Number off	Duration (Days)	Activity
	Survey Vessel	0	0.0	N/A
	Trenching Vessel	0	0.0	N/A
Marine Impact (Vessels)	Rockdump Vessel	1	9.0	Rockdump
marine impact (vessels)	DSV	0	0.0	N/A
	CSV	0	0.0	N/A
	Reel Vessel	0	0.0	N/A
	Trawler	0	0.0	N/A
	Vessel Type	Number off	Duration (Days)	Activity
Marine Impact (Vessel Legacy)	Survey Vessel (Legacy)	1	16.08	Survey
	Rockdump Vessel (Legacy)	0	0	N/A
Energy Use	Fuel (Te)	CO2 (Te)	Nox (Te)	SO2 (Te)
(Total = Ops + Legacy)	551	1,745	33	2
Life Cycle Emissions	CO2 - Disposal Ops (Te)	CO2 - Replacement Ops (Te)	Energy - Disposal Ops (GJ)	Energy - Replacement Ops
cycle Emissions sal / Replacement of Material)	5	1,937	61	26,300
	Activity	Area (m²)	Resources	
	Habitat Loss (Rock Cover)	8,400	8400 Te	
Marine Impact (Seabed)	Habitat Loss (Rock Bags)	N/A	N/A	
marile impact (Seabed)	Short Term Disturbance (Trench and Bury)	N/A	N/A	
	Short Term Disturbance (Reverse Installation w/o Deburial)	N/A	N/A	
	Short Term Disturbance	N/A	N/A	
	Material	Recovered Weight (Te)	N/A	
	Steel	3	528	
	Aluminium Alloy	0	0	
Materials	Copper	1	131	
	Concrete	0	0	
	Polymer	3	N/A	
	Mattress/Grout Bag	0	0	

TECHNICAL			
	Sub-Criterion	Scoring	Comments
	Technical Feasibility	1	Concept is technologically feasible. The scale is comparable with similar scopes completed.
Technical Considerations	Ease of Recovery from Excursion	1	Recovery is achievable with existing in-field equipment.
	Use of proven technology and equipment		Standard equipment available from multiple suppliers with well documented and proven track record.

SOCIETAL				
	Sub-Criterion	Scoring	Comments	
Societal Factors	Fishing		Short term disruption may occur during operations. Thereafter seabed generally clear for fishing, small amount of additional rock profiled to accommodate trawling.	
	Socio-Economic Impacts	1	No impact on communities.	

ECONOMIC				
	Comparative Cost Operational	£1.04	М	
Economic Considerations	Comparative Cost Legacy	£0.80	М	
	Comparative Cost Total	£1.84	М	

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Appendix F.7 Group 2 – Option 5

PROJECT CLIENT SUBJECT ASSIGNMENT NUMBER CALCULATION NUMBER REVISION Banff and Kyle Decommissioning CNRI Decommissioning Method Statements A400315-S00 A-400315-S00-CALC-001 R02



Group 1: Option 5 - Leave in-situ - Minimal Intervention (Remove Ends & Remediate Snag Risk)

	GRAND TOTAL				£3,	568,923
	SUB-TOTALS					
100	Offshore Operations				£1,	351,618
200	Onshore Operations					54,867
300	Project Services					57,584
400	Long Term Liability				£8	04,854
ITEM	Offshore Operations	Unit	QTY	Vessel	Rate £k	Total £k
101	Pipeline Ends Removal & Remediation					
	Mobilise CSV	Day	1.00	CSV	75	75
	Transit to Field (117nm @ 10kts)	Day	0.50	CSV	75	38
	DP Trials	Day	0.17	CSV	75	13
	As found surveys 1500m/hr	Day	1.37	CSV	75	102
	Deburial at product ends/tansitions -12 ends at 12hrs/end using Subsea ROV-Grab (based on 1.0m ³ /m of pipeline, 70m of pipeline to be deburied and recovered at each end)	Day	6.00	CSV	75	450
	Cut 70m of pipeline into 15m sections at each of the 12 ends (Each end: 3hrs to deploy/recover	,	4.50		75	338
	shear, 4hrs to make 5 cuts, 2hrs for vessel relocation).	Day	4.50	CSV	75	336
	Recovery of 15m sections (Bag and tag of NORM positive pipelines & seafastening - 45mins/pipe section)	Day	1.88	CSV	75	141
	Remediate with rock bags pipeline cut ends - 16Te/end at 2hrs/end (2 x 8Te Rock Bags at 10m ³	,	1.00		75	75
	approx)	Day	1.00	CSV	/5	/5
	Debris Recovery and As Left Surveys	Day	2.00	CSV	75	150
	Transit to Peterhead (117nm @ 10kts)	Day	0.50	CSV	75	38
	Demobilisation of Vessel	Day	1.00	CSV	75	75
						1,493
110	Offshore weather allowance					
	Offshore weather allowance	£k (LS)	15%	-	-	190 190
120	Decommissioning Contractors Engineering and Management					190
120	Based on 10% of total cost	£k (LS)	10%			168
		(==)				168
SUB-TO	OTAL Offshore Operations					1,852
ITCM	Onchara Onerations 9 Equipment Litra	Unit	QTY		Rate £k	Total £k
IIEW	Onshore Operations & Equipment Hire	Unit	QIT		Rate £k	TOTAL EK
201	Recycling & Disposal					
	Flexibles / Umbilicals / Cables	£k / Te	18.69	-	0.35	7
						7
202	Equipment Procurement, Hire & Fabrication	D	24.24		5.00	440
	Subsea Excavator (ROV-Grab) Hydraulic Shears	Day Day	21.91 21.91	-	5.00 1.50	110 33
	Pipe Handling Tool	Day	21.91		0.80	18
	Deck corrals for handling recovered pipe	Day	1.00		50.00	50
	Rock Bags (8Te)	£k - LS	24	-	1.60	38
						248
203	Miscellaneous					
	Misc. Onshore Costs (Port charges, storage etc.)	LS	1	-	100	100
						100
SUR-TO	DTAL Onshore Operations					355
,05	The ondion operations					300
ITEM	Project Services	Unit	QTY		Rate £k	Total £k
301	Owner Project Management Costs					
JU I	Project Management / Supervision / Owner Costs	LS	12%	_	_	265
			.270	-	_	265
302	3rd Party Verification					
	3rd Party Verification	LS	1	-	200.00	200
						200
303	Insurance					
	Insurance	LS	5%	-	-	93
304	ELTC Loggery Cort					93
304	FLTC Legacy Cost UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC)	£k / km	0.08	_	3.00	0.23
	ON THOMOSO CHARIOTO CHI di Casa Eegasty Trast Farila (FETO)	AR / KIII	0.00		5.00	0.23
SUB-TO	OTAL Project Services					558
ITEM	Long Term Liability	Unit	QTY		Rate £k	Total £k
					Nate Li	I Old I ER
401	Long Term Liability Surveys	No. Off	3			
	Mob / Demob Transit to Field	Day Day	6.0 3.0	Survey Vessel (Legacy) Survey Vessel (Legacy)	50 50	300 150
	Survey Operations (1500 m/hr)	Day	4.1	Survey Vessel (Legacy)	50	205
	Transit to Shore	Day	3.0	Survey Vessel (Legacy)	50	150
OUD TO	DTAL Long Term Liability	-	<u> </u>			805 805

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SAFETY				
Offshore Personnel	Number of	76	Man Hours	18,158
Diver Requirement	Number of	0	Man Hours	0
Onshore Personnel	Number of	14	Man Hours	1,558
Legacy Risk	Number of	44	Man Hours	8,501
Impact to Other Users of the Sea (operational)	Number of	1	Duration of Operations (Days)	19.9
Impact to Other Users of the Sea (Legacy)	Number of	1	Duration of Operations (Days)	16.1
Operational Risk Offshore	PLL	1.36E-03		
Operational Risk Diver	PLL	0.00E+00		
Operational Risk Onshore	PLL	6.35E-06		
Legacy Risk	PLL	6.38E-04		
Overall Risk	ΣPLL	2.01E-03		

ENVIRONMENTAL				
	Vessel Type	Number off	Duration (Days)	Activity
	Survey Vessel	0	0.0	N/A
	Trenching Vessel	0	0.0	N/A
Marine Impact (Vessels)	Rockdump Vessel	0	0.0	N/A
marine impact (vessers)	DSV	0	0.0	N/A
	CSV	1	19.9	Unburial / Destruct
	Reel Vessel	0	0.0	N/A
	Trawler	0	0.0	N/A
	Vessel Type	Number off	Duration (Days)	Activity
Marine Impact (Vessel Legacy)	Survey Vessel (Legacy)	1	16.1	Survey
gy Use	Rockdump Vessel (Legacy)	0	0	N/A
Energy Use	Fuel (Te)	CO2 (Te)	Nox (Te)	SO2 (Te)
(Total = Ops + Legacy)	947	3,001	56	4
Life Cycle Emissions	CO2 - Disposal Ops (Te)	CO2 - Replacement Ops (Te)	Energy - Disposal Ops (GJ)	Energy - Replacement
(Disposal / Replacement of Material)	11	1,919	155	26,050
	Activity	Area (m²)	Resources	
	Habitat Loss (Rock Cover)	N/A	N/A	
Marine Impact (Seabed)	Habitat Loss (Rock Bags)	254	24 x 8Te rock bags	
marine impact (Geaueu)	Short Term Disturbance (Trench and Bury)	N/A	N/A	
	Short Term Disturbance (Reverse Installation w/o Deburial)	N/A	N/A	
	Short Term Disturbance	4,200	N/A	
	Material	Recovered Weight (Te)	Remaining Weight (Te)	
	Steel	9	522	
	Aluminium Alloy	0	0	
Materials	Copper	2	130	
	Concrete	0	0	
	Polymer	7	423	
	Mattress/Grout Bag	0	0	

TECHNICAL				
	Sub-Criterion	Scoring	Comments	
	Technical Feasibility		Concept is technologically feasible. The scale is comparable with similar scopes completed.	
Technical Considerations	Ease of Recovery from Excursion	1	Recovery is achievable with existing in-field equipment.	
	Use of proven technology and equipment	1	Standard equipment available from multiple suppliers with well documented and proven track record.	

SOCIETAL			
	Sub-Criterion	Scoring	Comments
Societal Factors	Fishing		Short term disruption may occur during operations. Thereafter seabed clear for fishing, small amount of rock on pipeline ends, profiled to accommodate trawling.
	Socio-Economic Impacts	1	No impact on communities.

ECONOMIC			
	Comparative Cost Operational	£2.76	М
Economic Considerations	Comparative Cost Legacy	£0.80	М
	Comparative Cost Total	£3.57	М

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Appendix F.8 Group 4 – Option 2a

PROJECT CLIENT SUBJECT ASSIGNMENT NUMBER CALCULATION NUMBER REVISION

Banff and Kyle Decommissioning CNRI Decommissioning Method Statements A400315-S00-CALC-001 R02



Group 4 Option 2A: Full Removal: Cut and Lift with Deburial

	GRAND TOTAL				£15,	218,950
	SUB-TOTALS					
100 200	Offshore Operations Onshore Operations & Equipment Hire					422,349 36,207
300	Project Services				£2,	254,144
400	Long Term Liability					06,250
ITEM	Offshore Operations	Unit	QTY	Vessel	Rate £k	Total £k
101	Preparation - Crossings Mobilise DSV	Dav	1.00	DSV	140	140
	Transit to Field (117nm @ 10kts)	Day	0.50	DSV	140	70
	DP Trials	Day	0.17	DSV	140	23
	Dredge Crossings - 200m of 4" Banff to Kyle North Gas pipe which crosses beneath the Fulmar line	Day	1.50	DSV	140	210
	Diver cut of 1 x 200m crossings of the Fulmar lines (28 x 15m sections cut with Diamond Wire Saw 4hrs/cut)	Day	2.35	DSV	140	329
	Manual rig and recovery of 14 x 15m sections (Bag and tag of NORM positive pipelines & seafastening - 2hrs/pipe)	Day	1.15	DSV	140	161
	Debris Recovery and As Left Surveys	Day	1.00	DSV	140	140
	Transit to Peterhead (117nm @ 10kts) Demobilisation of DSV	Day Day	0.50 1.00	DSV	140 140	70 140
		Day	1.50	501	140	140
101	Cut and Lift Pipelines Mobilise CSV	Day	1.00	CSV	75	75
	Transit to Field (117nm @ 10kts)	Day	0.50	CSV	75	38
	DP Trials As found surveys 1500m/hr	Day Day	0.17 0.46	CSV CSV	75 75	13 34
	Deburial of 16.52 km of pipeline (114.3mm and 168.3mm in diameter) at 30m3/hr using Subsea ROV-Grab (based on 1.5m3/m of pipeline)	Day	34.42	CSV	75	2,581
	Cut 16.52 km of pipeline (114.3mm and 168.3mm in diameter) into 15m sections	Day	22.94	CSV	75	1,721
	Recovery of 15m sections (Bag and tag of NORM positive pipelines & seafastening -45 mins/pipe)	Day	34.42	CSV	75	2,581
	Interim portcalls x 3 for offloading of recovered pipe (634 lengths of pipe in total at ~320 lengths/trip)	Day	6.00	CSV	75	450
	Debris Recovery and As Left Surveys to determine requirement for further remediation (any areas of	7	2.00	001	75	225
	potential snag risk/ berms will be over trawled and remediated at a later date if required- the overtrawl footprint would be within the footprint of the line) excavation activity	Day	3.00	CSV	75	
	Transit to Peterhead (117nm @ 10kts) Demobilisation of Vessel	Day Day	0.50 1.00	CSV CSV	75 75	38 75
		,				
						9,114
110	Offshore weather allowance Offshore weather allowance	£k (LS)	15%			1,270
		ZR (EO)	1070			1,270
120	Decommissioning Contractors Engineering and Management Based on 10% of total cost	£k (LS)	10%			1,038
						1,038
SUB-TO	DTAL Offshore Operations					11,422
	Onshore Operations & Equipment Hire	Unit	QTY	Vessel	Rate £k	Total £k
ITEM	Recycling & Disposal			Vessel		Total £k
ITEM		Unit £k / Te	QTY 517.98	Vessel -	Rate £k	Total £k
201	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication			Vessel		-16
201	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Crab)	£k / Te	517.98 106.40	Vessel -	-0.03 5.00	-16 -16 -532
201	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication	£k / Te	517.98	Vessel .	-0.03	-16
201	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excastor (ROV-Grab) Hydraulic Shears	£k / Te Day Day	517.98 106.40 106.40	Vessel	-0.03 5.00 1.50	Total Ek -16 -16 -532 -160 -85 -75
201 202	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Corrais for handling of recovered pipe	£k / Te Day Day Day Day	517.98 106.40 106.40 106.40	Vesset	-0.03 5.00 1.50 0.80	-16 -16 -16 -532 160 85
201 202	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydralulis Shears Pipe Handling Tool	£k / Te Day Day Day Day	517.98 106.40 106.40 106.40	Vessel	-0.03 5.00 1.50 0.80	Total Ek -16 -16 -532 -160 -85 -75
201 202	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe Miscellaneous	£k / Te Day Day Day Day £k - LS	517.98 106.40 106.40 106.40 1.00	Vessel	-0.03 5.00 1.50 0.80 75.00	Total Ex -16 -16 -16 -16 -532 -160 -85 -75 -852
201 202 203	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe Miscellaneous	£k / Te Day Day Day Day £k - LS	517.98 106.40 106.40 106.40 1.00	Vessel	-0.03 5.00 1.50 0.80 75.00	16 -16 -16 -16 -16 -16 -17 -17 -18 -17 -18 -18 -18 -18 -18 -18 -18 -18 -18 -18
201 202 203 SUB-TC	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydralulis Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.)	£k / Te Day Day Day Ek - LS	517.98 106.40 106.40 106.40 1.00	- - -	-0.03 5.00 1.50 0.80 75.00	Total Ek -16 -16 -16 -16 -17 -18 -19 -19 -19 -19 -19 -19 -19 -19 -19 -19
201 202 203 SUB-TC	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.)	£k / Te Day Day Day Day £k - LS	517.98 106.40 106.40 106.40 1.00	Vessel	-0.03 5.00 1.50 0.80 75.00	Total Ek -16 -16 -16 -16 -17 -18 -19 -19 -19 -19 -19 -19 -19 -19 -19 -19
201 202 203 SUB-TO	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Corrais for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) JTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs	£k / Te Day Day Day Ek - LS LS	517.98 106.40 106.40 106.40 1.00	- - -	-0.03 5.00 1.50 0.80 75.00	Total £k -16 -16 -16 -532 -160 -85 -75 -852 -100 -100 -100 -100 -101 -101 -101 -10
201 202 203 SUB-TO	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services	£k / Te Day Day Day Ek - LS	517.98 106.40 106.40 106.40 1.00	- - -	-0.03 5.00 1.50 0.80 75.00	Total Ek -16 -16 -16 -532 -160 -85 -75 -852 -100 -100
201 202 203 SUB-TC ITEM 301	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification	Day Day Day Ek - LS LS Unit	517.98 106.40 106.40 106.40 1.00	- - -	-0.03 5.00 1.50 0.80 75.00 100.00	Total Ek -16 -16 -16 -532 -160 -85 -75 -852 -100 -100 -100 -100 -101 -101 -101 -10
201 202 203 SUB-TC ITEM 301	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs	£k / Te Day Day Day Ek - LS LS	517.98 106.40 106.40 106.40 1.00	- - -	-0.03 5.00 1.50 0.80 75.00	Total Ek -16 -16 -16 -17 -18 -19 -19 -19 -19 -19 -19 -19 -19 -19 -19
201 202 203 SUB-TC ITEM 301 302	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification	Day Day Day Ek - LS LS Unit	517.98 106.40 106.40 106.40 1.00 1	- - -	-0.03 5.00 1.50 0.80 75.00 100.00	Total Ek -16 -16 -16 -532 -160 -85 -75 -852 -100 -100 -100 -100 -101 -101 -101 -10
201 202 203 SUB-TC ITEM 301 302	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification and Party Verification	Day Day Day Ek - LS LS Unit	517.98 106.40 106.40 106.40 1.00 1	- - -	-0.03 5.00 1.50 0.80 75.00 100.00	Total Ek -16 -16 -16 -532 -160 -85 -75 -852 -100 -100
201 202 203 SUB-TC ITEM 301 302 303	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Cornais for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) 27AL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance	£k / Te Day Day Day Ex + LS LS LS	517.98 106.40 106.40 106.40 1.00 1 QTY 12%	- - -	-0.03 5.00 1.50 0.80 75.00 100.00	Total Ek -16 -16 -16 -532 -160 -85 -75 -852 -100 -100
201 202 203 SUB-TC ITEM 301 302 303	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Corrais for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification and Party Verification Insurance	£k / Te Day Day Day Ex + LS LS LS	517.98 106.40 106.40 106.40 1.00 1 QTY 12%	- - -	-0.03 5.00 1.50 0.80 75.00 100.00	Total Ek -16 -16 -16 -16 -532 -160 -85 -75 -852 -100 -100 -100
201 202 203 SUB-TC ITEM 301 302 303	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Cornals for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs and Party Verification and Party Verification and Party Verification Insurance Insurance Insurance FLTC Legacy Cost	Ex / Te Day Day Day Ex + LS LS LS LS	517.98 106.40 106.40 106.40 1.00 1 1 1 1 5%	- - -	-0.03 5.00 1.50 0.80 75.00 100.00	Total Ek -16 -16 -16 -532 -160 -85 -75 -852 -100 -100
201 202 203 SUB-TC ITEM 301 302 303 304	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Cornals for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs and Party Verification and Party Verification and Party Verification Insurance Insurance Insurance FLTC Legacy Cost	Ex / Te Day Day Day Ex + LS LS LS LS	517.98 106.40 106.40 106.40 1.00 1 1 1 1 5%	- - -	-0.03 5.00 1.50 0.80 75.00 100.00	Total Ek -16 -16 -16 -16 -532 -160 -85 -75 -852 -100 -100 -100
201 202 203 SUB-TC 301 302 303 304 SUB-TC	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs and Party Verification and Party Verification Insurance Insurance FLTC Legacy Cost UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC)	Ex / Te Day Day Day Day Ex + LS LS LS LS Ex / km	517.98 106.40 106.40 106.40 1.00 1 QTY 12% 1 5% 0	Vessel	-0.03 5.00 1.50 0.80 75.00 100.00 Rate Ek - 200.00 - 3.00	Total Ek -16 -16 -16 -532 -160 -85 -75 -852 -100 -100 -100
201 202 203 SUB-TC 301 302 SUB-TC	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excastor (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance	Ex / Te Day Day Day Ex + LS LS LS LS	517.98 106.40 106.40 106.40 1.00 1 1 1 1 5%	- - -	-0.03 5.00 1.50 0.80 75.00 100.00	Total Ek -16 -16 -16 -532 -160 -85 -75 -852 -100 -100 -100
201 202 203 SUB-TC ITEM 301 302 303 304 SUB-TC ITEM	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Corrais for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification Insurance Insurance Insurance UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC) TAL Project Services Long Term Liability Long Term Liability Surveys	Sk / Te	517.98 106.40 106.40 106.40 1.00 1 QTY 12% 1 5% 0	Vessel Vessel Vessel	-0.03 5.00 1.50 0.80 75.00 100.00 Rate £k - 200.00 - 3.00	Total Ek -16 -16 -16 -16 -532 -160 -85 -75 -852 -100 -100 -100
201 202 203 SUB-TC TTEM 301 302 303 304 SUB-TC	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC) OTAL Project Services Long Term Liability Long Term Liability Surveys Mob / Demob Transit to Field	Ek / Te Day Day Day Ek + LS LS LS Ek / km Unit No. Off Day Day Day	106.40 106.40 106.40 106.40 1.00 1 1 274 1 2% 1 0	Vessel Vessel Vessel Survey Vessel (Legacy) Survey Vessel (Legacy)	-0.03 5.00 1.50 0.80 75.00 100.00 Rate £k - 200.00 - 3.00 Rate £k	Total Ek -16 -16 -16 -16 -532 -160 -85 -75 -852 -100 -100 -100
201 202 203 SUB-TC TTEM 301 302 303 304 SUB-TC	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraduic Shears Pipe Handling Tool Deck Corrals for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance	Ex / Te Day Day Day Ex + LS LS LS LS LS No. Off Day	517.98 106.40 106.40 106.40 1.00 1 2TY 2TY 2TY 3 6.0	Vessel Vessel Vessel Survey Vessel (Legacy)	-0.03 5.00 1.50 0.80 75.00 100.00 Rate £k - 200.00 - 3.00	Total Ek -16 -16 -16 -16 -532 -160 -85 -75 -852 -100 -100
201 202 203 SUB-TC TTEM 301 302 303 304 SUB-TC TTEM	Recycling & Disposal Rigid Steel Pipe Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Hydraulic Shaers Pipe Handling Tool Deck Corrals for handling of recovered pipe Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance	Ex / Te Day Day Day Ex + LS LS LS LS LS LS Doint LS LS LS Doint LS	517.98 106.40 106.40 106.40 1.00 1 1 2TY 2TY 3 6.0 3.0 0.1	Vessel Vessel Vessel Suney Vessel (Legacy) Suney Vessel (Legacy)	-0.03 5.00 1.50 0.80 75.00 100.00 Rate £k - 200.00 - 3.00 Rate £k	Total Ek -16 -16 -16 -16 -17 -18 -19 -19 -19 -100 -100 -100 -100 -100 -1

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SAFETY				
Offshore Personnel	Number of	186	Man Hours	107,326
Diver Requirement	Number of	18	Man Hours	3,961
Onshore Personnel	Number of	14	Man Hours	73,790
Legacy Risk	Number of	44	Man Hours	6,405
Impact to Other Users of the Sea (operational)	Number of	2	Duration of Operations (Days)	113.6
Impact to Other Users of the Sea (Legacy)	Number of	1	Duration of Operations (Days)	12.13
Operational Risk Offshore	PLL	8.05E-03		
Operational Risk Diver	PLL	3.84E-03		
Operational Risk Onshore	PLL	4.32E-04		
Legacy Risk	PLL	4.80E-04		
Overall Risk	ΣPLL	1.28E-02		

ENVIRONMENTAL				
	Vessel Type	Number off	Duration (Days)	Activity
	Survey Vessel	0	0.0	N/A
	Trenching Vessel	0	0.0	N/A
Marine Impact (Vessels)	Rockdump Vessel	0	0.0	N/A
marine impact (Vesseis)	DSV	1	9.2	Dive Ops / Destruct
	CSV	1	104.4	Unburial / Destruct
	Reel Vessel	0	0.0	N/A
	Trawler	0	0.0	N/A
	Vessel Type	Number off	Duration (Days)	Activity
Marine Impact (Vessel Legacy)	Survey Vessel (Legacy)	1	12.13	Survey
	Rockdump Vessel (Legacy)	0	0	N/A
Energy Use	Fuel (Te)	CO2 (Te)	Nox (Te)	SO2 (Te)
(Total = Ops + Legacy)	3,342	10,593	199	13
Life Cycle Emissions	CO2 - Disposal Ops (Te)	CO2 - Replacement Ops (Te)	Energy - Disposal Ops (GJ)	Energy - Replacement Ops
(Disposal / Replacement of Material)	522	0	6,572	0
	Activity	Area (m²)	Resources	
	Habitat Loss (Rock Cover)	165,200	Existing rock redistributed	
Marine Impact (Seabed)	Habitat Loss (Rock Bags)	N/A	N/A	
marine impact (deaded)	Short Term Disturbance (Trench and Bury)	N/A	N/A	
	Short Term Disturbance (Reverse Installation w/o Deburial)	N/A	N/A	
	Short Term Disturbance	33,040	N/A	
	Material	Recovered Weight (Te)	Remaining Weight (Te)	
	Steel	518	0	
	Aluminium Alloy	0	0]
Materials	Copper	0	0]
	Concrete	0	0]
	Polymer	6.5	0]
	Mattress/Grout Bag	0	0	

TECHNICAL			
	Sub-Criterion	Scoring	Comments
	Technical Feasibility		Concept is technologically feasible. The scale is considerable and supply chain and assets may require some development to accommodate the option.
Technical Considerations	Ease of Recovery from Excursion	1	Recovery is achievable with existing in-field equipment.
	Use of proven technology and equipment	1	Standard equipment available from multiple suppliers with well documented and proven track record.

SOCIETAL			
	Sub-Criterion	Scoring	Comments
Societal Factors	Fishing	2	Short term disruption may occur during operations. Thereafter seabed clear for fishing.
	Socio-Economic Impacts	2	Short term impact on communities, positive from an economic perspective.

ECONOMIC			
	Comparative Cost Operational	£14.61	М
Economic Considerations	Comparative Cost Legacy	£0.61	М
	Comparative Cost Total	£15.22	М



Appendix F.9 Group 4 – Option 4a

PROJECT CLIENT SUBJECT ASSIGNMENT NUMBER CALCULATION NUMBER REVISION Banff and Kyle Decommissioning CNRI Decommissioning Method Statements A400315-S00 A400315-S00-CALC-001 R02



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	Group 4: Option 4A - Leave In Situ Rock Cover Exposures					
	GRAND TOTAL				£1,4	445,439
	SUB-TOTALS					
100 200 300 400	Offshore Operations Onshore Operations & Equipment Hire Project Services Long Term Liability				£1 £2	52,204 46,900 77,503 68,833
ITEM	Offshore Operations	Unit	QTY	Vessel	Rate £k	Total £k
101	Remedial Rock Placement Over Pipeline Ends Mobilise Vessel Transit to Field (239nm @ 10kts) DP Trials As found surveys 1500m/hr Rock Placement over 4 pipeline ends (70m at each end 5hrs duration - 10Te/m = 6m3/m approx) 3 Relocations (2hr/relocation) As Left Surveys Transit to Halsvik Quarry (238nm @ 10kts) Demobilisation of Vessel	Day	1.00 1.00 0.17 0.46 0.83 0.25 1.00 1.00	Rockdump Vessel Rockdump Vessel Rockdump Vessel Rockdump Vessel Rockdump Vessel Rockdump Vessel Rockdump Vessel Rockdump Vessel Rockdump Vessel	45 45 45 45 45 45 45 45 45	45 45 8 21 37 11 45 45 45
110	Offshore weather allowance Offshore weather allowance	£k (LS)	15%	-	-	18 18
120	Decommissioning Contractors Engineering and Management Based on 10% of total cost	£k (LS)	10%	-	-	32 32
SUB-T	OTAL Offshore Operations					352
ITEM	Onshore Operations & Equipment Hire	Unit	QTY	Vessel	Rate £k	Total £k
201	Recycling & Disposal Rigid Steel Pipe	£k / Te	0.00		-0.03	0.00
202	Equipment Procurement, Hire & Fabrication Rockdump (£k/Te dumped)	£k - LS	2800.00		0.02	47 47
203	Miscellaneous Misc. Onshore Costs (Port charges, storage etc.)	LS	1	-	100.00	100 100
SUB-T	DTAL Onshore Operations & Equipment Hire					147
ITFM	Project Services	Unit	QTY	Vessel	Rate £k	Total £k
301	Owner Project Management Costs Project Management / Supervision / Owner Costs	LS	12%	-	-	60
302	3rd Party Verification 3rd Party Verification	LS	1	-	200.00	200
303	Insurance Insurance	LS	5%	-	-	200
304	FLTC Legacy Cost UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC)	£k / km	0	-	3.00	0 0
SUB-T	DTAL Project Services					278
ITEM	Long Term Liability	Unit	QTY	Vessel	Rate £k	Total £k
401	Long Term Liability Surveys Mob / Demob Transit to Field Survey Operations (1500 m/hr) Transit to Shore	No. Off Day Day Day Day Day	3 6.0 3.0 1.4 3.0	Suney Vessel (Legacy) Suney Vessel (Legacy) Suney Vessel (Legacy) Suney Vessel (Legacy)	50 50 50 50	300 150 69 150 669
SUB-T	OTAL Long Term Liability					669

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SAFETY				
Offshore Personnel	Number of	20	Man Hours	1,610
Diver Requirement	Number of	0	Man Hours	0
Onshore Personnel	Number of	14	Man Hours	2,513
Legacy Risk	Number of	44	Man Hours	7,065
Impact to Other Users of the Sea (operational)	Number of	1	Duration of Operations (Days)	6.7
Impact to Other Users of the Sea (Legacy)	Number of	1	Duration of Operations (Days)	13.38
Operational Risk Offshore	PLL	1.21E-04		
Operational Risk Diver	PLL	0.00E+00		
Operational Risk Onshore	PLL	1.01E-05		
Legacy Risk	PLL	5.30E-04		
Overall Risk	ΣPLL	6.61E-04		

ENVIRONMENTAL				
	Vessel Type	Number off	Duration (Days)	Activity
	Survey Vessel	0	0.0	N/A
	Trenching Vessel	0	0.0	N/A
Marine Impact (Vessels)	Rockdump Vessel	1	6.7	Rockdump
marine impact (vessels)	DSV	0	0.0	N/A
	CSV	0	0.0	N/A
	Reel Vessel	0	0.0	N/A
	Trawler	0	0.0	N/A
	Vessel Type	Number off	Duration (Days)	Activity
Marine Impact (Vessel Legacy)	Survey Vessel (Legacy)	1	13.38	Survey
	Rockdump Vessel (Legacy)	0	0	N/A
Energy Use	Fuel (Te)	CO2 (Te)	Nox (Te)	SO2 (Te)
(Total = Ops + Legacy)	423	1,342	25	2
Life Cycle Emissions	CO2 - Disposal Ops (Te)	CO2 - Replacement Ops (Te)	Energy - Disposal Ops (GJ)	Energy - Replacement Ops
(Disposal / Replacement of Material)	0	979	0	12,950
	Activity	Area (m²)	Resources	
	Habitat Loss (Rock Cover)	2,800	2,800 Te Rock	
Marine Impact (Seabed)	Habitat Loss (Rock Bags)	N/A	N/A	
marine impact (coases)	Short Term Disturbance (Trench and Bury)	N/A	N/A	
	Short Term Disturbance (Reverse Installation w/o Deburial)	N/A	N/A	
	Short Term Disturbance	N/A	N/A	
	Material	Recovered Weight (Te)	Remaining Weight (Te)	
	Steel	0	518	
	Aluminium Alloy	0	0	
Materials	Copper	0	0	
	Concrete	0	0	
	Polymer	0	6.5	
	Mattress/Grout Bag	0	0	

TECHNICAL			
	Sub-Criterion	Scoring	Comments
	Technical Feasibility		Concept is technologically feasible. The scale is minimal and easily accommodated by existing supply chain and assets may require some development to accommodate the option.
Technical Considerations	Ease of Recovery from Excursion	1	Recovery is achievable with existing in-field equipment.
	Use of proven technology and equipment		Standard equipment available from multiple suppliers with well documented and proven track record.

SOCIETAL			
	Sub-Criterion	Scoring	Comments
Societal Factors	Fishing		Short term disruption may occur during operations. Thereafter seabed clear for fishing with small amount of additional rock.
	Socio-Economic Impacts	1	No impact.

ECONOMIC			
	Comparative Cost Operational	£0.78	М
Economic Considerations	Comparative Cost Legacy	£0.67	М
	Comparative Cost Total	£1.45	М

Report: Banff and Kyle Phase 2 and 3 Decommissioning Support – Comparative Assessment Report Assignment Number: A400315-S00



Appendix F.10 Group 4 – Option 5

PROJECT CLIENT SUBJECT ASSIGNMENT NUMBER CALCULATION NUMBER REVISION Banff and Kyle Decommissioning CNRI Decommissioning Method Statements A400315-S00 A-400315-S00-CALC-001 R02



Group 4: Option 5 - Leave in-situ - Minimal Intervention (Remove Ends & Remediate Snag Risk)

SUB-TOTALS	Group 4: Option 5 - Leave in-situ - Minimal Intervention (Remove Ends & Remediate Snag Risk)						
100	4	£2,05				GRAND TOTAL	
2005 Sharkore Operations 2506,57						SUB-TOTALS	
2304 270 200	1	£82				Offshore Operations	100
Comparison Com	•	£20				Onshore Operations	200
Pipeline Ends Removal & Remediation	<u>'</u>	£66				Long Term Liability	400
Pipeline Ends Removal & Remediation	Total £k	Rate £k	Vessel	QTY	Unit	Offshore Operations	ITEM
Michielle CSV							
Transit to Feld (177m of 10tests) Doy 0.50 Day 0.46 Day Day 0.46 Day Day 0.46 Day	75	75	0011	1.00	Devi		101
Direct D	38						
As fourd suwys 150mHz	13					,	
Dobraid at product and shrankinations - 4 and sat 12 hardward using Subsea ROV-Graib (based on 1.0m² not product, 7 and product to be debuted and exceeded as each and control of the 1.0m² not product, 7 and product to be debuted and exceeded as each and control of the 1.0m² not product, 7 and product to be debuted and exceeded as each and the 1.0m² not product of the	34						
Title Montabre Operations & Equipment Hire Title Ovabore Operations & Equipment Ovabore Operations & Equipment Ovabore O			***				
State Stat	150	/5	CSV	2.00	Day		
series, -this to make 5 cuts, -this bridgets becautedly to provide positive pipelines & seafastering -45 mins lappe section Day 0.63	113	75	0011	1.50	Dav		
Section Section Cosy C			CSV				
Supprox Debts Recovery and As Left Suneys Day 1.00 CSV 75	47	75	CSV	0.63	Day		
Debts Recovery and As Left Surveys Day 1.00 CSV 75	25	75		0.33	Dav		
Transit to Peterhend (177m @ 10kts)					,	approx)	
Day 1.00 CSV 75	75						
110	38						
Commissioning Contractors Engineering and Management Ek (LS) 15%	75 681	/5	CSV	1.00	⊔ay	Demodification of Vessel	
Commissioning Contractors Engineering and Management Ek (LS) 15%	001	F				Offshore weather allowance	110
Based on 10% of total cost	68	-	-	15%	£k (LS)		
Based on 10% of total cost	68	ļ.					
SUB-TOTAL Offshore Operations SEquipment Hire Unit OTY Rate £k	75						
	75			10%	£k (LS)	Based on 10% of total cost	
	75	-					
	824					OTAL Offichara Operations	SIID TO
201 Recycling & Disposal Rigid Steel Pipe	024					OTAL Offstore Operations	306-10
201 Recycling & Disposal Rigid Steel Pipe	Total £k	Rate £k		QTY	Unit	Onshore Operations & Equipment Hire	ITEM
Rigid Steel Pipe							
202 Equipment Procurement, Hire & Fabrication Subsea Excavator (ROV-Grab) Day 11.08 . 5.00 Hydraulic Shears Day 11.08 . 1.50 Day 11.08 . 0.80 0.80 Day 11.08 Day Day 11.08 Day						Recycling & Disposal	201
Subsea Excavor (ROV-Grab)	0	-0.03	-	8.78	£k / Te	Rigid Steel Pipe	
Subsea Excavor (ROV-Grab)	0						
Hydraulic Shears							202
Pipe Handling Tool Dek Winches Day 11.08 Day 22.16 Day	55		-				
Deck Winches Subsea Basket Day 22.16 Day D	17						
Subsea Basket Rock Bags (8Te) Rock Bags (8	9						
Rock Bags (8Te)	3						
Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) SUB-TOTAL Onshore Operations ITEM Project Services Unit QTY Rate £k Owner Project Management Costs Project Management / Supervision / Owner Costs 301 Owner Project Management / Supervision / Owner Costs LS 12% 302 3rd Party Verification 3rd Party Verification 1surance Insurance LS 5% ELS	13						
Misc. Onshore Costs (Port charges, storage etc.) LS	101	1.00	·	Ü	ZR - 20	Nock Bags (GTE)	
Misc. Onshore Costs (Port charges, storage etc.) LS		ľ				Miscellaneous	203
SUB-TOTAL Onshore Operations ITEM Project Services Unit QTY Rate £k 301 Owner Project Management Costs Project Management / Supervision / Owner Costs 302 3rd Party Verification 3rd Party Verification 1 LS 1 - 200.00 Insurance Insurance Insurance LS 5% ELS 5% -	100	100		1	IS		
	100					, , , , , , , , , , , , , , , , , , ,	
			<u> </u>				
	201					OTAL Onshore Operations	SUB-TO
301 Owner Project Management Costs LS 12% - -							
Project Management / Supervision / Owner Costs	Total £k	Rate £k		QTY	Unit	Project Services	ITEM
Project Management / Supervision / Owner Costs							
302 3rd Party Verification	400			4007	10		
3rd Party Verification LS 1 - 200.00 1	123 123		-	1∠%	LS	Project Management / Supervision / Owner Costs	
3rd Party Verification LS 1 - 200.00 1	123	 				3rd Party Varification	303
303 Insurance Insurance LS 5%	200	200.00	_	1	18		
Insurance	200	200.00	·	'		ora cary companion	
Insurance	200	F				Insurance	303
304 FLTC Legacy Cost	41	-	-	5%	LS		- 30
	41						
UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC) £k / km 0.02 - 3.00							304
	0.06	3.00	-	0.02	£k / km	UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC)	
	0.06						
SUB-TOTAL Project Services	364					DTAL Project Services	SUB-TO
TT	T-1-1 01:	D-1- 01-		OTY	11-24	1 T 11-1-00.	ITTA
ITEM Long Term Liability Unit QTY Rate £k	Total £k	Kate £K		QIY	Unit	Long Term Liability	HEM
401 Long Term Liability Surveys No. Off 3							401
Mob / Demob Day 6.0 Suney Vessel (Legacy) 50	300		Survey Vessel (Legacy)			Mob / Demob	
Transit to Field Day 3.0 Survey Vessel (Legacy) 50 Survey Operations (1500 m/hr) Day 1.4 Survey Vessel (Legacy) 50	150 68						
Transit to Shore Day 3.0 Survey Vessel (Legacy) 50	150						
	668						
SUB-TOTAL Long Term Liability	668					DTAL Long Term Liability	SUB-TO

Report: Banff and Kyle Phase 2 and 3 Decommissioning Support - Comparative Assessment Report

Assignment Number: A400315-S00



SAFETY						
Offshore Personnel	Number of	76	Man Hours	8,290		
Diver Requirement	Number of	0	Man Hours	0		
Onshore Personnel	Number of	14	Man Hours	5,561		
Legacy Risk	Number of	44	Man Hours	7,054		
Impact to Other Users of the Sea (operational)	Number of	1	Duration of Operations (Days)	9.1		
Impact to Other Users of the Sea (Legacy)	Number of	1	Duration of Operations (Days)	13.36		
Operational Risk Offshore	PLL	6.22E-04				
Operational Risk Diver	PLL	0.00E+00				
Operational Risk Onshore	PLL	2.99E-05				
Legacy Risk	PLL	5.29E-04				
Overall Risk	ΣPLL	1.18E-03				

ENVIRONMENTAL				
	Vessel Type	Number off	Duration (Days)	Activity
	Survey Vessel	0	0.0	N/A
	Trenching Vessel	0	0.0	N/A
Marine Impact (Vessels)	Rockdump Vessel	0	0.0	N/A
marine impact (vessers)	DSV	0	0.0	N/A
	CSV	1	9.1	Unburial / Destruct
	Reel Vessel	0	0.0	N/A
	Trawler	0	0.0	N/A
Marine Impact (Vessel Legacy)	Vessel Type	Number off	Duration (Days)	Activity
	Survey Vessel (Legacy)	1	13.36	Survey
	Rockdump Vessel (Legacy)	0	0	N/A
inergy Use Total = Ops + Legacy)	Fuel (Te)	CO2 (Te)	Nox (Te)	SO2 (Te)
	555	1,761	33	2
Life Cycle Emissions	CO2 - Disposal Ops (Te)	CO2 - Replacement Ops (Te)	Energy - Disposal Ops (GJ)	Energy - Replacement
(Disposal / Replacement of Material)	10	962	93	12,725
	Activity	Area (m²)	Resources	
	Habitat Loss (Rock Cover)	N/A	N/A	
Marine Impact (Seabed)	Habitat Loss (Rock Bags)	85	12 x 8 Te Rock Bags	
marine impact (Geaueu)	Short Term Disturbance (Trench and Bury)	N/A	N/A	
	Short Term Disturbance (Reverse Installation w/o Deburial)	N/A	N/A	
	Short Term Disturbance	1,400	N/A	
	Material	Recovered Weight (Te)	Remaining Weight (Te)	
	Steel	9	509	
	Aluminium Alloy	0	0	
Materials	Copper	0	0	
	Concrete	0	0	
	Polymer	0.1	6.3	
	Mattress/Grout Bag	0	0	

TECHNICAL					
	Sub-Criterion	Scoring	Comments		
	Technical Feasibility	1	Concept is technologically feasible. The scale is minimal and easily accommodated by existing supply chain and assets may require some development to accommodate the option.		
	Ease of Recovery from Excursion	1	Recovery is achievable with existing in-field equipment.		
	Use of proven technology and equipment	1	Standard equipment available from multiple suppliers with well documented and proven track record.		

SOCIETAL					
	Sub-Criterion	Scoring	Comments		
Societal Factors	Fishing		Short term disruption may occur during operations. Thereafter seabed clear for fishing with small amount of additional rock.		
Societai Factors	Socio-Economic Impacts	1	No impact.		

ECONOMIC					
Economic Considerations	Comparative Cost Operational	£1.39	М		
	Comparative Cost Legacy	£0.67	М		
	Comparative Cost Total	£2.06	М		

Report: Banff and Kyle Phase 2 and 3 Decommissioning Support – Comparative Assessment Report Assignment Number: A400315-S00



Appendix F.11 Group 8 – Option 2c

PROJECT
CLIENT
SUBJECT
ASSIGNMENT NUMBER
CALCULATION NUMBER
REVISION

GRAND TOTAL

Banff and Kyle Decommissioning Teekay Petrojarl Floating Production Decommissioning Method Statements

BFD-P3-TKC-CAL-0001 B1





100	SUB-TOTALS						
	Offshore Operations					73,072	
	Onshore Operations & Equipment Hire					£3,395,270 £1,367,855	
	Project Services						
400	Long Term Liability					:0	
TEM	Offshore Operations	Unit	QTY	Vessel	Rate £k	Total £k	
101	STL Pile Decommissioning						
	Mobilise CSV (Inc. day for additional seafastening / bumper bars required)	days	3.00	CSV	75	225	
	Transit to Field (117nm @ 10kts)	days	0.50	CSV	75	38	
	DP Trials	days	0.17	CSV	75	13	
	Dredge/Excavate to create a 15-20m Radius pit around pile - 25m³ grab performing 400m³/hr for ~25,000m³ per pile using Deep Water Excavator Grab and dredging systems - 4 piles	days	10.00	CSV	75	750	
	Lift Clamp/Rigging Arrangement Deployment and Installation - 4 piles at 2hr/pile	days	0.33	CSV	75	25	
	Pile lifting, upending and recovery to deck - 4 piles at 4hrs/pile	days	0.66	CSV	75	50	
	Interim Port Call x 1 (offload 4 x Recovered Piles)	days	1.50	CSV	75	113	
	Internal of Call X 1 (Chicae 1 X 100010104 1 1100)	dayo	1.00	551	70	110	
	Dredge/Excavate to create a 15-20m Radius pit around pile - 25m ³ grab performing 400m ³ /hr for -25,000m ³ per pile using Deep Water Excavator Grab and dredging systems - 4 piles	days	10.00	CSV	75	750	
	Lift Clamp/Rigging Arrangement Deployment and Installation - 4 piles at 2hr/pile	days	0.33	CSV	75	25	
	Pile lifting, upending and recovery to deck - 4 piles at 4hrs/pile	days	0.66	CSV	75	50	
- 1	Conduct excavation back-filling operation using the Deep Water Excavator Grab to replace soil.	days	20.00	CSV	75	1,500	
- 1						3,536	
110	Offshore weather allowance						
	Offshore weather allowance	£k (LS)	15%	_	_	530	
	L					530	
	Decommissioning Contractors Engineering and Management	01- (1-0)	400/			407	
	Based on 10% of total cost	£k (LS)	10%	-	-	407 407	
						407	
UB-TC	I DTAL Offshore Operations	<u> </u>				4,473	
TEM	Onshore Operations & Equipment Hire	Unit	QTY	Vessel	Rate £k	Total £k	
201	Recycling & Disposal						
	Steel	£k / Te	741.00		-0.03	-22	
- 1							
						-22	
202	Equipment Procurement, Hire & Fabrication					-22	
202	Equipment Procurement, Hire & Fabrication Pile Recovery Cradle Fabrication	LS	4.00		50.00	200	
	Pile Recovery Cradle Fabrication Subsea Jetter/Dredging Tool	£k / Day	50.00	-	0.9	200 43	
	Pile Recovery Cradle Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab	£k / Day £k / Day	50.00 50.00	- -	0.9 20.00	200 43 1,000	
	Pile Recovery Cradle Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Litting Clamp	£k / Day £k / Day £k / Day	50.00 50.00 50.00	- -	0.9 20.00 1.5	200 43 1,000 75	
	Pile Recovery Cradle Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab	£k / Day £k / Day	50.00 50.00	- - -	0.9 20.00	200 43 1,000	
	Pile Recovery Cradle Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Litting Clamp	£k / Day £k / Day £k / Day	50.00 50.00 50.00	- - -	0.9 20.00 1.5	200 43 1,000 75 4,000	
	Pile Recovery Cradle Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump	£k / Day £k / Day £k / Day	50.00 50.00 50.00	-	0.9 20.00 1.5	200 43 1,000 75	
203	Pile Recovery Cradle Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Litting Clamp Rock Dump Miscellaneous	£k / Day £k / Day £k / Day £k / Te	50.00 50.00 50.00 200000.00	-	0.9 20.00 1.5 0.02	200 43 1,000 75 4,000	
203	Pile Recovery Cradle Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump	£k / Day £k / Day £k / Day	50.00 50.00 50.00		0.9 20.00 1.5	200 43 1,000 75 4,000 1,318	
203	Pile Recovery Cradle Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Litting Clamp Rock Dump Miscellaneous	£k / Day £k / Day £k / Day £k / Te	50.00 50.00 50.00 200000.00		0.9 20.00 1.5 0.02	200 43 1,000 75 4,000	
203	Pile Recovery Cradle Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Litting Clamp Rock Dump Miscellaneous	£k / Day £k / Day £k / Day £k / Te	50.00 50.00 50.00 200000.00		0.9 20.00 1.5 0.02	200 43 1,000 75 4,000 1,318	
203 UB-TC	Pile Recovery Cradie Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TTAL Onshore Operations & Equipment Hire	£k / Day £k / Day £k / Day £k / Te	50.00 50.00 50.00 200000.00	-	0.9 20.00 1.5 0.02	200 43 1,000 75 4,000 1,318 100 100	
203 UB-TC	Pile Recovery Cradle Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Litting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.)	£k / Day £k / Day £k / Day £k / Te	50.00 50.00 50.00 200000.00	Vessel	0.9 20.00 1.5 0.02	200 43 1,000 75 4,000 1,318	
203 UB-TC	Pile Recovery Cradie Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TTAL Onshore Operations & Equipment Hire	£k / Day £k / Day £k / Day £k / Te	50.00 50.00 50.00 200000.00		0.9 20.00 1.5 0.02	200 43 1,000 75 4,000 1,318 100 100	
203 UB-TC TEM 301	Pile Recovery Cradie Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs	£k / Day £k / Day £k / Day £k / Te	50.00 50.00 50.00 200000.00	Vessel	0.9 20.00 1.5 0.02	200 43 1,000 75 4,000 1,318 100 100	
203 UB-TC	Pile Recovery Cradle Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Litting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) DTAL Onshore Operations & Equipment Hire	£k / Day £k / Day £k / Day £k / Day £k / Te	50.00 50.00 50.00 200000.00	- Vessel	0.9 20.00 1.5 0.02	200 43 1,000 75 4,000 1,318 100 100 Total £k	
203 TEM 301	Pile Recovery Cradie Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs	£k / Day £k / Day £k / Day £k / Day £k / Te	50.00 50.00 50.00 200000.00	Vessel	0.9 20.00 1.5 0.02	200 43 1,000 75 4,000 1,318 100 100 3,395 Total £k	
203 UB-TC TEM 301	Pile Recovery Cradle Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) DTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs	£k / Day £k / Day £k / Day £k / Day £k / Te	50.00 50.00 50.00 200000.00	Vessel	0.9 20.00 1.5 0.02	200 43 1,000 75 4,000 1,318 100 100 3,395 Total Ek	
203 UB-TC TEM 301 302	Pile Recovery Cradie Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification	£k / Day £k / Day £k / Day £k / Day £k / Te	50.00 50.00 50.00 200000.00	Vessel .	0.9 20.00 1.5 0.02 100.00	200 43 1,000 75 4,000 1,318 100 100 Total Ek	
203 UB-TC TEM 301 302	Pile Recovery Cradie Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance	£k / Day £k / Day £k / Day £k / Day £k / Te LS Unit	50.00 50.00 50.00 200000.00	Vessel .	0.9 20.00 1.5 0.02 100.00	200 43 1,000 75 4,000 1,318 100 100 Total Ek 944 944 200 200	
203 UB-TC TEM 301 302	Pile Recovery Cradle Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) 2TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification	£k / Day £k / Day £k / Day £k / Day £k / Te	50.00 50.00 50.00 200000.00	Vessel	0.9 20.00 1.5 0.02 100.00	200 43 1,000 75 4,000 1,318 100 100 3,395 Total £k 944 944 200 200	
203 UB-TC TEM 301 302	Pile Recovery Cradie Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance	£k / Day £k / Day £k / Day £k / Day £k / Te LS Unit	50.00 50.00 50.00 200000.00	Vessel .	0.9 20.00 1.5 0.02 100.00	200 43 1,000 75 4,000 1,318 100 100 3,395 Total Ek 944 944 200 200	
203 UB-TC TEM 301 302 303	Pile Recovery Cradie Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance	£k / Day £k / Day £k / Day £k / Day £k / Te LS Unit	50.00 50.00 50.00 200000.00	Vessel	0.9 20.00 1.5 0.02 100.00	200 43 1,000 75 4,000 1,318 100 100 3,395 Total £k 944 944 200 200	
203 UB-TC TEM 301 302 303	Pile Recovery Cradie Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) 2TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance Insurance	£k / Day £k / Day £k / Day £k / Tay £k / Te LS LS LS LS	50.00 50.00 50.00 200000.00		0.9 20.00 1.5 0.02 100.00 Rate £k - 200.00	200 43 1,000 75 4,000 1,318 100 100 3,395 Total Ek 944 944 200 200 224 224 1,368	
203 ITEM 301 302 303	Pile Recovery Cradie Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) TTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance	£k / Day £k / Day £k / Day £k / Day £k / Te LS Unit	50.00 50.00 50.00 200000.00	Vessel Vessel	0.9 20.00 1.5 0.02 100.00	200 43 1,000 75 4,000 1,318 100 100 Total Ek 944 944 200 200 224 224	
203 ITEM 301 302 303	Pile Recovery Cradie Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) 2TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance Insurance	£k / Day £k / Day £k / Day £k / Te LS Unit LS LS LS Unit	50.00 50.00 50.00 200000.00		0.9 20.00 1.5 0.02 100.00 Rate £k - 200.00	200 43 1,000 75 4,000 1,318 100 100 3,395 Total £k 944 944 200 200 224 224 1,368	
203 UB-TC TEM 301 302 303	Pile Recovery Cradie Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) 2TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance Insurance	£k / Day £k / Day £k / Day £k / Tay £k / Te LS LS LS LS	50.00 50.00 50.00 200000.00		0.9 20.00 1.5 0.02 100.00 Rate £k - 200.00	200 43 1,000 75 4,000 1,318 100 100 3,395 Total £k 944 944 200 200 224 224 1,368	
203 TEM 301 302 303 UB-TC	Pile Recovery Cradie Fabrication Subsea Jetter/Dredging Tool Deep Water Excavator Grab Pile Lifting Clamp Rock Dump Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) 2TAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance Insurance	£k / Day £k / Day £k / Day £k / Te LS Unit LS LS LS Unit	50.00 50.00 50.00 200000.00		0.9 20.00 1.5 0.02 100.00 Rate £k - 200.00	200 43 1,000 75 4,000 1,318 100 100 3,395 Total £k 944 944 200 200 224 224 1,368	

Report: Banff and Kyle Phase 2 and 3 Decommissioning Support - Comparative Assessment Report

Assignment Number: A400315-S00



Appendix F.12 Group 8 – Option 5

PROJECT CLIENT SUBJECT ASSIGNMENT NUMBER CALCULATION NUMBER REVISION

Banff and Kyle Decommissioning Teekay Petrojarl Floating Production Decommissioning Method Statements

BFD-P3-TKC-CAL-0001 B1





	GRAND TOTAL				£1,73	59,102
	SUB-TOTALS					
100	Offshore Operations				£1,00	03,493
	Onshore Operations & Equipment Hire					5,960
	Project Services					9,709
400	Long Term Liability				1	EO
ITEM	Offshore Operations	Unit	QTY	Vessel	Rate £k	Total £k
101	STL Pile Decommissioning					
	Mobilise CSV	days	1.00	CSV	75	75
	Transit to Field (117nm @ 10kts)	days	0.50	CSV	75	38
	DP Trials Dredge out pile internal soil - 8 piles at 12hrs/pile using Subsea Jetter/Dredging tool (based on	days	0.17	CSV	75	13
	2.5m ³ /m soil within the pile therefore 3.5m (8.75m ³) required per pile to allow cutting tool access)	days	4.00	CSV	75	300
	Cut each of the 8 piles 3m below seabed (4hrs/end. Cuting: 5.6m circumference @ 50mm/min)	days	1.33	CSV	75	100
	Recovery of the 8 x 3m pile sections to deck (sections to be lifted from seabed with internal clamp and recovered to deck in debris baskets)	days	1.00	CSV	75	75
	Lift and tension remaining 8 pile anchor chain and DWS/shear cut chain links at the seabed.	dava	4.22	CSV	75	100
	Recover chain to deck	days	1.33	CSV	/5	100
	As Left Surveys (all 8 pile locations)	days	0.25	CSV	75	19
	Transit to Peterhead (117nm @ 10kts)	days	0.50	CSV	75	38
	Demobilisation of Vessel	days	0.50	CSV	75	38
						793
110	Offshore weather allowance					
	Offshore weather allowance	£k (LS)	15%	-	-	119
120	Decommissioning Contractors Engineering and Management					119
	Based on 10% of total cost	£k (LS)	10%	-	-	91
		, ,				91
JB-T	OTAL Offshore Operations					1,003
	Onshore Operations & Equipment Hire		QTY		5	
	Offshore Operations & Equipment hire	Unit				
				Vessel	Rate £k	Total £k
201	Recycling & Disposal			Vessei		
201	Recycling & Disposal Steel	£k / Te	60.00	-	-0.03	-2
				-		
	Steel			- -		-2
	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks)	£k / Te £k / Day £k / Day	60.00	- - -	-0.03 0.85 15.00	-2 -2 11 195
	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Diamond Wire Saw / Shear Cutter (chains)	£k / Te £k / Day £k / Day £k / Day	60.00 13.00 13.00 13.00		-0.03 0.85 15.00 0.95	-2 -2 11 195 12
	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks)	£k / Te £k / Day £k / Day	60.00 13.00 13.00		-0.03 0.85 15.00	-2 -2 11 195
202	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Diamond Wire Saw / Shear Cutter (chains) Debris Baskets x 6	£k / Te £k / Day £k / Day £k / Day	60.00 13.00 13.00 13.00		-0.03 0.85 15.00 0.95	-2 -2 11 195 12
202	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Damond Wire Saw / Shear Cutter (chains) Debris Baskets x 6 Miscellaneous	£k / Te £k / Day £k / Day £k / Day £k / Day	60.00 13.00 13.00 13.00 13.00		-0.03 0.85 15.00 0.95 0.72	-2 -2 11 195 12 9
202	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Diamond Wire Saw / Shear Cutter (chains) Debris Baskets x 6	£k / Te £k / Day £k / Day £k / Day	60.00 13.00 13.00 13.00		-0.03 0.85 15.00 0.95	-2 -2 11 195 12 9
202	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Damond Wire Saw / Shear Cutter (chains) Debris Baskets x 6 Miscellaneous Misc. Onshore Costs (Port charges, storage etc.)	£k / Te £k / Day £k / Day £k / Day £k / Day	60.00 13.00 13.00 13.00 13.00		-0.03 0.85 15.00 0.95 0.72	-2 -2 11 195 12 9 228 100 100
202	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Damond Wire Saw / Shear Cutter (chains) Debris Baskets x 6 Miscellaneous	£k / Te £k / Day £k / Day £k / Day £k / Day	60.00 13.00 13.00 13.00 13.00		-0.03 0.85 15.00 0.95 0.72	-2 -2 11 195 12 9
202 203	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Damond Wire Saw / Shear Cutter (chains) Debris Baskets x 6 Miscellaneous Misc. Onshore Costs (Port charges, storage etc.)	£k / Te £k / Day £k / Day £k / Day £k / Day	60.00 13.00 13.00 13.00 13.00		-0.03 0.85 15.00 0.95 0.72	-2 -2 11 195 12 9 228 100 100
202 203 TEM	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Damond Wire Saw / Shear Cutter (chains) Debris Baskets x 6 Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations & Equipment Hire Project Services	£k / Te £k / Day	60.00 13.00 13.00 13.00 13.00	- - - - -	-0.03 0.85 15.00 0.95 0.72	-2 -2 11 195 12 9 228 100 100
202 203 TEM	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Diamond Wire Saw / Shear Cutter (chains) Debris Baskets x 6 Miscellaneous Misc. Onshore Costs (Port charges, storage etc.)	£k / Te £k / Day	60.00 13.00 13.00 13.00 13.00	- - - - -	-0.03 0.85 15.00 0.95 0.72	-2 -2 -11 195 12 9 -228
202 203 TEM 301	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Damond Wire Saw / Shear Cutter (chains) Debris Baskets x 6 Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs	£k / Te £k / Day	60.00 13.00 13.00 13.00 13.00	- - - - -	-0.03 0.85 15.00 0.95 0.72	-2 -2 -11 195 12 9 -228
202 203 TEM 301	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Diedging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Diamond Wire Saw / Shear Cutter (chains) Debris Baskets x 6 Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification	£k / Te £k / Day	60.00 13.00 13.00 13.00 13.00 13.00	Vessel	-0.03 0.85 15.00 0.95 0.72 100.00	-2 -2 -11 -195 -12 -9 -228
202 203 TEM 301	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Damond Wire Saw / Shear Cutter (chains) Debris Baskets x 6 Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs	£k / Te £k / Day	60.00 13.00 13.00 13.00 13.00	- - - - -	-0.03 0.85 15.00 0.95 0.72	-2 -2 -11 195 12 9 -228 -100 -100
202 203 TEM 301	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dtedging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Diamond Wire Saw / Shear Cutter (chains) Debris Baskets x 6 Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance	£k / Te £k / Day	60.00 13.00 13.00 13.00 13.00 13.00 14 QTY 12%	Vessel	-0.03 0.85 15.00 0.95 0.72 100.00	-2 -2 -11 -195 -12 -9
202 203 TEM 301	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Damond Wire Saw / Shear Cutter (chains) Debris Baskets x 6 Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification	£k / Te £k / Day	60.00 13.00 13.00 13.00 13.00 13.00	Vessel	-0.03 0.85 15.00 0.95 0.72 100.00	-2 -2 -11 195 12 9 -228
202 203 FEM 301 302	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Diamond Wire Saw / Shear Cutter (chains) Debris Baskets x 6 Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance	£k / Te £k / Day	60.00 13.00 13.00 13.00 13.00 13.00 14 QTY 12%	Vessel	-0.03 0.85 15.00 0.95 0.72 100.00	-2 -2 -11 195 12 9 -228 -100 -100
203 PEM 301 302	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dtedging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Diamond Wire Saw / Shear Cutter (chains) Debris Baskets x 6 Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance	£k / Te £k / Day	60.00 13.00 13.00 13.00 13.00 13.00 14 QTY 12%	Vessel	-0.03 0.85 15.00 0.95 0.72 100.00	-2 -2 -11 195 12 9 -228 100 100 326 Total £k 160 200 50
202 203 TEM 301 302	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Diamond Wire Saw / Shear Cutter (chains) Debris Baskets x 6 Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance	£k / Te £k / Day	60.00 13.00 13.00 13.00 13.00 13.00 14 QTY 12%	Vessel	-0.03 0.85 15.00 0.95 0.72 100.00	-2 -2 -11 195 12 9 -228 -100 -100
202 203 203 FEM 801 302	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Damond Wire Saw / Shear Cutter (chains) Debris Baskets x 6 Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance Insurance	£k / Te £k / Day LS Unit LS LS	60.00 13.00 13.00 13.00 13.00 13.00 1 1 QTY 12% 1 5%	Vessel	-0.03 0.85 15.00 0.95 0.72 100.00 Rate £k - 200.00	-2 -2 -11 1155 12 9 -228
202 203 203 301 302 303	Steel Equipment Procurement, Hire & Fabrication Subsea Jetter/Dredging Tool Abraisive water jet cutter spread (tool, downline, pumps, hose reel, grit storage/return tanks) Damond Wire Saw / Shear Cutter (chains) Debris Baskets x 6 Miscellaneous Misc. Onshore Costs (Port charges, storage etc.) OTAL Onshore Operations & Equipment Hire Project Services Owner Project Management Costs Project Management / Supervision / Owner Costs 3rd Party Verification 3rd Party Verification Insurance Insurance Insurance	£k / Te £k / Day LS Unit LS LS Unit	60.00 13.00 13.00 13.00 13.00 13.00 13.00 1 1	Vessel	-0.03 0.85 15.00 0.95 0.72 100.00 Rate £k - 200.00	-2 -2 -11 195 12 9 -228

Report: Banff and Kyle Phase 2 and 3 Decommissioning Support-Comparative Assessment Report

Assignment Number: A400315-S00



Appendix F.13 Estimate Basis

Vessel Rates	Unit	Rate £k
Survey Vessel	£k/day	50
Trenching Vessel	£k/day	150
Rockdump Vessel	£k/day	45
Rockdump (£k/Te dumped)	£k/Te	0.02
Rock Bags (8Te)	Each	1.60
DSV	£k/day	140
CSV	£k/day	75
Reel Vessel	£k/day	140
Trawler	£k/day	5
Survey Vessel (Legacy)	£k/day	50
Cargo Barge/Pipehaul	£k/day	90
Tug	£k/day	15
Equipment Rates	Unit	Rate £k
Suction Dredger	£k/day	0.95
Mass Flow Excavator (MFE)	£k/day	0.90
Mechanical / Jet Trencher	£k/day	2.50
Hydraulic Shears	£k/day	1.50
Diamond Wire Cutter	£k/day	0.95
Pipe Handling Tool	£k/day	0.80
Speed Loaders Hire	£k/day	0.04
Speed Loader Rigging	Each	0.24
Pipe Grab	£k/day	0.05
Subsea Basket	£k/day	0.12
Deck Corrals for handling of recovered pipe	£k - LS	
Deck Reel / Reel Drive System / Tensioner	£k/day	10.00
Subsea Excavator (ROV-Grab) Note: Equipment costs do not account for qualified technicians required to operate the	£k/day	5.00
equipment.		
Offshore Operations	Unit	Value
All Operations	<u> </u>	1 4141
Mob / Demob	day	2
Transit to Field	day	1
DP trials	hour	4
Transit to Shore	day	1
Interim trips (inc. transits and mob / demob)	day	3
Trip duration	day	28
Interfield transits	hour	4
	-	



Suction Dredger Operations		
Allow ance for deburial of pipeline section required to be cut	hour	1
Mass Flow Excavating Operations		
Deburial of trenched and buried line using MFE (whole length)	m / hour	100
Allow ance for deburial of pipeline section required to be cut	hour	2
Time required to deploy / retrieve MFE equipment	hour	1
Number of passes required for fully buried / rock covered		_
sections Number of passes required for partially buried / rock covered	QTY	3
sections	QTY	2
Remedial Trenching Operation		
Time required for jet trenching and burying exposure (only applies to trenching and burying exposure spots)	hour	1
Time required to deploy / retrieve and set up jet trenching equipment	hour	2
Time required to reposition jet trenching equipment	hour	1
Time required for jet trenching surface laid lines	m / hour	200
Time required for backfilling surface laid lines	m / hour	225
Length of trench transitions	m	50
Length of trench run in / out	m	30
Cutting and Lifting Operations		
Section length to be cut - Hydraulic Shears	m	15
Section length to be cut - Diamond Wire Saw	m	10
Section length to be cut - Trident Cut and Lift Tool	m	12
No. of hours required to perform one cut - hydraulic shears	hour	0.50
Hydraulic Shear Deployment Time	hour	1
Hydraulic Shears Repositioning Time	hour	0.50
Hydraulic shears retrieval time	hour	0.25
No. of hours required to perform one cut - Diamond Wire Cutter	hour	1
Diamond Wire Saw deployment time	hour	1
Diamond Wire Cutter Repositioning Time	hour	0.50
Diamond Wire Cutter Recovery Time	hour	0.25
Subsea basket deployment time	hour	0.50
Subsea basket retrieval time	hour	0.50
Time required to lift cut section of Pipeline / Spool / Flexible / Umbilical back to vessel - Pipe Grab	hour	0.50
Time required to lift cut section into subsea basket	hour	0.50
Time for combined cut pipe and lift (12m sections / 2 cuts) -	hour	1.50
Trident Time for a dual cut - Trident	hour hour	1.50
Time for a single pipe lift - Trident	hour	0.50
Trident deployment time	hour	0.30



Rock placement disturbance - length of pipeline	m (w idth)	10
Disturbance	Unit	v alue
Assumptions	Unit	Value
Ops Support Personnel	£k/day	0.68
Personnel Rates & Misc. Costs	Unit	Rate £k
Flexibles / Umbilicals / Cables	£ / Te	0.35
Rigid Steel Pipe	£/Te	-0.03
Concrete Coated Pipeline	£/Te	0.02
Recycling / Disposal Rates		
Onshore Rates	Unit	Rate £k
Decommissioning Contractors Engineering and Management	%	10%
Offshore tidal allow ance	%	30%
Offshore w eather allow ance	%	15%
Allow ance for diver intervention	day	2
Time required to carry out reverse s-lay of rigid pipeline	m / hour	400
Time required to carry out reverse reeling of rigid pipeline	m / hour	400
Time required to carry out reverse reeling of flexible / umbilical	m / hour	300
Time required to initiate reverse reel	hour	6
Time required to lift and attach recovery head and rigging	hour	4
Reverse Installation Operation		
No. hours to place rock bags per location	hour	0.33
No. of rock bag placement per end	QTY	4
Time required to rock cover section	hour / section	2
Rock quantity for cut ends	Te / end	25
Time required to rock cover line	Te / hour	1000
Rock quantity for pipelines / umbilical	Te / m	10
Rock Placement		
As-found / as-left cut end survey - rock cover	hour / end	0.5
As-found/post-decommissioning pipeline survey	m / hour	1500
Survey Operations		
Change out diamond wires	hour	2.0
Change out diamond wires every	cuts	6.0
Time required to recover concrete at each location	hour	0.5
Allow ance for concrete spalling	%	25%
Trident relocation time	hour	0.25



		1	ı
Rock placement disturbance - pipeline ends		m²	100
Rock bags (4Te) ~2.4m dia in-place		m²	25
Rock bags (8Te) ~3.0m dia in-place (3 bags per end)	m2	21	
Trench and bury disturbance		m (w idth)	10
Mass flow excavation disturbance		m (w idth)	5
Reverse install without deburial disturbance	m (w idth)	2	
Note: Any seabed dredging is considered to be localised and impact on the seabed in comparison to rockdumping, MFE etc included in the estimate for seabed disturbance/impact.			
Vessel Information		Unit	Value
Vessel Deck Area			
Olympic Ares (CSV)		m ²	1,300
Seven Atlantic (DSV)		m ²	1,200
Seven Arctic (CSV)		m ²	2,600
Seven Pegasus (DSV)		m ²	1,200
Vessel Deck Area Utilisation		%	50%
Maximum Pipe Storage Height		m m	1.5
Vessel Deck Weight Capacity			
Olympic Ares (CSV)		Te	7,150
Seven Atalantic (DSV)		Te	12,000
Seven Arctic (CSV)		Te	7,000
Seven Pegasus (DSV)		Te	7,800
			,,,,,,
Vessel Rock Capacity			
Nordnes (Flexible Fallpipe Vessel)		Te	24,000
			,,,,,,,
Project Services		Unit	Value
Project Management / Supervision / Owner Costs		%	12%
Insurance		%	5%
Misc. Onshore Costs (Port charges, storage etc.)		£k LS	100
3rd Party Verification		£k LS	200
Fees		Unit	Value
UK Fisheries Offshore Oil & Gas Legacy Trust Fund (FLTC)		£k / km	3.00
Personnel on Board (PoB) & Fatal Accident Rate (FAR)	РоВ	Hours Exposure	FAR
HLV	120	12	5.5
DSV	110	12	7.5
Barge / Pipehaul	20	12	5.5
Tug	7	12	13.2



Divers	18	24	97
Traw ler	5	12	7.5
Survey Vessel	44	12	7.5
CSV	76	12	7.5
Light CSV	76	12	5.5
SLV	200	12	5.5
Rockdump Vessel	20	12	7.5
Trenching Vessel	55	12	7.5
Large Deck CSV	76	12	5.5
Reel Vessel	76	12	7.5
Supply Vessel	76	12	18.1
Survey Vessel (Legacy)	44	12	7.5
Rockdump Vessel (Legacy)	20	12	7.5