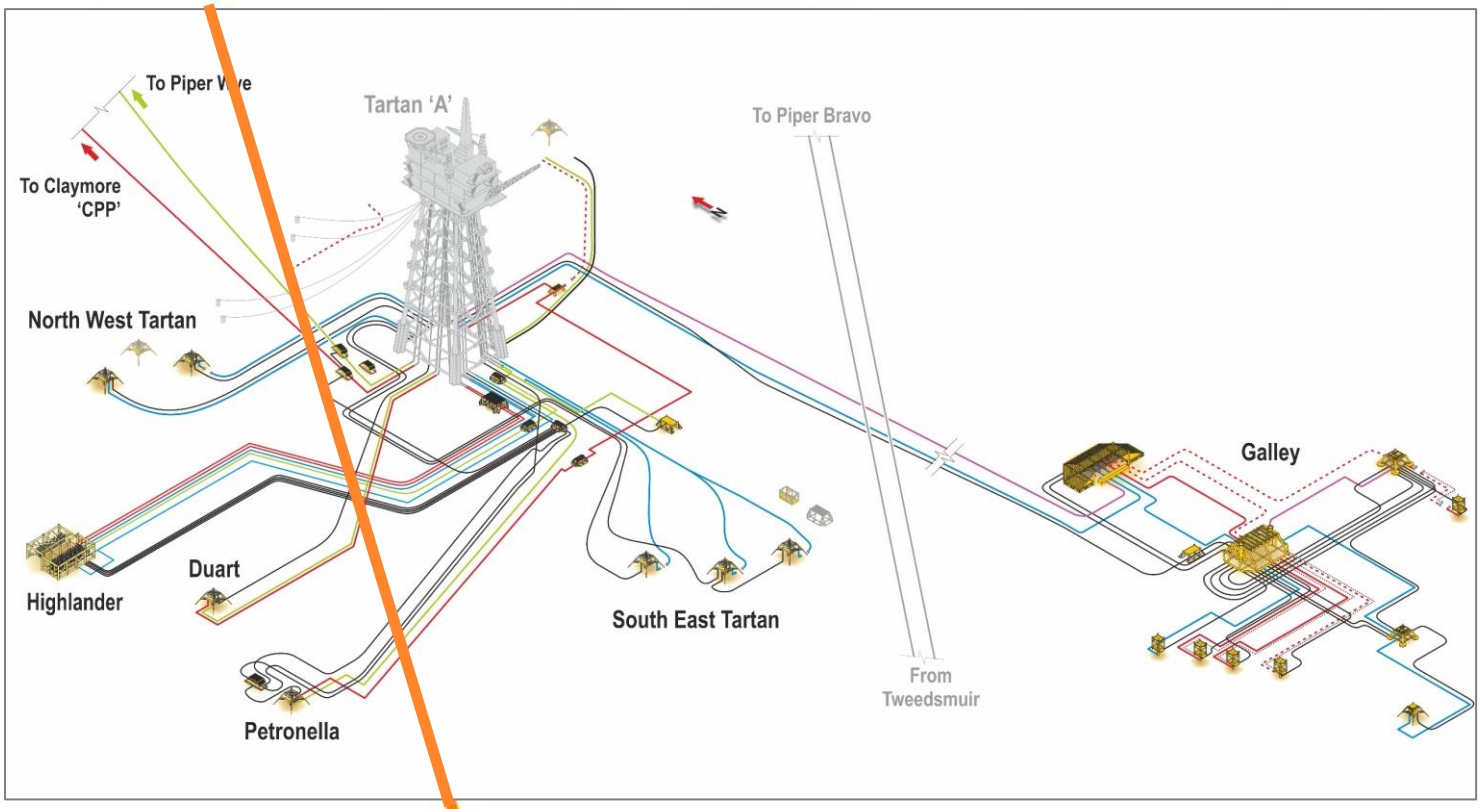

TARTAN DEVELOPMENT AREA
DECOMMISSIONING PROGRAMMES

PIPELINES COMPARATIVE ASSESSMENT REPORT (ALL FIELDS)

March 2021

Document Control Record

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HOLDS

Number	Section	Description

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FIGURES

TABLES

ABBREVIATIONS

ALARP	As Low As Reasonably Practicable
BAT	Best Available Technique
BEIS	Department for Business, Energy & Industrial Strategy
c.	circa
CA	Comparative Assessment
CNS	Central North Sea
CSV	Construction Support Vessel
C&P	Contracting and Procurement
dia.	Diameter
DSV	Dive Support Vessel
DOC	Depth of Cover
DOL	Depth of Lowering
DP	Decommissioning Programme
D&IM	Decommissioning & Investment Management
EA	Environmental Appraisal
EER	Escape Evacuation and Rescue
ENVID	Environmental Impact Identification
EPRD	Engineer, Prepare, Remove and Disposal
EPS	Early Production Skid
EUNIS	European Nature Information System
HIRA	Hazard Identification Risk Assessment
IS	Impact Significance
km	kilometres
KP	Kilometre Point
LAT	Lowest Astronomical Tide
m	metres
m^3	Cubic metres
Misc.	Miscellaneous
mm	millimetre
MSBL	Mean Seabed Level
MoE	Magnitude of Effect
NB	Nominal Bore
NSD	Not Significantly Different
N/A	Not Applicable
OD	Outside Diameter

OGA	Oil and Gas Authority
OGUK	Oil and Gas UK Ltd
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OSPAR	Oslo-Paris Convention
PL	Pipeline
PLU	Umbilical
PWA	Pipeline Works Authorisation
RAG	Red /Amber / Green
RAM	Risk Assessment Matrix
RBS	Riser Base / Pigging Structure
ROV	Remotely Operated Vehicle
SIMOPS	Simultaneous Operations
SPS	Subsea Production Skid
SSIV	Subsea Isolation Valve
SUDS	Subsea Umbilical Distribution System
TARA	Tartan Alpha Riser Assembly
te	Tonne
TEMPSC	Totally Enclosed Motor Propelled Survival Craft
THP	Tartan, Highlander and Petronella
TNT	Tartan North Terrace
TNW	Tartan North West
TOES	TEMPSC Orientation and Evacuation System
TOP	Top of Pipe
TSE	Tartan South East
TTD	Target Trench Depth
UKBAP	UK Biodiversity Action Plan
UKCS	United Kingdom Continental Shelf
Wgt	Weight
WI	Water Injection

1. EXECUTIVE SUMMARY

This document has been prepared to support the Decommissioning Programmes (DPs) for the Tartan Development Area pipeline systems. The Tartan Alpha platform commenced production in 1981 and since commencement of production, a series of subsea tie-backs have been installed and brought onstream between 1985 and 2009 and included subsequent reconfigurations of field infrastructure to optimise production.

The Tartan Development Area is in the Central North Sea (CNS), circa (*c.*)140km east of the nearest Scottish coastline and *c.*82km from the Norway/UK median line in a water depth of *c.*138m LAT.

The Tartan Development Area comprises several fields tied back to the Tartan Alpha platform located in Block 15/16. The fields include Tartan, Highlander, Duart, Petronella and Galley. From the Tartan Alpha platform, the processed oil is exported to the Claymore platform. In addition, a gas export/import pipeline ties into the Frigg Gas Pipeline System See field location in Figure 1 and field layout in Figure 2. A more detailed description of the field infrastructure with individual field locations is provided in Section 2.1.

All fields associated with the Tartan Development Area are now in the decommissioning phase, with Cessation of Production at Tartan being formally approved by the Oil and Gas Authority (OGA) in August 2020.

There is *c.*376.18km of pipelines and umbilicals associated with the Tartan Development Area to be comparatively assessed, *c.*238.74km – Tartan, Highlander and Petronella (THP), *c.*23.86km -Duart and *c.*113.58 – Galley. The decommissioning options for the pipelines and umbilicals have been subjected to a process of Comparative Assessment (CA) to assist the Repsol Sinopec Resources UK Limited project team to determine the preferred decommissioning strategy in compliance with the Department for Business, Energy & Industrial Strategy (BEIS) Guidance Notes: Decommissioning of Offshore Oil and Gas Installations and Pipelines under the Petroleum Act 1998 [1].

The strategy for surface laid structures, jumpers and any exposed stabilisation or protection features (mattresses, grout bags etc.) is that they will be removed and returned onshore for recycling or disposal.

The cuttings piles associated with the Tartan Development Area all fall within the leaching and persistence criteria set out by OSPAR agreed Recommendation 2006/5 on a Management Regime for Offshore Cuttings Piles (see the Subsea EA [2] for further information). Therefore, if undisturbed, the cuttings piles could be decommissioned in-situ. However, as recovery of the subsea infrastructure will result in some disturbance to each of the cuttings piles, a Best Available Technique (BAT) assessment will be used to identify the optimal management option for each of the cuttings piles. The BAT assessment precludes the requirement to capture the drilling cuttings in this CA.

This CA Report, considers the decommissioning options for the subsea pipelines and umbilicals only.

Robust evidence has been gathered in terms of determining quantities and status of the pipelines and umbilicals associated with the development area, by review of separate survey reports carried out over the operational life of the fields. A review of this evidence has determined the burial depth of the pipelines and umbilical and stability of the seabed is such that the lines currently trenched and buried are predicted to remain so.

The decommissioning options considered were:

- Total Removal, with all removed materials returned onshore for recycling and disposal:
  - By Reverse Reeling;
  - By Cut and Lift;

Total Removal by Reverse S-Lay was pre-screened out during early pre-screening studies and was not evaluated in the CA. Section 5.1 elaborates on why this option was pre-screened out.

- Remediate In-situ, by leaving the trenched and buried and rock covered sections of the lines in-situ, whilst remediating the exposed sections by one of the following sub options:
  - Rock Cover in-situ;
  - Trenched and Buried in-situ;
  - Cut and Remove with all removed materials returned onshore for recycle and disposal.
- Leave In-situ and Monitor

Each of the decommissioning options are described in more detail in Section 3.2

All decommissioning options and their sub options listed above, including Total Removal of all pipelines and umbilicals have been carried through to the conclusion of the CA process.

Seven separate pipelines/ umbilicals groups were considered during the CA process these are listed, together with the recommended/ preferred decommissioning option for each group in Table 1.

Table 1: Summary of Preferred Decommissioning Option by Pipeline Group

Group ID[1]	Component / As-laid Condition	Agreed Groupings[2]	Burial Status[3]	Preferred Decommissioning Option[4]
A	Rigid Trunk Pipelines, Concrete Coated and Trenched and Buried	Includes: One 24" x 15.6km and one 18" x 16.7km.	Both lines are buried >0.6m Depth of Cover (DOC), exposures are very short, located at pipeline ends and mid-line.	Remediate In-situ with exposed sections trenched and buried.[5]
B	Rigid and Flexible Pipelines and Umbilicals, Surface Laid	Includes: One 8" flexible x 7.5km, four 6" rigid x 13.1km (combined length) and four umbilicals x 13.3km (combined length).	All lines are surface laid with no natural burial evident along the lines.	Total Removal by Reverse Reeling.
C	Rigid Pipelines and Umbilicals, Trenched and Buried	Includes: Nine rigid pipelines of various diameter from 3" to 12" x 101km (combined length) and seven umbilicals x 83km (combined length).	All lines are buried to an average depth between 0.65 and 1.21m with some supplementary rock cover at intervals where adequate cover was not achieved. Some lines are in shared trenches and some lines are piggy-backed to other lines.	Remediate In-situ with exposed sections trenched and buried. [5]
D1	Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, with Depth of Lowering (DOL)[6] greater than 0.6m	Includes: Four 8" rigid pipelines x 7.7km (combined length) and two umbilicals x 3.8km (combined length).	All lines are trench laid with shallow cover of between 0.06m and 0.32m, with DOL of between 0.67m and 0.96m, with supplementary rock cover on some sections. Two lines share a common trench.	Remediate In-situ with exposed sections trenched and buried. [5]
D2	Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL[6] less than 0.6m	Includes: One 12" and three 8" rigid pipelines x 51.8km (combined length) and two umbilicals x 25.7km (combined length).	All lines are trench laid with shallow cover of between 0.24m and 0.37m, with DOL of between 0.37m and 0.45m, with supplementary rock cover on some sections. . Four lines share a common trench.	Total Removal by Reverse Reeling.[7]
E	Flexible Pipeline and Umbilical, Surface Laid and Rock Covered	Includes: One 6" Flexible Pipeline and one umbilical, both are 4.5km long.	Both lines are protected by a shared rock berm for their full length except for exposures at each end to enable tie-ins to be connected.	Total Removal by Reverse Reeling.[8]
F	Rigid Trunk Pipeline, Concrete Coated and Shallow Trenched and Partially Covered	The remaining section of the 24" Oil Trunk Pipeline x 11km (KP15.602) being the point where the pipeline transitions into the shallow trench.	The line has an average DOC of 0.44m and with mid line exposures of *c.*1.48km with some exposures currently covered with mattresses and concrete blocks.	Remediate In-situ with exposed sections trenched and buried. [5]

Table 1 Notes:

[1] Basis for pipeline groupings is described in Section 4.1.4.

[2] Detailed listings and pipeline numbers of each pipeline/ umbilical included in specific pipelines groups are provided in Table 6.

[3] A summary of the average burial status across the pipeline group is provided. Detailed burial status of each pipeline within the group is provided in Table 6.

[4] Basis for preferred decommissioning options are clarified in Section 6.1.

[5] Although the option to "Remediate in-situ with exposed sections trenched and buried" is ranked as the most preferred option in pipeline groups A, C, D1 and F, the difference in rating between all three remediate in-situ options considered is

marginal and all three options will be carried through to a Contracting and Procurement (C&P) phase of the project to allow contractors to tender and propose the overall preferred option. If the C&P tendering phase results in another remediate in-situ option being considered more favourable than the most preferred option noted in the table, the Operator will engage with Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) before a decision is taken on overall strategy.

[6] DOL denotes Depth of Lowering of the top of the pipeline, within the trench and below seabed level. See Figure 3 in Section 3.2 for a typical cross-section showing a pipeline in a trench for clarification.

[7] Although the option of "Total Removal by Reverse Reeling" is ranked as the most preferred option in pipeline group D2, the difference in rating between this option and "Remediate in-situ with exposed sections trenched and buried" is marginal and both options will be carried through to a C&P phase of the project to allow contractors to tender and propose the overall preferred option. If the C&P tendering phase results in the remediate in-situ with exposed sections trenched and buried option being considered more favourable than the most preferred option noted in the table, the Operator will engage with OPRED before a decision is taken on overall strategy.

[8] Although the option of "Total Removal by Reverse Reeling" is ranked as the most preferred option in pipeline group E, the difference in rating between this option and the three remediate in-situ options considered is marginal and all four options will be carried through to a C&P phase of the project to allow contractors to tender and propose the overall preferred option. If the C&P tendering phase results in any of the remediate in-situ option being considered more favourable than the most preferred option noted in the table, the Operator will engage with OPRED before a decision is taken on overall strategy.

In summary, the conclusions of the CA evaluation are:

- Where pipeline groups are surface laid, surface laid and rock covered or are laid in shallow trenches but do not meet adequate depth of cover, or depth of lowering requirements for most of their route, the most preferred decommissioning option is Option 1a) Total Removal by Reverse Reeling;
- Where pipeline groups are already trenched and buried to an adequate depth of cover, or depth of lowering for most of their route, the most preferred decommissioning option is Option 2b) Remediate In-situ with exposed sections trenched and buried.

This CA report is one of two documents submitted for consultation in support of the Tartan Development Area DPs, along with the Subsea Decommissioning Environmental Appraisal (EA) [2].

The DPs supported by this CA are:

- Subsea Decommissioning Programme –THP [3]
- Subsea Decommissioning Programme – Duart [4]
- Subsea Decommissioning Programme – Galley [5]

All documents will be made available online at the OPRED website, on request from Repsol Sinopec Resources UK Limited.

2. PROJECT OVERVIEW

2.1. Field Description

The Tartan Development Area is in the CNS, *c.*140km east of the nearest Scottish coastline and *c.*82km from the Norway/UK median line in a water depth of *c.*138m LAT. See field location in Figure 1 .

The Tartan Development Area comprises several fields tied back to the Tartan Alpha platform located in United Kingdom Continental Shelf (UKCS) Block 15/16. The fields include Tartan, Highlander, Duart, Petronella and Galley. From the Tartan Alpha platform, the processed oil was exported to the Claymore platform. In addition, a gas export/import pipeline ties into the Frigg Gas Pipeline System. The locations of the fields are as follows:

- The Tartan field, has three subsea well clusters all in Block 15/16:
  - Tartan North Terrace (TNT) is located *c.*3.2km north-east of the Tartan Alpha platform;
  - Tartan North West (TNW) is located *c.*3.4km north-west of the Tartan Alpha platform;
  - Tartan South East (TSE) is located *c.*3km south-east of the Tartan Alpha platform;
- The Highlander subsea development is located *c.*13km north-west of the Tartan Alpha platform in Block 14/20;
- The Petronella subsea tie-back located *c.*10.5km south-west of the Tartan Alpha platform, also in Block 14/20;
- The Duart subsea development is located *c.*8km west of the Tartan Alpha platform, also in Block 14/20;
- The Galley subsea development is located *c.*26 km east of the Tartan Alpha platform, in Block 15/23.

The overall Field Layout is shown in Figure 2.

Note: This figure includes the whole field, i.e. components covered by the Decommissioning Programmes (DP's). Only the pipelines and umbilicals included in the DP's have been subjected to the CA. See Section 2.3 for a detailed description of inclusions, exclusions and boundaries of the CA.

Since commencement of production, a series of subsea tie-backs were installed and brought onstream and subsequent reconfigurations has occurred, as summarised below:

- 1981 TNW & TSE;
- 1985 Highlander;
- 1986 Petronella;
- 1989 Amerada Hess AH001 gas;
- 1998 Galley;
- 2004 TNT;
- 2007 Galley reconfigured;
- 2007 Duart;
- 2009 AH001 Disconnected.

All fields associated with the Tartan Development Area are now in the decommissioning phase, with Cessation of Production for the Tartan field being formally approved by the OGA in August 2020.

Figure 1: Field Location

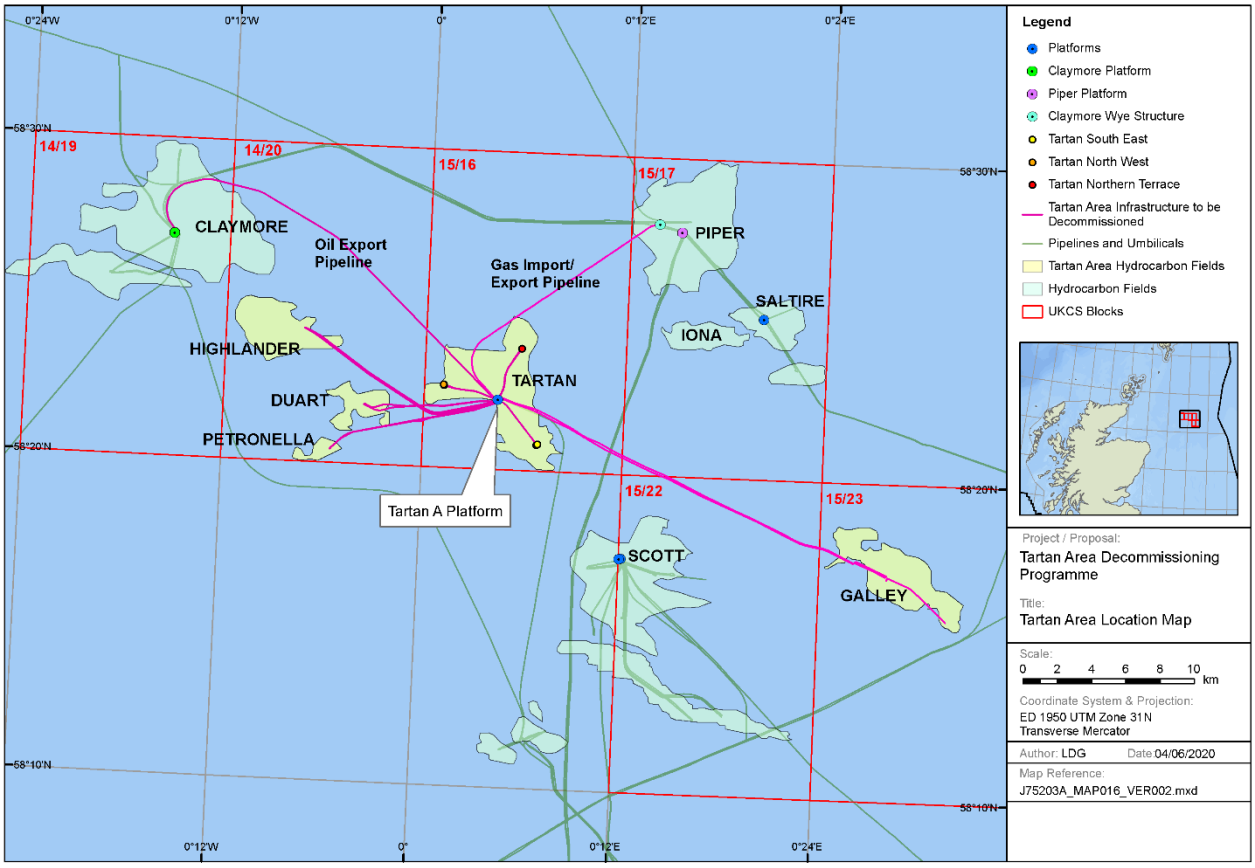
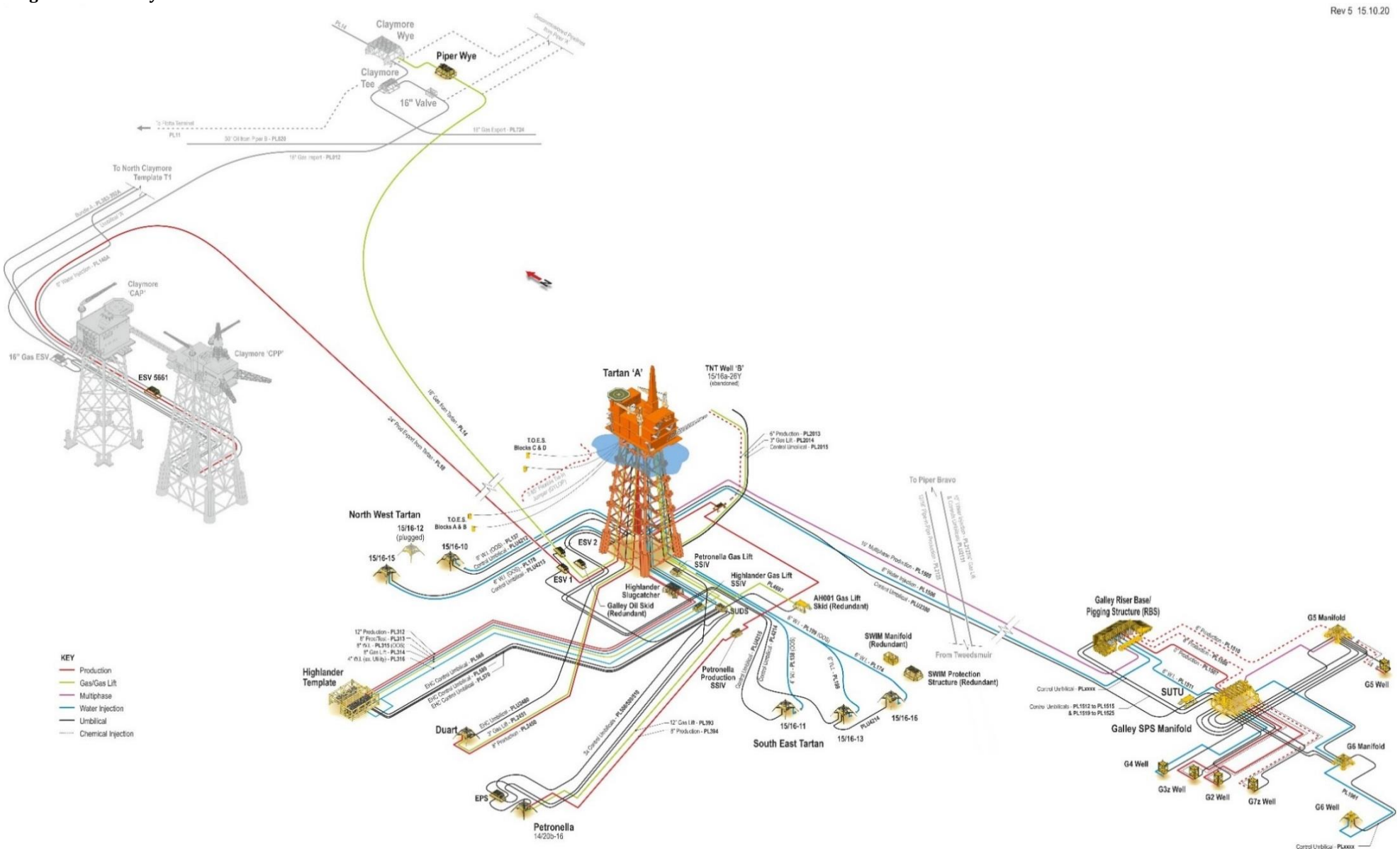


Figure 2: Field Layout



2.2. Environment and Social Overview

A detailed description of the environmental and social baseline at the Tartan Development Area fields is provided in the Subsea Environmental Appraisal (EA) Report [2], whilst a brief overview is presented in Section 4.1 of the DPs submissions [3, 4 and 5].

In summary, In September/October 2019, Repsol Sinopec Resources UK Limited commissioned a pre-decommissioning environmental survey across the Tartan Development Area. The survey results indicate that the sediments across the area covered by the pre-decommissioning survey were considered to be relatively homogenous and to comprise three main habitats: circalittoral fine mud (European Nature Information System (EUNIS) A5.36), circalittoral sandy mud (EUNIS A5.35) and deep circalittoral mixed sediment (EUNIS A5.45).

The sea pens *Virgularia mirabilis and Pennatula phosphorea* and burrows and tracks created by megafauna (e.g. *Nephrops norvegicus*) were widespread throughout the survey area. The majority of the Tartan Development Area, is therefore considered to meet the criteria for the OSPAR listed threatened and/or declining habitat 'Sea pen and burrowing megafauna communities' as well as the UK Habitat Feature of Conservation Importance and UK Biodiversity Action Plan (UKBAP) habitat 'mud habitats in deep water'.

The pre-decommissioning environmental survey identified six bathymetrically distinct cuttings piles within the Tartan Development Area; one medium sized piled at the Tartan A platform, and five small cuttings piles associated with the tie-backs. The small cuttings piles are located at: the TNW drilling location; the TSE drilling location, the Highlander drilling template location; the Galley SPS manifold location; and the Galley G6 well location. No distinct piles were identified at the Duart or Petronella Fields or at the TNT drilling location [Note 1].

[Note 1] The Galley G6 cuttings accumulation comprises cuttings from one well and therefore under OSPAR 2006/5 which defines a pile as comprising cuttings from more than one well is not considered a cuttings pile. It is therefore not identified in the Galley DP submission as a cuttings pile, though the impact of disturbance is considered in the Tartan Development Area Subsea EA.

Management of the Tartan A cuttings pile will be considered in the Tartan substructure DP and therefore no further details are provided here. The largest of the five small piles is the Highlander cuttings pile which has a volume of 495m^3 and a maximum height of 0.27m. The estimated hydrocarbon content within the Highlander cuttings pile is 0.44te whilst the total hydrocarbon content within each of the other small cuttings piles is < 0.4te.

Plankton, benthic and fish species in the area are typical of the CNS. Of the fish species identified in the area, cod, Norway pout, whiting, blue whiting and anglerfish have been assessed by Scottish Natural Heritage and Joint Nature Conservation Committee as Priority Marine Features in Scotland.

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

A number of seabird species are known to occur in the area including (but not limited to) the northern gannet, northern fulmar, black-legged kittiwake, lesser and greater black-backed gull, razorbill, great and Arctic skua, little auk, herring gull, common gull, common guillemot and Atlantic puffin.

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

Shipping activity in the vicinity of the Tartan Development Area is considered low, whilst there are no offshore windfarm developments in the area.

2.3. Inclusions, Exclusions and Boundaries for CA

2.3.1 Inclusions

Pipelines and Umbilicals

There are 43 separate pipelines/ umbilicals of various diameter and of total *c.*376.18km length that have been evaluated. The pipelines and umbilicals (and their respective pipeline number, dimensions, weight and specific boundaries) that have been evaluated in this CA are presented in Table 2 and Table 6.

For efficiency all fields have been evaluated together in one CA workshop and have therefore been listed and grouped together in this CA report and during the preparation of the Subsea Decommissioning Options Pre-screening Report [7].

Since this CA report supports three separate DPs THP [3], Duart [4] and Galley [5] Table 6 provides detail of the relevant DP applicable to each pipeline.

Table 2: Pipelines and Umbilicals Included in the CA Evaluation

Pipeline Number	Diameter (mm)	Length[1] (km)	Description	Original Product Conveyed	Description of Component Parts	From – To End Points	Burial Status	Pipeline Status	Current Content
TARTAN NORTH TERRACE (TNT)									
PL2013	168.3 (6"NB)	3.113	6" Production Pipeline	Oil	Carbon steel/ plastic/ alloy & misc. coatings	TNT Well 'B' to Tartan Alpha Platform	Trenched and buried	Out of use	Treated seawater
PL2014	88.9 (3"NB)	3.115	3" Gas Lift Pipeline (Piggybacked to PL2013)	Lift Gas	Carbon steel/ plastic/ alloy & misc. coatings	Tartan Alpha Platform to TNT Well 'B'	Trenched and buried	Out of use	Treated seawater
PLU2015	132.8	3.455[2]	Electrical, Hydraulic & Chemical Carbon steel / copper / plastic & misc. coatings	Hydraulic Fluid / Chemicals	Carbon steel/ alloy	Tartan Alpha Platform to TNT Well 'B' umbilcal termination assembly	Trenched and buried	Out of use	Hydraulic cores filled with Pelagic 100 Chemical cores filled with treated seawater
TARTAN NORTH WEST (TNW)									
PL137	168.3 (6"NB)	3.475[2]	6" Water Injection	Injection Water	Carbon steel / plastic coatings	Tartan Alpha Platform to Well 15/16-10 (TS10)	Surface laid	Out of use	Injection water fluids
PL178	168.3 (6"NB)	3.475[2]	6" Water Injection	Injection Water	Carbon steel / plastic coatings	Tartan Alpha Platform to Well 15/16-10 (TS10)	Surface laid	Out of use	Injection water fluids
PLU4212	63.5	3.395[2]	Control Umbilical	Hydraulic Fluid	Hydraulic Carbon steel / plastic & misc. coatings	Tartan Alpha Platform to Well 15/16-10 (TS10)	Surface laid	Out of use	Hydraulic cores filled with Pelagic 100
PLU4213	76.2	3.395[2]	Control Umbilical	Hydraulic Fluid	Hydraulic Carbon steel / plastic & misc. coatings	Tartan Alpha Platform to Well 15/16-15 (TS15)	Surface laid	Out of use	Hydraulic cores filled with Pelagic 100
TARTAN SOUTH EAST (TSE)									
PL138	168.3 (6"NB)	3.060	6" Water Injection (Ex. Production)	Injection Water	Carbon steel / plastic coatings	Blinded Big Inch Connecter (adjacent Petronella Gas Lift SSIV) to Sensor spool at Well 15/16-11 (TS11)	Surface laid	Out of use	Injection water fluids
PL199	168.3 (6"NB)	3.110[2]	6" Water Injection	Injection Water	Carbon steel / plastic coatings	Tartan Alpha Platform to Well 15/16-13 (TS13)	Surface laid	Out of use	Injection water fluids

Table 2: Continued

Pipeline Number	Diameter (mm)	Length[1] (km)	Description	Original Product Conveyed	Description of Component Parts	From – To End Points	Burial Status	Pipeline Status	Current Content
TARTAN SOUTH EAST (TSE) continued									
PLU4214	76.2	3.275[2]	Control Umbilical	Hydraulic Fluid	Hydraulic Carbon steel / plastic & misc. coatings	Tartan Alpha Platform to Well 15/16-13 (TS13)	Surface laid	Out of use	Hydraulic cores filled with Pelagic 100
PLU4215	63.5	3.225[2]	Control Umbilical	Hydraulic Fluid / Chemical	Hydraulic / Chemical Carbon steel / plastic & misc. coatings	Tartan Alpha Platform to Well 15/16-11 (TS11)	Surface laid	Out of use	Hydraulic cores filled with Pelagic 100 / Chemical cores filled with treated seawater
OIL EXPORT PIPELINE									
PL18 (Pt 1)[3]	609.6 (24”)	15.602	Oil Export Pipeline, Concrete Coated	Oil	Carbon steel / plastic coatings / concrete coating	Tartan Alpha Platform to Mid-line (KP 15.602)[3]	Trenched and buried	Out of use	Treated seawater
PL18 (Pt 2)[3]	609.6 (24”)	10.958	Oil Export Pipeline, Concrete Coated	Oil	Carbon steel / plastic coatings / concrete coating	Mid-line (KP 15.602) to Claymore A Platform	Trenched / Natural Backfill	Out of use	Treated seawater
GAS IMPORT PIPELINE									
PL14	457 (18”)	16.700	Gas Import Pipeline, Concrete Coated	Gas	Carbon steel / plastic coatings / concrete coating	Claymore Wye Piece to Tartan Alpha Platform	Trenched and buried	Out of use	Seawater
HIGHLANDER									
PL312	323.9 (12”NB)	12.950	12” Production Pipeline	Oil	Carbon steel / plastic coatings	Highlander Template to Highlander Slug Catcher	Trenched / Natural Backfill	Out of use	Seawater
PL313	219.1 (8”NB)	12.950	8” Production/Test Pipeline	Oil	Carbon steel / plastic coatings	Highlander Template to Highlander Slug Catcher	Trenched / Natural Backfill	Out of use	Seawater
PL314	219.1 (8”NB)	12.950	8” Gas Lift Pipeline	Lift Gas	Carbon steel / plastic coatings	Petronella Gas Lift SSIV to Highlander Template	Trenched / Natural Backfill	Out of use	Seawater

Table 2: Continued

Pipeline Number	Diameter (mm)	Length[1] (km)	Description	Original Product Conveyed	Description of Component Parts	From – To End Points	Burial Status	Pipeline Status	Current Content
HIGHLANDER continued									
PL315	219.1 (8"NB)	12.950	8" Water Injection Pipeline	Injection Water	Carbon steel / plastic coatings	Tartan Alpha Platform to Highlander Template	Trenched / Natural Backfill	Out of use	Injection water fluids
PL316	114.3 (4"NB)	12.950	4" Utility Pipeline	Injection Water	Carbon steel / plastic coatings	Tartan Alpha Platform to Highlander Template	Trenched / Natural Backfill	Out of use	Injection water fluids
PL568	55	13.370[2]	Control Umbilical	N/A	Electrical Carbon steel / copper / plastic & misc. coatings	Tartan Alpha Platform to Highlander Template	Trenched / Natural Backfill	Out of use	N/A
PL569	90	12.950	Control Umbilical	Chemicals	Chemical Carbon steel / plastic & misc. coatings	Subsea Umbilical Distribution System (SUDS) to Highlander Template	Trenched / Natural Backfill	Out of use	PAO85433 Wax Inhibitor / CRW83133 Corrosion Inhibitor
PL570	108	12.780[2]	Control Umbilical	Hydraulic Fluid / Chemicals	Hydraulic / Chemical Carbon steel / plastic & misc. coatings	Tartan Alpha Platform to Highlander Template	Trenched / Natural Backfill	Out of use	Hydraulic cores filled with Pelagic 100 / Chemical cores filled with PAO85433 Wax Inhibitor / CRW83133 Corrosion Inhibitor
PETRONELLA									
PL393	323.9 (12"NB)	10.400	12" Gas Lift Pipeline	Lift Gas	Carbon steel / plastic coatings	Tartan Alpha Platform to Well 14/20b-16 (PS16)	Surface Laid	Out of use	Treated seawater
PL394	219.1 (8"NB)	10.400	8" Production Pipeline	Oil	Carbon steel / plastic coatings	Well 14/20b-16 (PS16) to Tartan Alpha Platform	Trenched / Natural Backfill	Out of use	Treated seawater
PL508	89	10.900	Control Umbilical	Hydraulic Fluid / Chemicals	Hydraulic & Chemical Carbon steel / plastic & misc. coatings	SUDS to Petronella Early Production Skid (EPS)	Trenched / Natural Backfill	Out of use	Hydraulic cores filled with Pelagic 100 Chemical cores filled with PAO85433 Wax Inhibitor / CRW83133 Corrosion Inhibitor

Table 2: Continued

Pipeline Number	Diameter (mm)	Length[1] (km)	Description	Original Product Conveyed	Description of Component Parts	From – To End Points	Burial Status	Pipeline Status	Current Content
PETRONELLA continued									
PL509	89	11.100	Control Umbilical	Hydraulic Fluid / Chemicals	Hydraulic & Chemical Carbon steel / plastic & misc. coatings	SUDS to Petronella EPS	Trenched / Natural Backfill	Out of Use	Hydraulic cores filled with Pelagic 100 / Chemical cores filled with PAO85433 Wax Inhibitor / CRW83133 Corrosion Inhibitor
PL510	55	10.930[2]	Control Umbilical	N/A	Electrical Carbon steel / copper / plastic & misc. coatings	Tartan Alpha Platform to Petronella EPS	Trenched / Natural Backfill	Out of Use	N/A
DUART									
PL2450	219.1 (8"NB)	7.805	8" Production Pipeline	Oil	Carbon steel / plastic coatings	Duart North Well to Tartan Alpha Platform	Trenched and buried	Out of Use	Treated seawater
PL2451	88.9 (3"NB)	7.805	3" Gas Lift Pipeline (Piggybacked to PL2450)	Lift Gas	Carbon steel / plastic coatings	Tartan Alpha Platform to Duart North Well	Trenched and buried	Out of Use	Treated seawater
PLU2480	125.4	8.254[2]	Duart Chemical Injection/ Control Umbilical	Hydraulic Fluid / Methanol / Wax Inhibitor / Corrosion Inhibitor / Scale Inhibitor	Electrical, Hydraulic & Chemical Carbon steel / copper / plastic & misc. coatings	Tartan Alpha Platform to Duart North Well Subsea Termination/ Distribution Unit	Trenched and buried	Out of Use	Hydraulic cores filled with Pelagic 100/ Chemical cores filled with treated seawater
GALLEY									
PL1505	273.1 (10.75")	23.058	Production Pipeline RBS to Tartan	Oil	Carbon steel / plastic coatings	Galley Riser Base / Pigging Structure (RBS) to Tartan Alpha Platform	Trenched and buried with spot rock cover	Out of Use	Treated seawater

Table 2: Continued

Pipeline Number	Diameter (mm)	Length[1] (km)	Description	Original Product Conveyed	Description of Component Parts	From – To End Points	Burial Status	Pipeline Status	Current Content
GALLEY continued									
PL1506 (Pt 1)[4]	267.3 (8"ID)	7.481	Flexible Water Injection Pipeline (Originally Galley Gas Export)	Injection Water	Carbon steel / plastic coatings	Tartan Alpha Platform to Mid-line (KP 7.481)	Surface laid in shallow pre-existing trench	Out of Use	Injection water fluids
PL1506 (Pt 2)[4]	219.1 (8"NB)	29.715	Water Injection Pipeline (Originally Galley Gas Export)	Injection Water	Carbon steel / plastic coatings	Mid-line (KP 7.481) to Galley RBS	Trenched & Buried with rock cover at trench transition	Out of Use	Injection water fluids
PL1506A	219.1 (8"NB)	7.440	Redundant section of Water Injection Pipeline (Originally Galley Gas Export)	Injection Water	Carbon steel / plastic coatings	Adjacent to Galley pipeline end at Tartan Alpha Platform to adjacent Pipeline Repair Tie-in	Trenched and buried	Out of Use	Injection water fluids & RX-9034A Dye sticks
PL1507	219.1 (8"NB)	1.886	North Production Flowline	Oil	Carbon steel / plastic coatings	Galley Subsea Production Skid (SPS) Manifold to Rigid Pipe extension spool to pigging skid RBS	Trenched / Natural Backfill with rock cover at trench transition	Out of Use	Treated seawater
PL1508	219.1 (8"NB)	1.911	South Production Flowline	Oil	Carbon steel / plastic coatings	Galley SPS Manifold to Galley RBS	Trenched / Natural Backfill	Out of Use	Treated seawater & RX-9034A Dye sticks
PL1510	219.1 (8"NB)	1.911	Third Production Flowline	Oil	Carbon steel / plastic coatings	M5 Manifold to Galley RBS	Trenched / Natural Backfill	Out of Use	Treated seawater & RX-9034A Dye sticks
PL1511	219.1 (8"NB)	1.898	Infield Water Injection Flowline	Injection Water	Carbon steel / plastic coatings	Galley RBS to Galley SPS Manifold	Trenched / Natural Backfill	Out of Use	Injection water fluids

Table 2: Continued

Pipeline Number	Diameter (mm)	Length[1] (km)	Description	Original Product Conveyed	Description of Component Parts	From – To End Points	Burial Status	Pipeline Status	Current Content
GALLEY continued									
PL1961	204.3 (6"ID)	4.500	Flexible Water Injection Flowline	Injection Water	carbon steel / plastic & misc. coatings	G6 Manifold to G6 Well	Surface laid with continuous rock cover[5]	Out of Use	Injection water fluids
PLU2380	160	25.480[2]	Galley Main Control Umbilical	Hydraulic Fluid / Chemicals	Electrical, Hydraulic & Chemical Carbon steel / copper / plastic & misc. coatings	Tartan Alpha Platform to Galley SPS Manifold	Trenched & Buried with rock cover at crossings	Out of Use	Hydraulic cores filled with Pelagic 100/ Chemical cores filled with treated seawater
PL1512 to PL1515 & PL1519 to PL1525	90	1.900	Galley Infield Control Umbilical[6]	Hydraulic Fluid / Chemicals	Hydraulic & Chemical Carbon steel / plastic & misc. coatings	Galley RBS to Galley SPS Manifold	Trenched / Natural Backfill	Out of Use	Hydraulic cores filled with Pelagic 100/ Chemical cores filled with treated seawater
PLU5056	75	1.900	Galley Infield Control Umbilical	N/A	Electrical Carbon steel / copper / plastic & misc. coatings	Galley RBS to Galley SPS Manifold	Trenched / Natural Backfill	Out of Use	N/A
PLU5060	78	4.500	Galley G6 Control Umbilical	Hydraulic Fluid / Chemicals	Electrical, Hydraulic & Chemical Carbon steel / copper / plastic & misc. coatings	G6 Manifold to G6 Well	Surface laid with continuous rock cover[5]	Out of Use	Hydraulic cores filled with Pelagic 100/ Chemical cores filled with treated seawater

Notes for Table 2:

[1] All pipeline lengths quoted in Pipeline Works Authorisation (PWA) documents generally include jumper spool lengths. However, since jumper spools are to be recovered and returned onshore and are excluded from this CA, all pipeline lengths quoted in Table 2 exclude jumper spool lengths.

[2] Length quoted is from exit point from conductor/ J-tube and excludes "riser" lengths inside well conductors and J-Tubes, but includes lengths encased in drill cutting mound at Tartan Alpha Platform.

a) There are 14 separate pipelines highlighted by this note, that are partially buried by drill cuttings. The CA evaluation was not influenced by the existence of this status. However, if the Substructure (Jacket) CA subsequently concludes and recommends that the jacket footings should be decommissioned in-situ (a derogation case), then the cutting pile is likely to remain mainly undisturbed. In such circumstances the pipeline ends local to the jacket and identified by this footnote are also buried by drill cuttings and these buried sections may be managed differently from the preferred decommissioning options identified for each pipeline group from this CA.

b) Modelling of cuttings pile disturbance [15] has shown that disturbing the cuttings to recover the ends of the pipelines will extend the area impacted by contaminated cuttings beyond the current cuttings footprint, therefore should the Substructure (Jacket) CA conclude that the jacket footings are to remain in-situ and drill cuttings are to remain undisturbed, then the pipeline ends that are also buried by drill cuttings will also remain undisturbed.

[3] PL18 has been split into two parts in Table 2 to reflect the fact that the burial status is different for each part of the pipeline, which may influence the CA evaluation for each part.

[4] PL1506 has been split into two parts in Table 2 to reflect the fact that the burial status is different for each part of the pipeline, which may influence the CA evaluation for each part.

[5] PL1961 Flexible Water Injection Flowline and the Galley G6 Control Umbilical are both rock covered below a shared rock berm.

[6] The Galley Infield Control Umbilical cores have been allocated separate PL numbers in the PWA.

2.3.2 Exclusions

Tartan Alpha Platform Substructure

The substructure is a derogation candidate for partial removal and will be subject to a separate CA workshop and reported separately.

Pipe Spools and Jumpers

There is a total of 65 relatively short and exposed pipe spool tie-ins at each end of most pipelines and there is a further five redundant spools on the seabed ranging in length from 5m to 380m long. The total combined length of all spools is *c.*7,800m with a total combined weight of *c.*570te.

There are also 24 relatively short and exposed umbilical jumpers at the field end of some umbilicals ranging in length from 3m to 550m long. The total combined length of all umbilical jumpers is *c.*3,570m with a total combined weight of *c.*71te.

There are 25 of the pipe spools and jumpers included in the quantities above that have been allocated a unique PL/PLU number within the PWA system and these components are listed in Table 3 for clarity and completeness. However, most of the pipe spools and jumpers quantified in paragraph one and two above have been allocated the same PL/PLU number as the pipeline/ umbilical that they are associated with and are included within these specific PWAs, these pipelines/ umbilicals are already listed in Table 2 and are therefore not repeated in Table 3.

In compliance with BEIS Guidance [1], exposed small diameter pipelines, including flexible flowlines and umbilicals are expected to be entirely removed. Therefore, the base case is that all exposed pipeline spools and umbilical jumpers will be fully removed and returned onshore for recycle and have therefore been excluded from the CA.

Subsea Structures

There are 39 separate subsea structures associated with the Tartan Development Area with a total combined weight of *c.*3,939te. A breakdown and itemised description of the components excluded are provided in the Subsea Material and Waste Inventories for the Tartan Development Area Infrastructure [6]

In compliance with BEIS Guidance [1], all subsea structures other than the Tartan Alpha platform jacket associated with Tartan Development Area fields are not candidates for derogation and therefore, the base case is that they will be fully removed and returned onshore for recycle and have therefore been excluded from the CA.

Stabilisation / Protection Features

There is *c.*1,130 (5,000te) prefabricated mattresses, 23,443 (587te) grout bags and 180,872te of rock cover in the Tartan Development Area.

Most of the mattresses and grout bags are located at the ends of pipelines at the Tartan Alpha platform or at the field end tie-ins and offer protection to the exposed sections on pipeline and pipe spools at each end. Although a small amount has been used to provide stitch mattressing to protect umbilicals.

Spot rock cover has been applied at pipeline /umbilical/ cable crossings and where trench anomalies exist, however most of the rock cover is applied to Duart and Galley pipelines, where Galley has one pipeline and one umbilical that have been rock covered their entire length.

The oil export line has 65 (777te) of special prefabricated concrete protection units near the Claymore SSIV (ESV5661).

The oil export and gas import lines also have a small number of timber mud mats spool pieces at the base of the Tartan jacket when the spool pieces been removed the timber mud mats will also be removed.

A breakdown and itemised description of the components excluded are provided in the Subsea Material and Waste Inventories for the Tartan Development Area Infrastructure [6]

From a review of inspection reports, all exposed mattresses, grout bags, prefabricated concrete protection units and timber mud mats are expected to be recoverable. Subject to the outcome of the CA for pipelines that are rock covered, rock berms may be left undisturbed. Mattresses and grout bags that are already buried or are rock covered will be decommissioned in-situ.

Since these proposals are aligned with the expectations identified in the BEIS Guidance [1], stabilisation / protection features have been excluded from this CA.

If, during execution of the project, full recovery of all exposed mattresses is not achievable, Repsol Sinopec Resource UK will engage with OPRED to agree alternative options.

Drill Cuttings

The cuttings piles associated with the Tartan Development Area all fall within the leaching and persistence criteria set out by OSPAR agreed Recommendation 2006/5 on a Management Regime for Offshore Cuttings Piles (see the Subsea EA [2] for further information). Therefore, if undisturbed, the cuttings piles could be decommissioned in-situ.

However, as recovery of the subsea infrastructure will result in some disturbance to each of the cuttings piles, a Best Available Technique (BAT) assessment will be used to identify the optimal management option for each of the cuttings piles. The BAT assessment precludes the requirement to capture the drilling cuttings in this CA.

Table 3: Pipelines and Umbilicals Excluded from the CA Evaluation

Pipeline Number	Diameter (mm)	Length[1] (km)	Description	Original Product Conveyed	Description of Component Parts	From – To End Points	Burial Status	Pipeline Status	Current Content
TARTAN NORTH TERRACE (TNT)									
PL4024	25.4 (1")	0.003	Short Umbilical	Chemicals/ Hydraulic Fluid	Carbon steel/ plastic, misc. coatings	Loop connected to SUTU at TNT	Surface laid	Out of use	Treated seawater
PL4025	25.4 (1")	0.003	Short Umbilical	Chemicals/ Hydraulic Fluid	Carbon steel/ plastic, misc. coatings	Loop connected to SUTU at TNT	Surface laid	Out of use	Treated seawater
TARTAN SOUTH EAST (TSE)									
PL174	101.6 (4"NB)	0.016	Water Injection jumper spool	Injection Water	Carbon steel/ plastic, misc. coatings	Wye Piece to Sensor spool at Well 15/16-16 (TS16)	Surface laid	Out of use	Injection water fluids
TARTAN OIL EXPORT									
PLU5048	80 (3.15")	0.300	Short Umbilical	Hydraulic Fluid	Electrical / Hydraulic Carbon steel / copper / plastic & misc. coatings	SUDS to Tartan Oil Export SSIV (ESV1)	Surface laid	Out of use	Hydraulic cores filled with Pelagic 100
PLU5049	80 (3.15")	0.105	Short Umbilical	Hydraulic Fluid	Electrical / Hydraulic Carbon steel / copper / plastic & misc. coatings	Claymore Production Platform to Claymore SSIV (ESV5661)	Surface laid	Out of use	Hydraulic cores filled with Pelagic 100
TARTAN GAS IMPORT									
PLU5050	80 (3.15")	0.090	Short Umbilical	Hydraulic Fluid	Electrical / Hydraulic Carbon steel / copper / plastic & misc. coatings	Tartan Oil Export SSIV (ESV1) to Tartan Gas Import SSIV (ESV2)	Surface laid	Out of Use	Hydraulic cores filled with Pelagic 100

Table 3: Continued

Pipeline Number	Diameter (mm)	Length[1] (km)	Description	Original Product Conveyed	Description of Component Parts	From – To End Points	Burial Status	Pipeline Status	Current Content
HIGHLANDER									
PL324 to PL326 [1]	80 (3.15")	0.540	Short Umbilical	Hydraulic Fluid	Electrical / Hydraulic Carbon steel / copper / plastic & misc. coatings	Tartan Alpha Platform to Highlander Slug catcher (via SUDS)	Surface laid	Out of Use	Hydraulic cores filled with Pelagic 100 / Chemical cores filled with PAO85433 Wax Inhibitor / CRW83133 Corrosion Inhibitor
PLU5052	80 (3.15")	0.050	Short Umbilical	Hydraulic Fluid	Electrical / Hydraulic Carbon steel / copper / plastic & misc. coatings	SUDS to Highlander Gas Lift SSIV	Surface laid	Out of Use	Hydraulic cores filled with Pelagic 100
PLU5053	55 (2.17")	0.230	Short Umbilical (Acoustic Telemetry Cable)	N/A	Electrical Carbon steel / copper / plastic & misc. coatings	Tartan Alpha Platform to Monitoring Unit on Highlander Protection/Test Pipeline PL313	Surface laid	Out of Use	N/A
PETRONELLA									
PL394	282 (11.1")	0.250	Redundant Production Riser[2]	Oil	carbon steel / plastic coatings	Redundant flexible riser at Tartan Platform	Platform caisson to seabed surface laid	Out of use	Treated seawater
PL394A	155 (6.1")	0.370	Redundant Production Riser[2]	Oil	carbon steel / plastic coatings	Redundant flexible riser at Tartan Platform	Platform caisson to seabed surface laid	Out of use	Treated seawater
PL394B	155 (6.1")	0.370	Redundant Production Riser[2]	Oil	carbon steel / plastic coatings	Redundant flexible riser at Tartan Platform	Platform caisson to seabed surface laid	Out of use	Treated seawater
PL395 to PL399 [1]	130 (5.12")	0.400	Short Umbilical	Chemicals	Carbon steel/ plastic, misc. coatings	Tartan Alpha Platform to SUDS	Surface laid	Out of Use	Seawater

Table 3: Continued

Pipeline Number	Diameter (mm)	Length[1] (km)	Description	Original Product Conveyed	Description of Component Parts	From – To End Points	Burial Status	Pipeline Status	Current Content
PETRONELLA Continued									
PL400	80 (3.15")	0.050	Short Umbilical	Chemicals	Carbon steel/ plastic, misc. coatings	SUDS to Tartan Alpha Platform	Surface laid	Out of Use	CRW83133 Corrosion Inhibitor
PLU5054	80 (3.15")	0.040	Short Umbilical	Hydraulic Fluid	Electrical / Hydraulic Carbon steel / copper / plastic & misc. coatings	SUDS to Petronella Production SSIV	Surface laid	Out of Use	Hydraulic cores filled with Pelagic 100
PLU5055	80 (3.15")	0.100	Short Umbilical	Hydraulic Fluid	Electrical / Hydraulic Carbon steel / copper / plastic & misc. coatings	SUDS to Petronella Gas Lift SSIV	Surface laid	Out of Use	Hydraulic cores filled with Pelagic 100
GALLEY									
PL1505A	254 (10")	0.062	Redundant Production Pipeline	Oil	Carbon steel/ plastic, misc. coatings	Redundant repaired section at approx. KP 2.200	Surface laid	Out of Use	Treated seawater
PL1505.1	384 (15.1")	0.275	Redundant Production Pipeline	Oil	Carbon steel/ plastic, misc. coatings	Redundant flexible jumper & rigid spool-piece adjacent to Tartan Platform	Surface laid	Out of Use	Treated seawater
PL1507A	219.1 (8" NB)	0.055	Redundant Production Pipeline	Oil	Carbon steel/ plastic, misc. coatings	Redundant repaired section adjacent to Galley RBS	Surface laid	Out of Use	Treated seawater
PL1511-J-G1/G7z	168.3 (6"NB)	0.050	Production Jumper	Oil	Carbon steel/ plastic, misc. coatings	G1/G7z Tree to SPS (Disconnected both ends)	Surface laid	Out of Use	Pipeline filled with treated seawater (RX-9034A Dye sticks)
PL1511-J-G2	168.3 (6"NB)	0.054	Production Spool-piece	Oil	Carbon steel/ plastic, misc. coatings	G2 Tree to SPS	Surface laid	Out of Use	Pipeline filled with treated seawater (RX-9034A Dye sticks)
PL1511-J-G4	168.3 (6"NB)	0.050	Water Injection Jumper	Injection Water	Carbon steel/ plastic, misc. coatings	SPS to G4 Tree	Surface laid	Out of Use	Injection water fluids
PL1510-J-G5	168.3 (6"NB)	0.031	Production Jumper	Oil	Carbon steel/ plastic, misc. coatings	G5Tree to M5 Manifold (Disconnected both ends)	Surface laid	Out of Use	Pipeline filled with treated seawater (RX-9034A Dye sticks)

Table 3: Continued

Pipeline Number	Diameter (mm)	Length[1] (km)	Description	Original Product Conveyed	Description of Component Parts	From – To End Points	Burial Status	Pipeline Status	Current Content
GALLEY Continued									
PL1510-J-G5	168.3 (6" NB)	0.045	Production Jumper	Oil	Carbon steel/ plastic, misc. coatings	M5 Manifold to SPS manifold	Surface laid	Out of Use	Production Fluids[3]
PL4697 (Ex. PL514)	193 (7.6")	0.430	AH001 Gas Jumper[4]	Gas	Carbon steel/ plastic, misc. coatings	Tartan Alpha Platform to AH001 Gas Skid	Surface laid	Out of Use	Pipeline filled with treated seawater (RX-9034A Dye sticks)

Notes for Table 3

1. All these PL numbers are individual cores within a single umbilical / umbilical bundle, hence a single line entry in this table. A PWA variation is in the process of being prepared for submission to OGA, with the intention of have a single PLU number allocated to account for these multiple PL numbers

2. Redundant risers within the caissons in the Tartan A jacket will be decommissioned as part of the jacket.

3. Galley production jumper PL1510-J-G5 from M5 manifold to SPS manifold was unsuccessfully attempted to be flushed during recent offshore campaign, it is believed to be blocked and as such remains filled with production fluids. Appropriate measures will be put in place to minimise any discharges during its recovery when decommissioned.

4. The redundant AH001 Gas Jumper was part of the now decommissioned AH001 production semi-submersible, the jumper was part of an earlier configuration of the Galley field (when Galley exported gas) – as such has been included in this Galley DP.

2.3.3 Boundaries

In summary the boundaries of the CA are as follows:

- TNT – pipeline flanges at TNT drill centre and Tartan Alpha platform; and umbilical exit from Tartan Alpha platform well conductor (Slot H4) & umbilical end at the TNT drill centre;
- TNW – pipelines exit from the Tartan Alpha platform (J-Tube No.1) and pipeline flanges at the TNW drill centre; and umbilicals exit from Tartan Alpha platform (J-Tube No.2) and umbilical ends at TNW drill centre;
- TSE – pipeline exit from Tartan Alpha platform (J-Tube No.3) and pipeline flanges at TSE drill centre; and umbilicals exit from Tartan Alpha platform (J-Tube No.2) & umbilical ends at TSE drill centre;
- Tartan Oil Export Pipeline – pipeline flanges at the Tartan Alpha platform and Claymore Alpha platform;
- Tartan Gas Export/Import Pipeline – pipeline flanges at Piper Wye Piece and Tartan Alpha platform;
- Highlander – pipeline flanges at the Highlander Field and the Tartan Alpha platform; and umbilicals exit from Tartan Alpha platform well conductor (Slot B4 Tartan Alpha Riser Assembly (TARA)) / SUDS & umbilical ends at the Highlander Field;
- Petronella – pipeline flanges at Petronella Field and Tartan Alpha platform; and umbilicals exit from Tartan Alpha platform well conductor (J-Tube No.3 & Slot G4 TARA) / SUDS & umbilical ends at the Petronella field;
- Duart – pipeline flanges at the Duart field and Tartan Alpha platform; and umbilical exit from Tartan Alpha platform well conductor (Slot B1) & umbilical end at the Duart field;
- Galley – pipelines flanges at the Galley field and the Tartan Alpha platform; umbilical exit from Tartan Alpha platform well conductor (Slot H2) & umbilical ends at the Galley field;

3. DECOMMISSIONING OPTIONS

3.1. Regulatory Context

The decommissioning of offshore oil and gas installations and pipelines on the UKCS is controlled through the Petroleum Act 1998, as amended by the Energy Act 2008.

The UK's international obligations on decommissioning are governed principally by the 1992 Convention for the Protection of the Marine Environment of the North East Atlantic (OSPAR Convention). Agreement on the regime to be applied to the decommissioning of offshore installations in the Convention area was reached at a meeting of the OSPAR Commission in July 1998 (OSPAR Decision 98/3). BEIS Guidance [1] align with OSPAR Decision 98/3.

Pipelines do not fall within the remit of OSPAR Decision 98/3 but OPRED requires that operators apply the OSPAR framework when assessing pipeline decommissioning options.

Because of the widely different circumstances of each case, OPRED does not predict with any certainty what decommissioning strategy may be approved in respect of any class of pipeline. Each pipeline must therefore be considered on its merits and in the light of a CA of the feasible options, considering the safety, environmental, technical, societal and cost impacts of the options. Cost may only be a determining factor when other criteria emerge as equal.

3.2. Options Considered

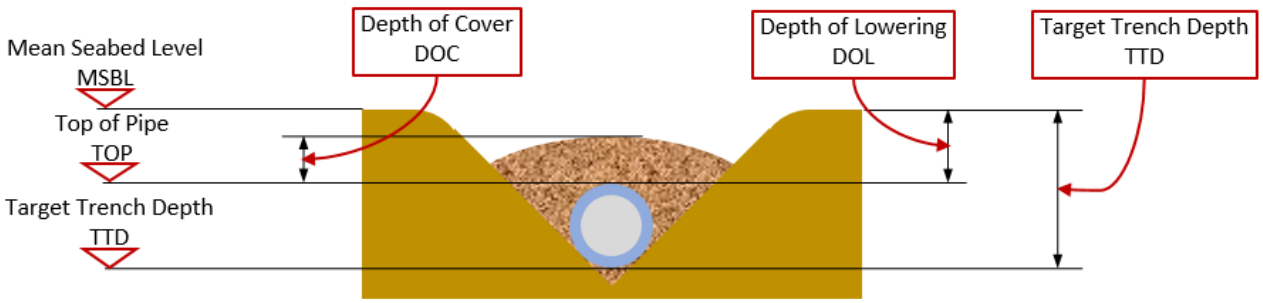
An overview of the decommissioning options considered for each of the pipelines and umbilicals included in the CA evaluation process is presented below, it should be noted that:

- For the purposes of the descriptions below, the term "pipeline" may refer to a rigid pipeline, a flexible pipeline or an umbilical;
- The term "Exposed section" is where no adequate DOC* or DOL* to the pipeline exists e.g.;
  - Highlander PL312 - 12" Production pipeline x 12.950km long is currently laid in a trench with a shallow DOC of 0.24m (average) and with DOL of 0.37m (average), with supplementary rock cover for 0.236km. PL312 has been considered as fully exposed during the CA evaluation;
  - Highlander PL316 - 4" Water Injection pipeline x 12.950km long is currently laid in a trench with adequate DOC of 0.69m (average), with supplementary rock cover (0.237km). PL316 is adequately buried for almost all of its length with only short exposures at each end where the pipeline transitions out of the trench to enable tie-ins of the line to be achieved. Exposures for PL316 are considered to exist only at the pipeline ends during the CA evaluation;

  *DOC and DOL is explained in Figure 3

  Table 6 provides details of the burial status of each pipeline evaluated by the CA process.
- Where Total Removal is considered remediation of the open trench or seabed after de burial has not been considered as a requirement however discussion with stakeholders may be required on the condition of the open trench where a Total Removal option is recommended by the CA.

Figure 3: Typical Trenched Pipeline Cross- section



3.2.1 Option 1a): Total Removal by Reverse Reeling

In this option, the pipeline(s) would be fully recovered from the seabed by reverse reeling and returned to shore for recycling or disposal. Note:

The approximate sequence of operations would be as follows:

1. If deep buried - Excavate pipeline(s) from seabed using a mass flow excavator deployed from a Construction Support Vessel (CSV) crane:
   - Pipelines that are identified as surface laid in Table 2 would not require any de-burial;
2. Remotely Operated Vehicle (ROV) to attach recovery clamp to end of pipeline and connect to reel lay vessel winch wire;
3. Recover pipeline to reel lay vessel and wind on to main or auxiliary reels;
4. Repeat #2 and #3 for remaining pipelines;
5. Transit to shore and offload recovered pipeline(s).

The capacity of currently available reel lay vessels range from 2000te to 5600te. Multiple trips to shore will be required due to the quantity of material to be recovered.

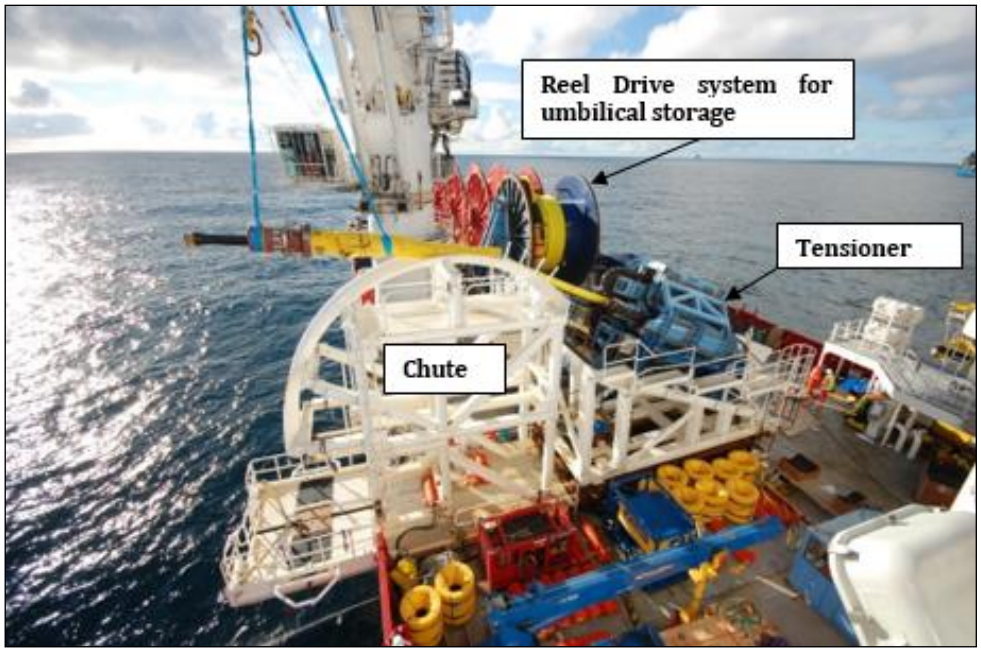
This option is not suitable for concrete coated pipelines installed by "S" lay as the pipelines have not been designed to be reeled on to a vessel, the pipe integrity would potentially fail during reeling operations also pipelines with concrete coating cannot be reeled onto the reel without the coating cracking and falling off the pipeline.

An image of a Typical Reel Lay Vessel is provided in Figure 4.

Figure 4: Typical Reel Lay Vessel

For some of the smaller diameter pipeline, flexible and umbilical sizes, recovery could also be achieved by using a CSV/ Dive Support Vessel (DSV) with a reel drive system on the deck. Depending on the size of the vessel deck, multiple reels can be used, as shown in Figure 5.

Figure 5: Reel Drive System on a Vessel (umbilical Installation shown)



Various Tartan Development Area umbilicals are buried and it's expected that these would require de burial before recovering but it may be possible to remove some umbilicals without excavating the umbilicals from the soil. This would be done by pulling the umbilical free from the soil as it is reeled onto the vessel. This would have to be reviewed to determine the top tension required to pull the umbilical out of the seabed and the integrity of the umbilical on a case by case basis.

3.2.2 Option 1b): Total Removal by Reverse S-Lay

In this option, the pipeline(s) would be fully recovered from the seabed by reverse S-lay and returned to shore for recycling or disposal. A pipelay barge (Figure 6) would likely be used for the recovery of rigid pipelines specifically the concrete coated export pipeline.

The pipeline would have to have its integrity assessed to resist forces induced during reverse S-Lay, the pipeline should be recovered open ended particularly as it would have been installed empty to reduce tension on the lay system and only flooded post installation. Any existing damage to the concrete weight coating or damage caused during recovery would need to be appropriately assessed (both from a safety perspective and technically). A particular technical challenge being for the pipeline tensioners ability to maintain appropriate tension during recovery should varying pipeline overall diameters be experienced. Similarly, the presence of any marine growth would have to be appropriately dealt with.

The approximate sequence of operations would be as follows:

1. If Buried - Excavate pipeline(s) from seabed using a mass flow excavator deployed from a CSV crane:
   - Pipelines that are identified as surface laid in Table 2 would not require any de-burial;
2. ROV to attach recovery clamp to end of pipeline and connect to S-lay vessel winch wire;
3. Recover pipeline to S-lay vessel, secure in tensioner and cut into sections on deck (usually two pipe joints ~24m);
4. Repeat #2 and #3 for remaining pipelines;
5. Offload to pipe carriers for transit to shore and offload recovered pipeline(s).

The pipeline would need to be emptied of fluids prior to recovery to reduce the top tension on the vessel during recovery. The pipelines were installed dry and then flooded once on the seabed.

Figure 6: Typical Pipelay Barge

It should be noted that there is no industry track record of reverse S-lay of concrete coated pipe. There are also potential issues with the deterioration of the concrete coating over time which would hinder pick up of the pipe and may result in sections falling off during recovery.

3.2.3 Option 1c): Total Removal by Cut and Lift

In this option, the pipelines would be fully recovered from the seabed and returned to shore for recycling or disposal. The approximate sequence of operations would be as follows:

1. If deep buried - Excavate pipeline(s) from seabed using a mass flow excavator deployed from a CSV crane:
   - Pipelines that are identified as surface laid in Table 2 would not require any de-burial;
2. ROV to assist with the deployment of cutting tools (typically hydraulic shears - Figure 7) to cut the pipeline into 24m sections;
3. ROV to attach rigging to the cut sections to allow recovery to surface via the CSV/DSV crane (Figure 8);
4. Repeat #2 and #3 for remaining pipelines;
5. Transit to shore and offload recovered pipeline(s).

Depending on the quantity of material to be recovered it may be more cost efficient to transfer cut sections to a cargo barge with tugs or alternatively pipe haul vessels which would make multiple trips to and from shore.

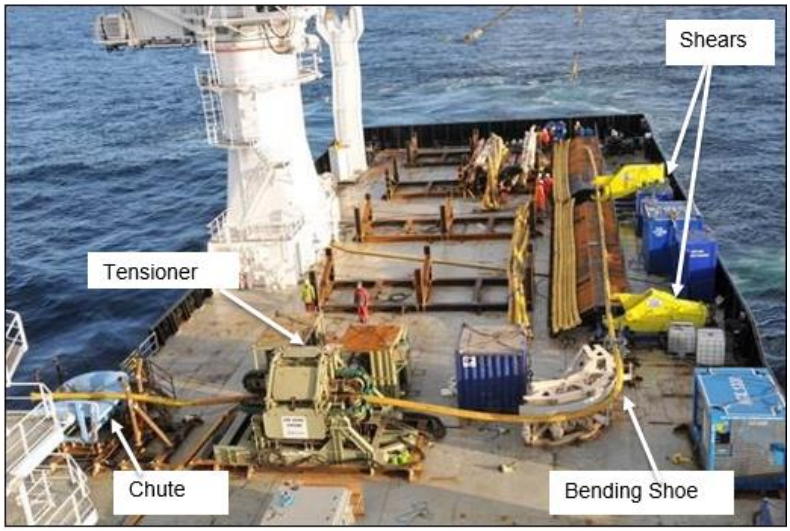
Figure 7: Example of Hydraulic Shears

Figure 8: Pipeline Cut into Sections for Recovery

This method has been used extensively in the UKCS and in decommissioning. It is also suitable for all the pipeline types, concrete coated lines and small diameter pipelines/flowlines.

An option to "Lift and Cut" i.e. firstly recover the pipeline end to the vessel and then cut for recovery may reduce vessel time with short length infield umbilicals and flexibles rather than cutting them into sections on the seabed. Figure 9 shows a typical layout for recovery.

Figure 9: Lift and Cut Methods on a CSV



3.2.4 Option 2a): Remediate In-Situ - Exposed Sections Rock Covered

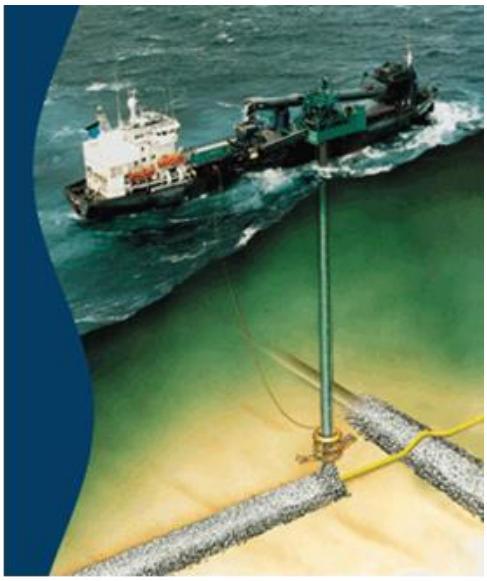
For this option, trenched and buried or rock covered lines would be decommissioned in-situ with rock added to exposed sections to achieve a rock cover profile consistent with being overtrawlable. Where the pipeline is already trenched and buried, the pipeline ends, trench transitions and exposed sections of pipeline identified in the pipeline survey would be covered with rock deployed from a rock dumping vessel, see Note: Based on review of historical inspection records reviewed during development of the Pipeline Status and Historical Review Reports [9, 10 and 11] and the fact the lines will be no longer in use, the potential for new pipeline exposures to occur in future is very unlikely.

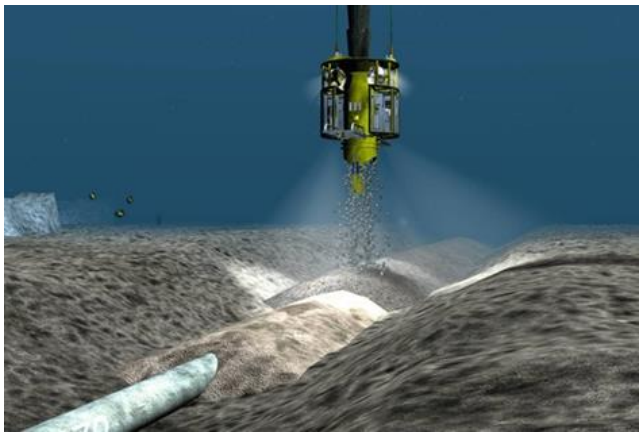
Figure 10. The amount of rock cover would be in line with industry practise and would be agreed with all consultees during the works authorisation process.

Future inspections of the pipelines left in-situ would be required to confirm that no future exposures develop.

Note: Based on review of historical inspection records reviewed during development of the Pipeline Status and Historical Review Reports [9, 10 and 11] and the fact the lines will be no longer in use, the potential for new pipeline exposures to occur in future is very unlikely.

Figure 10: Typical Rock Dumping Activity





3.2.5 Option 2b): Remediate In-Situ - Exposed Sections Trenched and Buried

For this option, trenched and buried or rock covered lines would be decommissioned in-situ with the exposed sections trenched and buried, using a trenching / jetting unit (Figure 11/Figure 12) deployed from an CSV / DSV crane. Where the pipeline is already trenched and buried, the pipeline ends, trench transitions and exposed sections of the pipeline identified in the pipeline survey would be trenched and buried. The trenching strategy would be in line with industry practise and would be agreed with all consultees during the works authorisation process.

Future inspections of the pipelines left in-situ would be required to confirm that no future exposures develop.

Note: Based on review of historical inspection records reviewed during development of the Pipeline Status and Historical Review Reports [9, 10 and 11] and the fact the lines will be no longer in use, the potential for new pipeline exposures to occur in future is very unlikely.

It should be noted that the export pipeline is already in a trench, which would make additional burial difficult as the berms created by trenching, are normally used as the burial material may have dispersed.

Figure 11: Example Jetting/Trenching Unit

Figure 12: Deep Ocean AMP500 Plough

3.2.6 Option 2c): Remediate In-Situ - Exposed Sections Cut and Removed

This option will only apply to pipelines that are already trenched and adequately buried and will apply to exposed sections of pipeline only. If the pipeline is surfaced laid or is predominantly exposed for most of its length, then cut and remove is covered under Decommissioning Option 1c).

In this option, the trenched and buried sections of pipeline would remain in place. The pipeline ends, trench transitions and exposed sections of pipeline identified in the pipeline survey would be cut and removed to full trench depth. The approximate sequence of operations would be as follows:

1. Excavate pipeline(s) local to exposed sections to full trench depth using a mass flow excavator deployed from a CSV / DSV crane;
2. ROV to assist with the deployment of cutting tools (typically hydraulic shears) to cut the pipeline into 24m sections;
3. ROV to attach rigging to the cut sections to allow recovery to surface via the CSV/DSV crane;
4. Return cut sections to shore.

Future inspections of the pipelines left in-situ would be required to confirm that no future exposures develop.

Note: Based on review of historical inspection records reviewed during development of the Pipeline Status and Historical Review Reports [9, 10 and 11] and the fact the lines will be no longer in use, the potential for new pipeline exposures to occur in future is very unlikely.

3.2.7 Option 3: Leave In-Situ and Monitor

BEIS Guidance [1] identifies certain pipelines that may be candidates for in-situ decommissioning. This Leave In-situ option would mean that no remedial action would be required to the pipelines, but that only periodic monitoring over a period, with the specifics of monitoring agreed with OPRED.

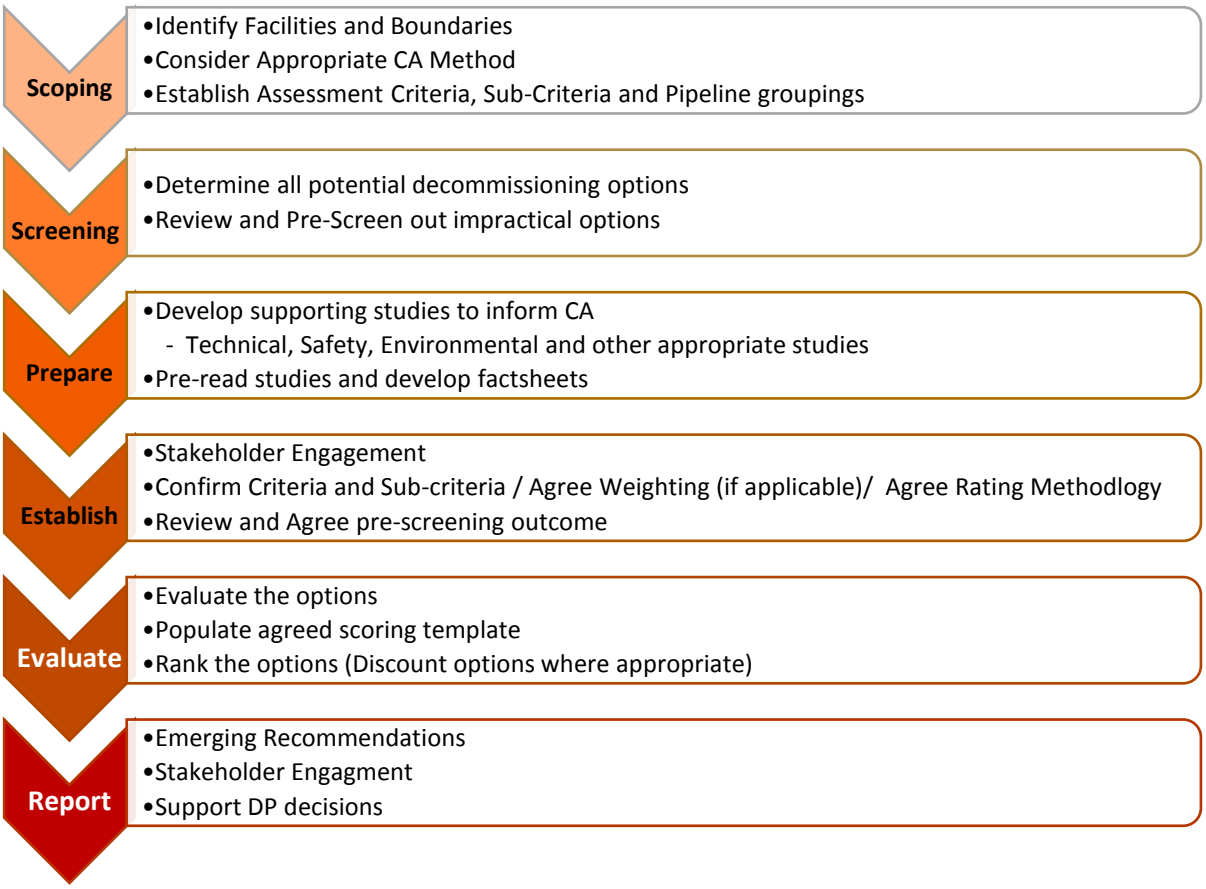
Large diameter trunk lines which are not trenched and buried have been identified in the Guidance [1] as potential candidates for decommissioning in-situ, subject to the outcome of a CA evaluation;

- This option is therefore applicable to the large diameter trunk lines in Groups A and F;
- This option is not applicable to the smaller diameter intra-field or in field pipelines and umbilicals covered by Groups B to E.

4. OVERVIEW OF THE CA PROCESS

The Tartan Development Area Pipelines Decommissioning CA has followed the recommended process to be adopted for CA as laid out in 2015 Oil and Gas UK Ltd (OGUK) "Guidelines in CA in Decommissioning Programmes – 2015" [8]. Figure 13 , taken from OGUK Guidelines [8], describes the process that was followed.

Figure 13: OGUK CA Process



4.1. Scoping

4.1.1 Facilities and Boundaries:

To ensure robust evidence was available to support and inform the CA evaluation of all decommissioning options, significant preparation by data gathering, reviewing drawings, inspection reports, survey reports and operating history has been completed. In addition, technical studies have been completed to accurately determine the quantity, specification, physical layout, status and predicted behaviour of the facilities to be decommissioned.

Five documents were produced that are relevant to and support and inform the CA, they are:

- Material and Waste Inventories for the Tartan Development Area Infrastructure [6]
- Subsea Decommissioning Options Pre-screening Report [7]
- Pipeline Status and Historical Review Report - THP [9]
- Pipeline Status and Historical Review Report - Duart [10]
- Pipeline Status and Historical Review Report - Galley [11]

The results from these studies are summarised in the tables and narrative provided throughout this CA report. However, these referenced documents are available upon request.

4.1.2 Evaluation Method:

It was agreed that Evaluation Method A, as described in the OGUK Guidelines [8] should be adopted i.e. Qualitative Assessment using Red/Amber/Green (RAG) to rate the performance of each decommissioning option against a pre-determined set of sub-criteria.

Under this Evaluation Method A, colour coding represents the relative preference of the options with respect to the criteria and sub-criteria, see Table 4.

Table 4: Evaluation Method A – Comparative Impact

Performance	Comparative Impact
Most Preferred	Lower Impact
	Moderate Impact
Least Preferred	Higher Impact
No Preference	No significant impact across options[1]

Notes for Table 4:

[1] BEIS Guidance [1] Annex A identifies that "The most preferred option should be selected by focusing on the matters where the impacts of the options are significantly different"; therefore, where there is no significant difference between the options the sub-criterion across the options should be colour coded grey.

4.1.3 Assessment Criteria:

The main criteria adopted for the evaluation aligns with BEIS Guidance [1] and the sub-criteria adopted generally aligns. Table 5 highlights the slight difference in the sub-criteria adopted compared to that provided in the BEIS Guidance [1].

Table 5: Main Criteria and Sub-criteria adopted in the CA evaluation

Main Criteria	Sub-Criteria		In aligned with BEIS Guidance [1] on sub-criteria
Technical	Risk of major project failure		Yes
	Technical complexity & track record		No- Additional sub-criteria
Safety	Risk During Project Execution Phase	To project personnel	Yes
		To those on land	Yes
		To other users of the sea	Yes
	From end points	Residual risk to other users of the sea	No- but guideline states take account for future use of area
Environment	Impact of Decommissioning Operations Offshore (includes emissions to air, discharges to sea and underwater noise)		Environmental covers all sub-criteria identified in the BEIS Guidance [1] but combines some and splits out others to make more appropriate to this specific project
	Seabed Disturbance- Short Term (includes disturbance to the cuttings pile)		
	Change of Habitat - Long Term		
	Waste Processing (i.e. processing of returned materials and use of landfill)		
Societal	Impact on commercial fisheries		Yes
	Socio-economic impact on communities and amenities		Yes - Communities and amenities combined in one sub-criterion
Economic	Cost of Decommissioning/ Removal activities		BEIS Guidance [1] do not elaborate on economic sub-criteria, but highlight that long-term cost should be a consideration
	Cost for long term monitoring / potential future remediation activities		

4.1.4 Pipeline Groupings:

On completion of the subsea studies, listed in Section 4.1.1, where the quantity, specification, physical layout, current status and predicted behaviour of the facilities to be decommissioned was determined, an evaluation of similarities between individual pipelines was completed to determine appropriate pipeline groupings.

Table 6 identifies the agreed pipeline groupings and details of each pipeline within each group and Figure 14 provides the field layout identifying the individual pipeline groups by colour coding.

Table 6: Pipeline and Umbilicals Grouping for CA

Group ID	Component type / as-laid condition	Agreed groupings[1]	Boundary	Length[2] (km)	Weight (te)	Burial Status[3]	Exposed Length (m)[4]	Relevant DP[5]
A	Rigid Trunk Pipelines, Concrete Coated and Trenched and Buried	PL18 24" (696mm OD[6]) Oil Export	KP 0.000 - 15.602	15.602	7,450.8	Burial depth of 1.17m (average), with supplementary rock cover (for 0.075km)	3 + 41 = 44 (0.3%)	THP
		PL14 18" (531mm OD[7]) Gas Import	KP 0.000 - 16.700	16.700	5532.2	Burial depth of 2.00m (average)	27 (0.2%)	THP
B	Rigid and Flexible Pipelines and Umbilicals, Surface Laid	TNW PL137 Rigid 6"NB (168.3mm OD) Water Injection	Entire Length	3.475[8]	192.6	Surface laid – shallow covered sections seen along lines	3,475 (100%)	THP
		TNW PL178 Rigid 6"NB (168.3mm OD) Water Injection		3.475[8]	192.6		3,475 (100%)	THP
		TSE PL138 Rigid 6"NB (168.3mm OD) Water Injection		3.060	167.6		3,060 (100%)	THP
		TSE PL199 Rigid 6"NB (168.3mm OD) Water Injection		3.110[8]	170.3		3,110 (100%)	THP
		Galley PL1506 Flexible 8"ID (267.3mm OD) Water Injection	KP 0.000 – 7.481	7.481	730.1	Surface laid / DOL of 0.31m (average), supplementary rock cover (0.576km)	7,481 (100%)	Galley
		TNW PLU4212 - 63.5mm OD Umbilical	Entire Length	3.395[8]	26.8	Surface laid – shallow covered sections seen along lines	3,395 (100%)	THP
		TNW PLU4213 - 76.2mm OD Umbilical		3.395[8]	38.7		3,395 (100%)	THP
		TSE PLU4214 - 76.2mm OD Umbilical		3.275[8]	37.4		3,275 (100%)	THP
		TSE PLU4215 - 63.5mm OD Umbilical		3.225[8]	25.5		3,225 (100%)	THP

Table 6 continued

Group ID	Component type / as-laid condition	Agreed groupings[1]	Boundary	Length[2] (km)	Weight (te)	Burial Status[3]	Exposed Length (m)[4]	Relevant DP[5]
C	Rigid Pipelines and Umbilicals, Trenched and Buried	TNT PL2013 6"NB (168.3mm OD) Production	Entire Length	3.113	203.8	Piggybacked lines. Burial depth of 0.88m (average), with supplementary rock cover (1.413km)	153 (4.9%)	THP
		TNT PL2014 6"NB (88.9mm OD) Gas Lift		3.115	51.3			THP
		Highlander PL316 4"NB (114.3mm OD) Water Injection		12.950	291.5	Burial depth of 0.69m (average), with supplementary rock cover (0.237km)	78 (0.6%)	THP
		Petronella PL393 12"NB (323.9mm OD) Gas Lift		10.400	1,268.5	Burial depth of 0.65m (average)	200 (1.9%)	THP
		Petronella PL394 8"NB (219.1mm OD) Production		10.400	673.9	Burial depth of 0.85m (average)	200 (1.9%)	THP
		Duart PL2450 8"NB (219.1mm OD) Production		7.805	660.3	Piggybacked lines. Burial depth of 1.27m (average) with supplementary rock cover (0.966km)	112 (0.7%)	Duart
		Duart PL2451 3"NB (88.9mm OD) Gas Lift		7.805	124.2			Duart
		Galley PL1505 10"NB (273.1mm OD) Production		23.058	2,139.7	Burial depth of 1.14m (average) with significant supplementary rock cover (12.900km)	122 (0.5%)	Galley
		Galley PL1506A 8"NB (219.1mm OD) Water Injection	Old KP 0.000 – 7.440 + Current KP 7.481 – 22.275	22.234	1,468.7	Burial depth of 1.21m / 1.16m (average) with supplementary rock cover (0.815km)	564 (2.5%)	Galley
		TNT PLU2015 - 132.8mm OD Umbilical	Entire Length	3.455[8]	86.4	Burial depth of 0.88m (average)	74 + 53 = 127 (3.7%)	THP
		Highlander PL568 55mm OD Umbilical		12.780[8]	65.3	Same trench as PL316. 0.69m average DOC, 0.79m average DOL, with supplementary rock cover (0.239km)	0	THP
		Petronella PL508 - 89mm OD Umbilical		10.900	327.0	Same trench as PL393. Burial depth of 0.65m (average)	20 (0.2%)	THP

Table 6 continued

Group ID	Component type / as-laid condition	Agreed groupings[1]	Boundary	Length[2] (km)	Weight (te)	Burial Status[3]	Exposed Length (m)[4]	Relevant DP[5]
C cont'd	Rigid Pipelines and Umbilicals, Trenched and Buried	Petronella PL509 - 89mm OD Umbilical	Entire Length	11.100	333.0	Same trench as PL393. Burial depth of 0.65m (average)	20 (0.2%)	THP
		Petronella PL510 - 55mm OD Umbilical		10.930[8]	43.3	Same trench as PL393. Burial depth of 0.65m (average)	20 (0.2%)	THP
		Duart PLU2480 - 125.4mm OD Umbilical		8.254[8]	171.0	Burial depth of 0.96m (average) with supplementary rock cover (0.541km)	100 (1.2%)	Duart
		Galley PLU2380 - 150mm OD Umbilical		25.854[8]	751.7	Burial depth of 0.72m (average) with supplementary rock cover (0.367km)	405 (1.6%)	Galley
D1[9]	Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, with DOL greater than 0.6m	Galley PL1507 8"NB (219.1mm OD) Production	Entire Length	1.969	231.5	Trench laid - shallow cover of 0.15m (average), with DOL of 0.75m (average)	118 (6.0%)	Galley
		Galley PL1508 8"NB (219.1mm OD) Production		1.911	234.6	Trench laid - shallow cover of 0.07m (average), with DOL of 0.78m (average)	156 (8.2%)	Galley
		Galley PL1510 8"NB (219.1mm OD) Production		1.911	234.6	Trench laid - shallow cover of 0.08m (average), with DOL of 0.67m (average)	277 (14.5%)	Galley
		Galley PL1511 8"NB (219.1mm OD) Water Injection		1.898	233.0	Trench laid - shallow cover of 0.32m (average), with DOL of of 0.96m (average)	64 (3.4%)	Galley
		Galley PL Nos. PL1512 to PL1515 & PL1519 to 1525 - 90mm OD Umbilical		1.900	33.6	Trench laid in same trench - shallow cover of 0.06m (average), with DOL of 0.67m (average)	3 (0.2%)	Galley
		Galley PL 5056. - 75mm OD Electrical Umbilical		1.900	28.1		3 (0.2%)	Galley

Table 6 continued

Group ID	Component type / as-laid condition	Agreed groupings[1]	Boundary	Length[2] (km)	Weight (te)	Burial Status[3]	Exposed Length (m)[4]	Relevant DP[5]
D2	Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL less than 0.6m	Highlander PL312 12"NB (323.9mm OD) Production	Entire Length	12.950	1,570.7	Trench laid - shallow cover of 0.24m (average), with DOL of 0.37m (average), with supplementary rock cover (0.179km)	4641 + 8254 = 12895 (99.6%)[9]	THP
		Highlander PL313 8"NB (219.1mm OD) Production / Test		12.950	844.1	Trench laid - shallow cover of 0.37m (average), with DOL of 0.45m (average), with supplementary rock cover (0.070km)	1826 + 10304 = 12130 (93.7%)[9]	THP
		Highlander PL314 8"NB (219.1mm OD) Gas Lift		12.950	844.1	Trench laid - shallow cover of 0.32m (average), with DOL of 0.44m (average), with supplementary rock cover (0.106km)	2325 + 10557 = 12882 (99.5%)[9]	THP
		Highlander PL315 8"NB (219.1mm OD) Water Injection		12.950	844.1	Trench laid - shallow cover of 0.28m (average), with DOL of 0.38m (average), with supplementary rock cover (0.099km)	7933 + 4730 = 12663 (97.8%)[9]	THP
		Highlander PL569 - 90mm OD Umbilical		12.950	129.5	Same trench as PL315. Trench laid - shallow cover of 0.28m (average), with DOL of 0.38m (average), with supplementary rock cover (0.099km)	7933 + 4730 = 12663 (97.8%)[9]	THP
		Highlander PL570 -108mm OD Umbilical		12.780[8]	153.4	Same trench as PL314. Trench laid - shallow cover of 0.32m (average), with DOL of 0.44m (average), with supplementary rock cover (0.106km)	2325 + 10557 = 12882 (99.5%)[9]	THP
E	Flexible Pipeline and Umbilical, Surface Laid and Rock Covered	Galley PL1961 6"ID (204.3mm OD) Water Injection	Entire Length	4.500	278.6	Depth of rock cover 0.51m (average)	262 (5.8%)	Galley
		Galley PL5060. - 78mm OD Umbilical		4.500	69.0		262 (5.8%)	Galley

Table 6 continued

Group ID	Component type / as-laid condition	Agreed groupings[1]	Boundary	Length[2] (km)	Weight (te)	Burial Status[3]	Exposed Length (m)[4]	Relevant DP[5]
F	Rigid Trunk Pipeline, Concrete Coated and Shallow Trenched and Partially Covered	PL18 24" (696mm OD[6]) Oil Export	KP 15.602 - 26.560	10.958	5,233.0	Burial depth of 0.44m (average), with concrete mattresses / blocks (0.626km)	185 + 1302 = 1487 (13.7%)	THP

Notes for Table 6:

[1] Pipeline lengths quoted exclude jumper spools.

[2] Agreed grouping pipeline ODs exclude anti-corrosion and insulation coating thicknesses (typically 0.5 to 5mm and 20mm thick respectively for the pipelines reviewed).

[3] Average burial depths are calculated including exposed lengths, concrete mattresses / blocks and rock cover.

[4] Exposed lengths are total lengths where the pipelines / umbilicals have no cover (ends and mid-line) and includes lengths that are spanning, covered with concrete mattresses / concrete protection blocks. Where the exposed length quoted is the summation of 2 lengths, then the first of these lengths is total of pipeline exposed ends and the second is a summation of mid-line exposures. Where exposed length quoted is only 1 length, then this exposed length is total of pipeline exposed ends.

[5] This report covers all pipelines across all fields in the Tartan Development Area. This report supports three separate Decommissioning Programmes a) THP, b) Duart and c) Galley. This column highlights the applicable Decommissioning Programme for each pipeline within each pipeline group.

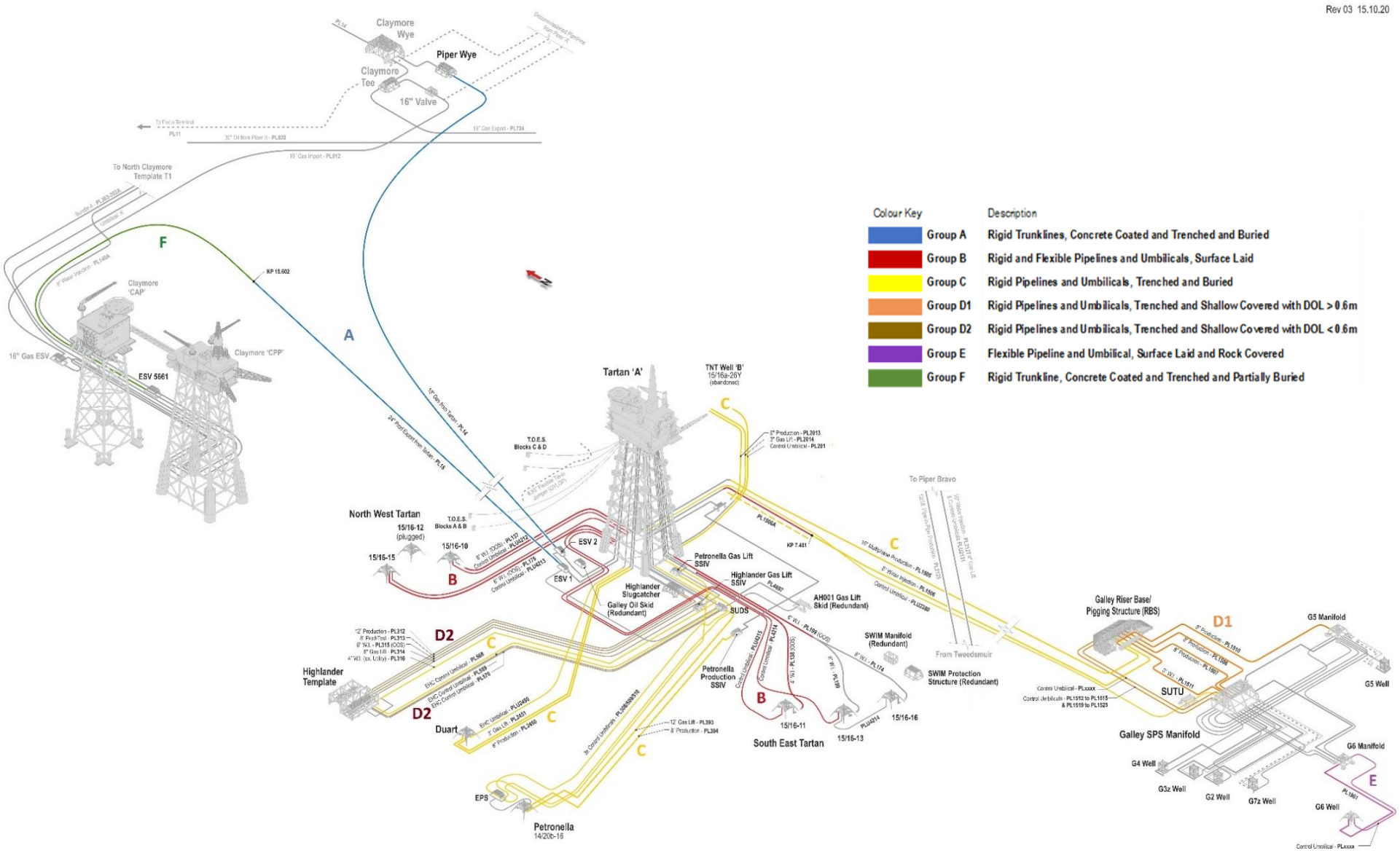
[6] PL18 Oil Export Pipeline OD includes 38mm thick concrete coating on the 609.6mm (24") diameter steel pipe.

[7] PL14 Gas Import Pipeline OD includes 32mm thick concrete coating on the 457.2mm (18") diameter steel pipe.

[8] Length quoted excludes "riser" lengths inside well conductors and J-Tubes but includes lengths of pipeline encased in drill cutting mound at Tartan Alpha Platform.

[9] Exposed lengths are total lengths where the pipelines / umbilicals have cover less than 0.6m (ends and mid-line) and includes lengths that are spanning, covered with concrete mattresses / concrete protection blocks. Where the exposed length quoted is the summation of 2 lengths, then the first of these lengths is total of pipeline exposed ends and the second is a summation of mid-line exposures. Where exposed length quoted is only 1 length, then this exposed length is total of pipeline exposed ends.

Figure 14: Field Layout indicating Pipeline Groups



4.2. Screening

BEIS Guidance [1] Annexe A, provides guidance on expectations for option screening:

Where decommissioning of a pipeline in-situ is being considered, a CA of the options is required. A two-stage process with an early option screening process to narrow options is permissible.

Stage 1: Option Screening

- Identify a comprehensive list of potential decommissioning options;
- Identify the criteria against which each option will be considered;
- Complete an evidence-based evaluation to reduce the number of reasonable/technically feasible options to a short-list;
- Expert review of evaluation results to assure the outcome and choice of options to be carried forward to a more detailed CA.

Stage 2: Detailed CA process

- Adopting shortlisted options from Stage 1, undertake a detailed CA of each option;
- Assessments must be evidenced based, using existing data where possible or gathering additional or new information as appropriate;
- Decisions must be transparent, and regulators and stakeholders must understand the rationale underpinning the assessment and decision-making process.

To fulfil the requirements of Stage 1 Option screening, these options were taken offline and were studied in detail to define the methods, equipment and vessels needed to support each option. The results of this study are reported in the Pre-Screening Report [7] which is available upon request.

Similar assessment criteria as described in Section 4.1.3 were applied during the option screening study. The OGUK Guidelines [8] Evaluation "Type A" approach as described in 4.1.2 was also adopted, where each of the pipeline and umbilical decommissioning options were qualitatively assessed using the RAG evaluation method shown below.

4.3. Preparation

In addition to the Technical studies described in Section 4.1.1, safety and environmental studies were carried out in support of the CA:

4.3.1 Safety Risk Assessment / Environmental Impact Identification

Before the CA evaluation workshop was convened a Hazard Identification and Risk Assessment (HIRA) and an Environmental (Impacts) Identification (ENVID) workshop was convened to inform the CA.

The objectives of the workshops were to:

- Identify initiating events that have the potential to give rise to safety, health, societal and environmental consequences;
- Evaluate the safeguards, controls and mitigating measures;
- Risk assess the hazards identified across the options; and
- If appropriate, make recommendations for adequate safeguards, controls, mitigating and emergency response measures to minimise the occurrence, reduce the consequences and escalation potential such that the risk or environmental impact is reduced to as low as reasonably practicable (ALARP).

The activities associated with each decommissioning option under consideration for each pipeline group were assessed separately which enabled the specific safety and environmental related risks of each option to be identified.

The HIRA and ENVID processes involved structured approaches, in line with general industry practice. The methodology adopted and the results from both workshops are summarised in Appendix A. The combined

HIRA and ENVID Report [9] provides more detail and is available upon request. The ENVID methodology is presented in Appendix A of the EA [2].

HIRA:

To enable a comparative evaluation of the risks across each decommissioning option under consideration, a Repsol Sinopec Resources UK, Risk Assessment Matrix (RAM) was adopted and used to rate each decommissioning option against an agreed set of guide words.

The ratings were then summated to derive the relative safety performance of each decommissioning option against:

- Project Risk to Offshore Personnel;
- Project Risk to those on land;
- Project Risk to Other Users of the Sea;
- Residual Risk to Other Users of the Sea.

These risk criteria align with the safety sub-criteria to be considered in the CA evaluation as discussed in Section 4.1.3 and in Table 5.

Summary tables were prepared following the HIRA to inform the CA Evaluation Workshop. The summary tables are provided in Appendix A, for reference.

ENVID:

The ENVID assessed both environmental and societal impacts and the potential activities were assessed with respect to:

- Emissions to air;
  - Vessels
  - Atmospherics associated with material recycling including transport onshore
- Resource use (offshore and onshore);
  - Energy consumption (fuel use by offshore and onshore plant/equipment)
  - Use of landfill space
- Disturbance to the seabed;
  - Disturbance to the seabed
- Discharges to sea;
  - Routine vessel (e.g. greywater, blackwater, ballast) and/or facilities discharges
  - Chemicals/hydrocarbons from the umbilicals / pipelines etc.
- Underwater noise;
  - Underwater noise from vessels (injury/disturbance to marine species)
  - Underwater noise from cutting noise
- Physical Presence;
  - Physical presence of vessels in relation to other sea users
  - Physical presence of infrastructure recovered as part of a later campaign
- Onshore dismantling yard activities;
  - Airborne noise, including traffic movements at onshore sites, odour etc.
- Waste generation;
  - Non-hazardous waste
  - Marine growth
  - Hazardous waste e.g. oil entrained in the pipelines
- Unplanned discharges to sea;
  - Accidental loss of vessel inventory

- Unplanned disturbance to the seabed;
  - Dropped objects.

Summary data sheets were prepared following the ENVID to inform the CA Evaluation Workshop, these data sheets as presented in the CA are provided in Appendix B, for reference.

4.4. Establish

4.4.1 Stakeholder Engagement

A Stakeholder Engagement Plan [13] has been prepared which identifies stakeholders, communication methods and indicative timings of engagement.

Consulting with stakeholders is an important part of the decommissioning impact assessment process as it allows any concerns or issues which stakeholders may have, to be communicated and addressed. In August 2020, as part of the informal stakeholder engagement process Repsol Sinopec Resources UK Limited issued a Scoping Report [14] to a number of stakeholders. The Scoping Report provided an overview of Tartan Development Area, the proposed decommissioning options that would be considered in the CA, and an overview of the impacts to be assessed in the EA [2]. Stakeholders were invited to comment on the Scoping Report with respect to any concerns they may have. Comments received on the Scoping Report have been considered during the CA process and will be addressed in the consultation draft of the EA.

In addition, to issuing the Scoping Report, Repsol Sinopec Resources UK Limited convened a stakeholder engagement session on 15th February 2021, where the results of this CA were shared with the stakeholders.

Feedback received during the stakeholder engagement session has not impacted the recommendations of the CA workshop, however the request for more detailed background information from the stakeholder engagement session has now been incorporated in this revision of the CA report. The additional information incorporated is as follows:

- Ensure the extent of any existing rock cover pipelines is clearly reflected within the Tartan Decommissioning Documentation. See Table 6, “Burial Status” column which provides additional information on rock cover on individual pipelines.
- Ensure the extent of any existing free spanning on pipelines is clearly reflected within the Tartan Decommissioning Documentation. See Table 6, “Exposed length” column which provides additional information i.e. total length of exposures on individual pipelines.
  - The length of free spans is included in the calculation of “exposed lengths”. As such all free spans will be remediated in-situ as the proposed solution for all current exposures of all lines being left in-situ.

4.4.2 Agreed Criteria, Sub-Criteria and Weightings

Agreed main and sub-criteria is as described in Section 4.1.3.

As described in Section 4.1.2, a qualitative RAG approach to rating performance of each decommissioning option and across each sub-criterion was adopted, therefore, no numerical scoring was available during the evaluation. The application of arithmetic weightings across the criteria to be evaluated was therefore not possible. i.e. all sub-criteria evaluated were given equal weighting.

Therefore, the more sub-criteria evaluated against a specific main criterion results in that specific main criterion having greater influence on the outcome than other main criteria.

To review the impact where all the main criteria had equal weighting, the individual sub-criteria ratings were viewed during the workshop and an average weighting against the specific main criterion was agreed. The average ratings across all five main criteria, were then viewed and an equal weighting rating and ranking was agreed for each pipeline group.

The result of this analysis by main criteria is summarised against each pipeline group in Section 6.1. See also the “Narrative Summary - CA Workshop Output Sheet” for each pipeline group in the workbook provided in Appendix E, for reference.

4.4.3 Review and Agree Pre-screening Outcome

The Pre-Screening Report [7] was published to the wider project team for review ahead of the CA Evaluation Workshop. The updates from the review cycle of this study [7] was presented as the introduction at the CA Evaluation Workshop described under Section 4.5.

Technical fact sheets were prepared to summarise the results of both the Pre-Screening Report [7] the Material and Waste Inventories report [6] and the Pipeline Status and Historical Review Reports [9, 10 & 11]. The technical fact sheets are provided in Appendix C for reference.

4.5. Evaluate

The CA Evaluation Workshop was convened over two days on 18th and 19th August 2020. Details of participants is provided in Table 7.

Table 7: CA Workshop Participants

Repsol Sinopec Resources UK Limited	
Colin Hopkins	Senior Project Lead
Tim Hollis	Decommissioning Environmental Advisor
Stephen Etherson	Subsea Engineer
Andrew Wright	HSE Lead
Fiona Fraser	Technical Process Safety Support Engineer
Genesis	
John Wilson	Senior Consultant Decommissioning (Chair)
Michael McFadden	Project Manager
Martha O' Sullivan	Senior Environmental Engineer
Mark Hoshemi	Technical Safety & Risk Consultant
David Warren	Senior Subsea Consultant

Workshop considerations are explained in Section 5.0, the outcome of the workshop is reported in Section 6.1.

4.6. Report

This document reports the emerging recommendations of the CA Workshop and these are summarised in Section 6.1.

The outcome and recommendations of the CA are reflected in the draft Decommissioning Programmes [3, 4 and 5] to be issued for public consultation.

5. CA WORKSHOP CONSIDERATIONS

5.1. Results of Options Pre-screening

The Subsea Decommissioning Options Pre-screening Report [7] describes the pre-screening process and provides the basis for the short-listed options to be taken forward in the CA workshop.

Table 8 below, identifies for each pipeline and umbilical group:

- the options considered initially;
- the options pre-screened out by the study; and
- the options that were carried forward to the CA workshop.

Detailed descriptions of all methods evaluated are described in the Options Pre-screening Report [7] and are summarised in Section 3.2 above. Presentation slides provided an overview of each decommissioning option at the CA workshop.

The reasoning for decommissioning options being discounted at pre-screening stage is also provided in the option pre-screening study [7] and only summarised here:

1a) - Total Removal by Reverse Reeling

- Concrete coated pipe installed by "S" lay has not been designed to be reeled on to a vessel, the pipe integrity would fail during reeling operations. It is also not technically feasible to reverse-reel large diameter pipelines with aged concrete coating due to the reeling process where the concrete coating will not deform around the reel without cracking and could fall on the vessel causing harm to personnel and equipment. There is also no track record in the industry of this method of recovery for this type of pipeline:
  - This option has therefore been discounted as not technically feasible in the Pre-screening Report [7] for Group A and Group F;
- Both the Galley pipeline and umbilical associated with Group E are rock covered for their entire length. Although BEIS Guidance [1] recognises that removal of the pipeline is unlikely to be practicable and it is generally assumed that the rock berm and the pipeline and umbilical will remain in place, in line with OSPAR and BEIS clean seabed policy, at least one total removal option must be considered in the CA Workshop evaluation. Therefore, Option 1a) has been carried forward for evaluation as a total removal option for Group E;
- Where reverse reeling has been deemed as technically feasible in the Pre-screening Report [7] for pipeline groups with relatively small diameter and/or more flexible lines and where no concrete coating exists, this option has been carried forward for CA evaluation as a total removal option for the remaining pipeline groups i.e. Groups B, C, D1 and D2.

1b) - Total Removal by Reverse S-Lay

- There is no industry track record of reverse S-Lay of concrete coated pipe and there is concern that the deterioration of the concrete coating over time would hinder initial pick up of the pipe and may result in sections of concrete coating falling off during recovery:
  - This option has therefore been discounted for Group A and F in the Pre-screening Report [7];
- Option 1a) Reverse Reeling and Option 1b) Reverse S-Lay methods of recovery have been rated similarly in the Pre-screening Report [7] for pipeline groups with relatively small diameter and/or more flexible lines and where no concrete coating exists:
  - It is deemed necessary to only carry forward one of these total removal methods and as Option 1a) Total removal by reverse reeling incurs less vessel time, less deck space requirements, less manual handling and lower cost, than by Option 1b) Total removal by reverse S-Lay, then Option 1b) has been discounted for all remaining pipeline groups in the Pre-screening Report [7].

1c) - Total Removal by Cut and Lift

- Total Removal by Cut and Lift would involve multiple seabed to vessel deck lifts which would have an increase in risk to deck personnel when pipe is recovered to the vessel deck and to onshore personnel when pipe is back loaded onshore.
- Total Removal by Cut and Lift compared with other Total Removal options would require significantly longer duration of offshore work and vessel days, which could drive a longer decommissioning offshore campaign or multiple campaigns, which increases the chance of schedule slippages, for all pipeline groups.
- In line with OSPAR and OPRED clean seabed policy, at least one Total Removal option must be considered in the CA Workshop evaluation:
  - Since both other Total Removal methods, by reverse reeling and by reverse S Lay, have already been discounted for Pipeline Group A in the Pre-Screening Report [7], it is proposed to carry forward the cut and lift option for Group A.
  - Since Total Removal by reverse reeling is to be carried forward to the already trenched and buried pipelines groups C and E, Total Removal by Cut and Lift has been screened out for these groups.
  - It has been recommended that, since pipeline groups B is surface laid and groups D1 and D2 are in trenches but only shallow covered, the effort in offshore work and in vessel durations for these groups is closer for both methods, Option 1a) Total Removal by Reverse Reeling and Option 1c) Total Removal by Cut and Lift, as option 1c) and both options should be evaluated in the CA workshop for Groups B, D1 and D2.

2a) - Remediate In-situ: Exposed Sections Rock Covered

- This decommissioning option is to be carried forward for all pipeline groups.
- In this option, the exposed sections of pipelines would be left in place on the seabed and rock covered to achieve a profile of rock cover that is over-trawlable. Where the pipeline is already trenched and buried, the pipeline ends, trench transitions and mid-line exposures would be covered with rock, to achieve a profile of rock cover that is over-trawlable. The amount of rock cover would be in line with industry practise and would be agreed with all consultees during the works authorisation process.
- Future periodic inspections of the pipelines left in-situ would be required to confirm that no future exposures develop:
  - Note: Based on review of historical inspection records reviewed during development of the Pipeline Status and Historical Review Reports [9, 10 and 11] and the fact the lines will be no longer in use, the potential for new pipeline exposures to occur in future is very unlikely.

2b) - Remediate In-situ: Exposed Sections Trenched and Buried

- This decommissioning option is to be carried forward for all pipeline groups.
- In this option, the exposed sections pipelines would remain in place on the seabed and would be trenched and buried, using a trenching / jetting unit. Where the pipeline is already trenched and buried, the pipeline ends, trench transitions and any mid-line exposures would be trenched and buried. The trenching strategy would be in line with industry practise and would be agreed with all consultees during the works authorisation process.
- Future periodic inspections of the pipelines left in-situ would be required to confirm that no future exposures develop:
  - Note: Based on review of historical inspection records reviewed during development of the Pipeline Status and Historical Review Reports [9, 10 and 11] and the fact the lines will be no longer in use, the potential for new pipeline exposures to occur in future is very unlikely.

2c) - Remediate In-Situ: Exposed Sections Cut and Removed

- This option will only apply to pipelines that are already trenched and buried as if the pipeline is surfaced laid, cut and remove is covered under the Total Removal Option 1c.
- This decommissioning option is therefore to be carried forward for all pipeline groups that are already trenched and buried i.e. Pipeline Groups A, C and E.

- In this option, the trenched and buried sections of pipeline would remain in place. The pipeline ends, trench transitions and mid-line exposures would be cut and removed to full trench depth.
- Future periodic inspections of the pipelines left in-situ would be required to confirm that no future exposures develop:
  - Note: Based on review of historical inspection records reviewed during development of the Pipeline Status and Historical Review Reports [9, 10 and 11] and the fact the lines will be no longer in use, the potential for new pipeline exposures to occur in future is very unlikely.

3) -Leave In-situ and Monitor

This option is described in Section 3.2.7 it is only applicable to large diameter trunk lines such as Groups A and F, and no activities are carried out to remediate any exposures, merely periodic pipeline surveys over a prolonged time to determine if the pipeline status (exposures) is improving or getting worse over time.

Table 8: Option Pre-Screening Study Recommendations

Group ID	Component Type/ As Laid Condition	1. Total Removal by:			2. Remediate In-Situ with Exposed Sections:			3. Leave In-situ and Monitor
		a) Reverse Reeling	b) Reverse S-Lay	c) Cut and Lift	a) Rock Covered	b) Trench and Buried	c) Cut and Removed	
A	Rigid Trunk Pipelines, Concrete Coated and Trenched and Buried	✗ Not Technically Feasible	✗ Screened Out	✓	✓	✓	✓	✓
B	Rigid and Flexible Pipelines and Umbilicals, Surface Laid	✓	✗ Screened Out	✓	✓	✓	✗ Same as Option 1b)	✗ Not Applicable
C	Rigid Pipelines and Umbilicals, Trenched and Buried	✓	✗ Screened Out	✗ Screened Out	✓	✓	✓	✗ Not Applicable
D1	Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, with DOL greater than 0.6m	✓	✗ Screened Out	✓	✓	✓	✓	✗ Not Applicable
D2	Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL less than 0.6m	✓	✗ Screened Out	✓	✓	✓	✓	✗ Not Applicable
E	Flexible Pipeline and Umbilical, Surface Laid and Rock Covered	✓	✗ Screened Out	✗ Screened Out	✓	✓	✓	✗ Not Applicable
F	Rigid Trunk Pipeline, Concrete Coated and Shallow Trenched and Partially Covered	✗ Not Technically Feasible	✗ Screened Out	✓	✓	✓	✓	✓

✓ denotes this decommissioning option was carried through to the CA workshop for evaluation

✗ denotes this decommissioning option was not evaluated in the CA workshop

5.2. Evaluation Workshop Tools

5.2.1 Qualitative Assessment - Rating Guide Table

A project specific guide table for each sub-criterion to be comparatively assessed qualitatively was prepared and published to ensure workshop participants were aligned in the application of RAG rating against each sub-criterion. This guide table is provided in Appendix D, for reference.

5.2.2 Evaluation / Rating Workbook

A project specific evaluation/ rating workbook was prepared in M.S Excel format which reflected the criteria and sub-criteria to be assessed against the specific decommissioning options for the project and for each group being evaluated.

This workbook was populated at the workshop with the agreed ratings and relevant narrative explaining the reasoning behind the rating of each sub-criterion against each decommissioning option.

The evaluation/ rating workbook is provided in Appendix E, for reference and elaborates on the basis to the recommended decommissioning options recorded in Section 6.1.

5.2.3 Decommissioning Fact Sheets

Decommissioning fact sheets have been prepared and are included in Appendices A, B and C. These present a summary of the results of the supporting studies and were used to inform the workshop participants throughout the workshop.

Note: Where possible, the authors of the factsheets also participated in the evaluation workshop and were, when required, able to expand and clarify the facts.

5.3. Mechanics of Rating the Options

The evaluation / rating workbook described in Section 5.2.2 was live on screen and was populated during the workshop.

Each pipeline group was assessed in turn, by:

a) Taking each sub-criterion in turn and assessing and rating across each decommissioning option. This ensured a true comparison of the options for each sub-criterion, which would not be the case if each decommissioning option had been assessed in isolation and for all criteria first;

b) When appropriate, comments have been added in the cell being rated to record the reasoning for the rating. These comments have been used to develop the summary narrative in Section 6.1;

c) Steps a) and b) were repeated for each sub-criterion in turn until all sub-criteria had been assessed for all decommissioning options;

d) Summating the ratings was not completed until each criterion has been assessed and rated individually. This avoided the possibility of summation results influencing ratings across subsequent criteria;

e) Once all criteria had been completed, a summary page was collated and viewed to determine the overall ranking for each decommissioning option:

   i. The decommissioning option with the most number of sub-criteria rated as RED (Higher Impact), was agreed to be the least preferred option;

   ii. The decommissioning option with the least number of sub-criteria rated as RED (Higher Impact) and the most number of sub-criteria rated GREEN (Low Impact), was agreed to be the most preferred option;

   iii. Other options were then ranked in order, based on relative numbers of RED (Higher Impact) and AMBER (Moderate Impact) that the sub-criteria have attracted.

The results by individual sub-criteria were then viewed and an overall rating and ranking for each pipeline group was agreed. See the “Visual Summary” page for each pipeline group in the workbook provided in Appendix E, for reference.

5.3.1 Sensitivity Analysis

Ratings equally weighted across main criteria

As described in Section 4.1.2, a qualitative RAG approach to rating performance of each decommissioning option and across each sub-criterion was adopted, therefore, no numerical scoring was applied during the evaluation such that all sub-criteria evaluated were given equal weighting.

Therefore, the more sub-criteria evaluated against a specific main criterion results in that specific main criterion having greater influence on the outcome than other main criteria.

To review the impact if all main criteria had an application of equal weighting, the individual sub-criteria ratings were viewed during the workshop and an average weighting against the specific main criterion was agreed. The average ratings across all five main criteria, were then viewed and an equally weighted rating and ranking was agreed for each pipeline group.

The result of this analysis by main criteria is summarised against each pipeline group in Section 6.1. See also the "Narrative Summary - CA Workshop Output Sheet" for each pipeline group in the workbook provided in Appendix E, for reference.

A further two Sensitivity Analyses were identified as required during the CA workshop but were conducted offline to review potential impact on the recommended / preferred decommissioning options for each pipelines group.

Sensitivity Analysis 1 - Specific Sub-Criteria

During the workshop, as participants carried out the original RAG Evaluation described in Section 5.3.1, if participants considered a decision on a specific rating to be marginal between one rating and another, this would be noted in the individual worksheets and a decision was taken to carry out a sensitivity analysis offline, by applying the agreed alternative rating for that specific sub-criteria and decommissioning option. The reasoning behind the requirement for the sensitivity analysis was also noted.

The basis and results of Sensitivity Analysis 1 for each pipeline group are summarised in Sections 6.1.1 to 6.1.7 and are described in detail in the relevant Sensitivity Analysis 1 Worksheet for each pipeline group in Appendix E.

Sensitivity Analysis 2

BEIS Guidance Notes Decommissioning of Offshore Oil and Gas Installations and Pipelines, November 2018, Annexe A - A guide to Comparative Assessments provides the following guidance *"…. Proportionality must also be considered but it is unlikely that cost will be accepted as the main driver unless all other matters show no significant difference…."*

To demonstrate that the rating results from the evaluation of the cost of the decommissioning options has not had an undue influence on the ranking of the decommissioning options, the economic risk sub-criteria is discounted under this sensitivity analysis for each pipeline group. i.e.:

- Cost for Decommissioning/ Removal Activities, and
- Cost for Long Term Monitoring / Remediation Activities

Please refer to the relevant Sensitivity Analysis 2 worksheet in Appendix E, where the revised ratings count for each decommissioning option, but discounting the ratings originally awarded to the two sub-criteria above. The results sensitivity analyses results are also summarised by pipeline group in Sections 6.1.1 to 6.1.7 below.

6. COMPARATIVE ASSESSMENT EVALUATION

6.1. Results, Conclusions and Recommendations

This section provides a summary of the ranking reached for each decommissioning option under consideration and for each pipeline group. Options ranked 1st being the most preferred option and options ranked 2nd, 3rd, 4th and 5th (where applicable), being poorer performing options compared to the most preferred option.

During the Evaluation Workshop, the allocated ratings were recorded on a pre-prepared MS Excel evaluation workbook and narrative was added to explain and justify each rating. A full set of the evaluation workbook / worksheets is provided in Appendix E and a summary of the results for each group is shown in Table 9 and Figure 15 below.

In summary the conclusions of the evaluation are:

- Where pipeline groups are surface laid, surface laid and rock covered or are laid in shallow trenches but do not meet adequate DOC requirements for most of their route (groups B, D2 and E), the most preferred decommissioning option is Option 1a) Total Removal by Reverse Reeling;
- Where pipeline groups are already trenched and buried to an adequate DOC or DOL for most of their route (groups A, C, D1 and F), the most preferred decommissioning option is Option 2b) Remediate In-situ with exposed sections trenched and buried.

The overall ratings and rankings for each pipeline group were determined from a summation of the ratings of the individual sub-criteria. Since no numerical scoring was adopted during the evaluation, the application of weightings across the criteria to be evaluated could not be applied. i.e. all 14 sub-criteria were given equal weighting by default. Therefore, the more sub-criteria evaluated against a specific main criterion results in that specific main criterion having greater influence on the outcome than other main criteria.

i.e. In this CA evaluation, Safety and Environmental have four sub-criteria each, whereas Technical, Societal and Economic each have only two sub-criteria each, see Table 5 in Section 4.1.3 for individual sub-criteria. Therefore, the ratings allocated to Safety and Environmental will have had a greater influence on the outcome overall than the other main criteria.

To review the impact if all main criteria had an application of equal weighting, the individual sub-criteria ratings were viewed during the workshop and an average weighting against the specific main criterion was agreed. The average ratings across all five main criteria, were then viewed and an equal weighting rating and ranking was agreed for each pipeline group.

The result of this analysis by main criteria is summarised in Table 10 below. See also the "Narrative Summary - CA Workshop Output Sheet" for each pipeline group in the workbook provided in Appendix E, for reference.

In summary the conclusions of the original evaluation where all 14 sub-criteria ratings were summated (Table 9) were not impacted when evaluated using average ratings by main criteria only (Table 10) was completed:

- The most preferred option for each pipeline group remains the same as the original evaluation;
- The least preferred options and recommendations to discount the least preferred options in the DP remains the same:
  - Some of the more poorly rated options, specifically in Group B and Group F changed ranking, but not sufficient to change the recommendation to discount the options.

Sensitivity Analysis

During the workshop, if participants considered a decision on a specific rating to be marginal between one rating and another, this would be noted in the individual worksheets and a decision was taken to carry out a sensitivity analysis offline, by applying the agreed alternative rating for that specific sub-criteria and decommissioning option. The reasoning behind the requirement for the sensitivity analysis was also noted.

The results of these sensitivity analyses are reported in detail in the relevant Sensitivity Analysis 1 - Specific Sub-Criteria Worksheet for each pipeline group in Appendix E.

Sensitivity Analysis 2, taking account of BEIS Guidance [1], where it states, "it is unlikely that costs alone will be accepted as the deciding factor in arriving at the most preferred option unless all other matters show no significant difference". Sensitivity Analysis 2 has removed the Economic Criteria and evaluated the outcome on the remaining equally weighted main criteria.

Sections 6.1.1 to 6.1.7 below provides conclusions and recommendations as to the preferred decommissioning options for each pipeline group and provides a summary of the influencing factors which caused this ranking. Each sub-section also provides conclusions on the impact of the sensitivity analyses carried out.

Table 9: Summary of CA Ranking and Rating by Sub-Criteria

The overall ratings count is based on the individual 14 sub-criteria evaluated.

Pipeline Group		Evaluation Summary	1. Total Removal by:			2. Remediate In-situ with Exposed Sections:			3. Leave In-situ and Monitor
			a) Reverse Reeling	a) Reverse S-Lay	a) Cut and Lift	a) Rock Covered	b) Trenched and Buried	c) Cut and Removed	
A	Rigid Trunk Pipelines, Concrete Coated and Trenched and Buried	Overall rating	Confirmed as not technically feasible during pre-screening study	Screened out during pre-screening study	Higher Impact	Lower Impact	Lower Impact	Lower Impact	Moderate Impact
		Overall ranking			5th	3rd	1st	2nd	4th
		Overall Rating Count			Red = 2	Red = 0	Red = 0	Red = 0	Red = 2
					Amber = 6	Amber = 3	Amber = 1	Amber = 2	Amber = 1
					Green = 4	Green = 9	Green = 11	Green = 10	Green = 9
					NSD = 2	NSD = 2	NSD = 2	NSD = 2	NSD = 2
B	Rigid and Flexible Pipelines and Umbilicals, Surface Laid	Overall rating	Lower Impact		Moderate Impact	Moderate Impact	Moderate Impact	Pipelines fully exposed. Same as Option 1c)	Confirmed as not applicable during pre-screening study
		Overall ranking	1st		4th	3rd	2nd		
		Overall Rating Count	Red = 0		Red = 1	Red = 1	Red = 0		
			Amber = 2		Amber = 6	Amber = 5	Amber = 5		
			Green = 10		Green = 5	Green = 6	Green = 7		
			NSD = 2		NSD = 2	NSD = 2	NSD = 2		
C	Rigid Pipelines and Umbilicals, Trenched and Buried	Overall rating	Moderate Impact		Screened out during pre-screening study	Lower Impact	Lower Impact	Lower Impact	
		Overall ranking	4th			3rd	1st =	1st =	
		Overall Rating Count	Red = 0			Red = 0	Red = 0	Red = 0	
			Amber = 6			Amber = 4	Amber = 1	Amber = 1	
			Green = 4			Green = 6	Green = 9	Green = 9	
			NSD = 4			NSD = 4	NSD = 4	NSD = 4	
D1	Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, with DOL greater than 0.6m	Overall rating	Moderate Impact		Higher Impact	Moderate Impact	Lower Impact	Lower Impact	
		Overall ranking	3rd =		5th	3rd =	1st =	1st =	
		Overall Rating Count	Red = 0		Red = 1	Red = 0	Red = 0	Red = 0	
			Amber = 4		Amber = 5	Amber = 4	Amber = 0	Amber = 0	
			Green = 6		Green = 4	Green = 6	Green = 10	Green = 10	
			NSD = 4		NSD = 4	NSD = 4	NSD = 4	NSD = 4	
D2	Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL less than 0.6m	Overall rating	Lower Impact		Higher Impact	Moderate Impact	Lower Impact	Pipelines mainly exposed. Same as Option 1c)	
		Overall ranking	1st		4th	3rd	2nd		
		Overall Rating Count	Red = 0		Red = 1	Red = 1	Red = 0		
			Amber = 2		Amber = 6	Amber = 5	Amber = 3		
			Green = 11		Green = 6	Green = 7	Green = 10		
			NSD = 1		NSD = 1	NSD = 1	NSD = 1		
E	Flexible Pipeline and Umbilical, Surface Laid and Rock Covered	Overall rating	Lower Impact		Screened out during pre-screening study	Moderate Impact	Moderate Impact	Moderate Impact	
		Overall ranking	1st			2nd =	2nd =	2nd =	
		Overall Rating Count	Red = 0			Red = 0	Red = 0	Red = 0	
			Amber = 1			Amber = 2	Amber = 2	Amber = 2	
			Green = 2			Green = 1	Green = 1	Green = 1	
			NSD = 11			NSD = 11	NSD = 11	NSD = 11	
F	Rigid Trunk Pipeline, Concrete Coated and Shallow Trenched and Partially Covered	Overall rating	Confirmed as not technically feasible during pre-screening study		Higher Impact	Lower Impact	Lower Impact	Lower Impact	Higher Impact
		Overall ranking			4th	3rd	1st	2nd	5th
		Overall Rating Count			Red = 1	Red = 0	Red = 0	Red = 0	Red =3
					Amber = 7	Amber = 6	Amber = 2	Amber = 4	Amber =0
					Green = 4	Green = 6	Green = 10	Green = 8	Green =9
					NSD = 2	NSD = 2	NSD = 2	NSD = 2	NSD = 2

Denotes Most Preferred Option

Denotes Option is discounted by CA and will not be considered further

Table 10: Summary of CA Ranking and Average Rating by Main Criteria

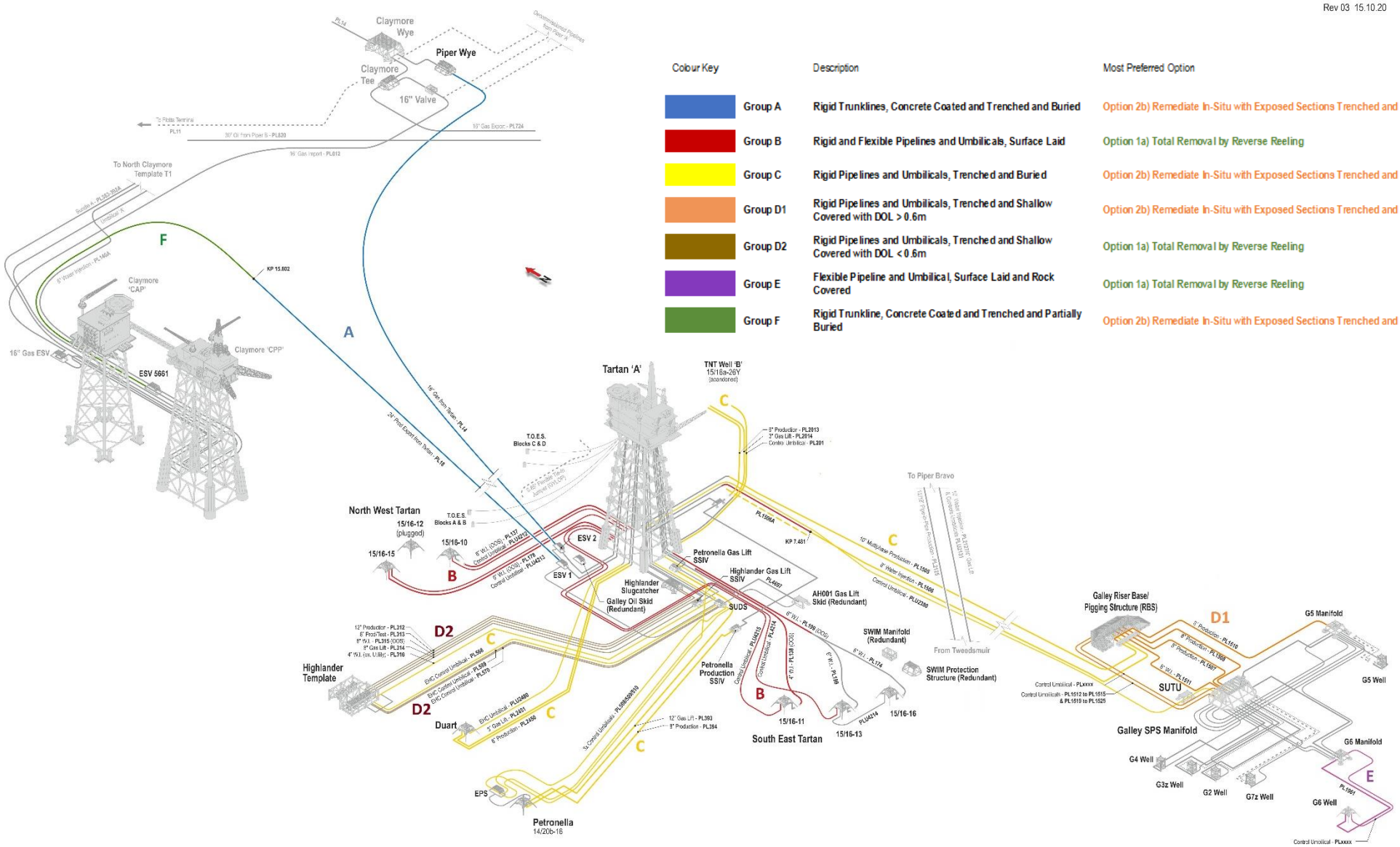
The overall ratings count is based on the five main criteria evaluated, to provide a sense check of impact of equally weighted results across main criteria.

Pipeline Group		Evaluation Summary	1. Total Removal by:			2. Remediate In-situ with Exposed Sections:			3. Leave In-situ and Monitor
			a) Reverse Reeling	a) Reverse S-Lay	a) Cut and Lift	a) Rock Covered	b) Trenched and Buried	c) Cut and Removed	
A	Rigid Trunk Pipelines, Concrete Coated and Trenched and Buried	Overall rating	Confirmed as not technically feasible during pre-screening study	Screened out during pre-screening study	Higher Impact	Lower Impact	Lower Impact	Lower Impact	Moderate Impact
		Overall ranking			5th	1st =	1st =	1st =	4th
		Overall Rating Count			Red = 2	Red = 0	Red = 0	Red = 0	Red = 0
					Amber = 2	Amber = 0	Amber = 0	Amber = 0	Amber = 3
					Green = 1	Green = 5	Green = 5	Green = 5	Green = 2
					NSD = 0	NSD = 0	NSD = 0	NSD = 0	NSD = 0
B	Rigid and Flexible Pipelines and Umbilicals, Surface Laid	Overall rating	Lower Impact		Higher Impact	Higher Impact	Moderate Impact	Pipelines fully exposed. Same as Option 1c)	Confirmed as not applicable during pre-screening study
		Overall ranking	1st		3rd =	3rd =	2nd		
		Overall Rating Count	Red = 0		Red = 1	Red = 1	Red = 0		
			Amber = 0		Amber = 3	Amber = 3	Amber = 4		
			Green = 5		Green = 1	Green = 1	Green = 1		
			NSD = 0		NSD = 0	NSD = 0	NSD = 0		
C	Rigid Pipelines and Umbilicals, Trenched and Buried	Overall rating	Moderate Impact		Screened out during pre-screening study	Lower Impact	Lower Impact	Lower Impact	
		Overall ranking	4th			3rd	1st =	1st =	
		Overall Rating Count	Red = 0			Red = 0	Red = 0	Red = 0	
			Amber = 4			Amber = 4	Amber = 0	Amber = 0	
			Green = 1			Green = 1	Green = 5	Green = 5	
			NSD = 0			NSD = 0	NSD = 0	NSD = 0	
D1	Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, with DOL greater than 0.6m	Overall rating	Moderate Impact		Higher Impact	Lower Impact	Lower Impact	Lower Impact	
		Overall ranking	3rd =		5th	3rd =	1st =	1st =	
		Overall Rating Count	Red = 0		Red = 1	Red = 0	Red = 0	Red = 0	
			Amber = 2		Amber = 2	Amber = 1	Amber = 0	Amber = 0	
			Green = 2		Green = 1	Green = 3	Green = 4	Green = 4	
			NSD = 1		NSD = 1	NSD = 1	NSD = 1	NSD = 1	
D2	Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL less than 0.6m	Overall rating	Lower Impact		Higher Impact	Higher Impact	Lower Impact	Pipelines mainly exposed. Same as Option 1c)	
		Overall ranking	1st		4th	3rd	2nd		
		Overall Rating Count	Red = 0		Red = 1	Red = 1	Red = 0		
			Amber = 0		Amber = 3	Amber = 2	Amber = 1		
			Green = 5		Green = 1	Green = 2	Green = 4		
			NSD = 0		NSD = 0	NSD = 0	NSD = 0		
E	Flexible Pipeline and Umbilical, Surface Laid and Rock Covered	Overall rating	Lower Impact		Screened out during pre-screening study	Moderate Impact	Moderate Impact	Moderate Impact	
		Overall ranking	1st			2nd =	2nd =	2nd =	
		Overall Rating Count	Red = 0			Red = 0	Red = 0	Red = 0	
			Amber = 1			Amber = 2	Amber = 2	Amber = 2	
			Green = 2			Green = 1	Green = 1	Green = 1	
			NSD = 2			NSD = 2	NSD = 2	NSD = 2	
F	Rigid Trunk Pipeline, Concrete Coated and Shallow Trenched and Partially Covered	Overall rating	Confirmed as not technically feasible during pre-screening study		Higher Impact	Moderate Impact	Lower Impact	Lower Impact	Moderate Impact
		Overall ranking			5th	3rd	1st	2nd	4th
		Overall Rating Count			Red = 1	Red = 0	Red = 0	Red = 0	Red = 2
					Amber = 3	Amber = 3	Amber = 1	Amber = 1	Amber = 1
					Green = 1	Green = 2	Green = 4	Green = 4	Green = 2
					NSD = 0	NSD = 0	NSD = 0	NSD = 0	NSD = 0

Denotes Most Preferred Option

Denotes Option is discounted by CA and will not be considered further

Figure 15: Field Layout indicating Most Preferred Option – All Pipeline Groups



6.1.1 Group A - Rigid Trunk Pipelines, Concrete Coated and Trenched and Buried

This group consists of one 24" x 15.6km (KP 0.0 to KP KP15.602) pipeline and one 18" x 16.7km pipeline. Both pipelines are fully trenched buried to an average burial depth of more than 0.6m to top of pipe, exposures are mainly at pipeline ends, with a very short mid-line exposure only. See Table 6 in Section 4.1.4 for details of individual pipelines.

The CA Evaluation Workshop ranking and recommendation for each decommissioning option was as follows:

Decommissioning Option[1]	1. Total Removal by:	2. Remediate In-situ with exposed sections:			3. Leave In-situ and Monitor
	c) Cut & Lift	a) Rock Covered	b) Trenched & Buried	c) Cut & Removed	
Ranking	5th	3rd	1st	2nd	4th
Recommendation	Discounted option in DP	Although Option 2b) is ranked as the most preferred option, the difference in rating between 2b) , 2a) and 2c) is marginal and all three options will be carried through to a C&P phase of the project to allow contractors to tender and propose the overall preferred option. If the C&P tendering phase results in either options 2a) or 2c) being considered more favourable than option 2b) the Operator will engage with OPRED before a decision is taken on overall strategy .			Discounted option in DP

[1]Options 1a) Total Removal by Reverse Reeling and 1b) Total Removal by Reverse S-lay were both screened out in the Pre-Screening Report [7], see Section 5.1 for a summary of the pre-screening reasoning.

Key influencing factors in ranking this group:

Each of the Remediate In-situ options 2a), 2b) and 2c), are rated predominantly Low Impact (Green) across most of the individual sub-criteria. Option 2c) is only rated marginally worse than Option 2b), by one additional Moderate Impact (Amber) under the sub-criterion "Risk to Project Personnel" due to the fact Option 2c) recovers a small quantity of materials to the vessel deck and Option 2b) does not. Option 2a) is rated marginally worse than both Options 2b) and 2c), mainly due to the fact Option 2a) introduces several small new rock berms to the seabed, i.e. *c.*978te of new rock over a pipeline length of *c.*100m.

Notably Options 2a), 2b) and 2c) do not attract any Higher Impact (Red) ratings. Option 2b) is also the lowest cost option from all options evaluated, except option 3), see Table 9.

Options 1c) and 3) have both performed much worse in the CA workshop evaluation than the Remediate In-situ options.

Option 1c) is ranked 5th and is rated poorly across all main criteria, other than Societal, this is due to the significantly longer vessel duration, estimated as 639 days for this option compared to between 18 and 27 days for the other options evaluated, and also the significant additional materials recovered, that needs to be managed from both a safety and environmental perspective (*c.*13,579te recovered with potentially *c.*5,309te anticipated to be disposed to landfill)compared to the other options.

Option 3) is ranked 4th and is rated more poorly on the Main Criteria of Safety, Societal and Economic Risk as this option results in increased risk to other users of the sea from exposed sections of pipeline decommissioned in-situ, with no mitigation introduced to prevent snagging from over trawling. The exposed pipeline sections will deteriorate overtime which may lead to increased snagging risk to trawling nets. This snagging risk may also have a commercial impact on the fishing industry (under the main criteria Societal), due to the potential for lost nets and the fishermen introducing a self-imposed exclusion zone. Economic Risk of this option was rated as Moderate Impact (Amber) due to anticipated ongoing and prolonged monitoring surveys and the increased potential of future remedial action required and therefore cost, compared to the other decommissioning options.

The output sheets providing more detail of the original evaluation are provided in Appendix E, pages 88 to 92 for Group A.

Sensitivity Analysis

Sensitivity Analysis 1 – By specific sub-criteria:

The results of the specific sub-criterion sensitivity analyses (see Section 5.3.1) are reported in detail in the relevant Sensitivity Analysis 1 - Specific Sub-Criteria Worksheet for each pipeline group in Appendix E.

The sensitivity analyses and the results are summarised by pipeline group below.

There were seven separate sub-criteria / decommissioning options combinations identified for specific change of ratings in Group A, see Table 11.

Table 11: Group A Sensitivity Analysis 1

Option / Sub-Criteria	Original Rating	Revised Rating	Reason for sensitivity analysis
Option 1c) Total Removal by Cut and Lift/ Technical Complexity & Track Record	Not significantly different	Moderate Impact (Amber)	Aged concrete coating is in poor condition and may result in more complex recovery methods, than initial evaluation assumes.
Option 1c) Total Removal by Cut and Lift/ Risk to Project Personnel	Higher Impact (Red)	Moderate Impact (Amber)	Engineer, Prepare, Remove and Disposal (EPRD) contractor may apply risk mitigation during recovery (e.g. recovery of pipeline sections in baskets), which would reduce both manual handling and potential for concrete spalls to fall to deck from height.
Option 1c) Total Removal by Cut and Lift/ Risk to Those on Land	Moderate Impact (Amber)	Higher Impact (Red)	There are significantly large quantities of materials to be handled at the yard than other options and over a prolonged period of >2 years.
Option 1c) Total Removal by Cut and Lift/ Waste Processing	Moderate Impact (Amber)	Not significantly different	Changed to Low Impact (Green)* If circumstances allow the concrete coating to recycled rather than go to landfill. *Since other options are already Low Impact (Green), changes to not significantly different
Option 2a) Remediate In-situ with exposed sections rock covered/ Impact on Commercial Fisheries	Low Impact (Green)	Moderate Impact (Amber)	The fishermen may feel the accumulation of rock berms across the pipeline groups may be unacceptable, where this was originally assessed as one group in isolation.
Option 2c) Remediate In-situ with exposed sections cut and removed/ Risk to Project Personnel	Moderate Impact (Amber)	Low Impact (Green)	EPRD contractor may apply risk mitigation during recovery (e.g. recovery of pipeline sections in baskets), which would reduce both manual handling and potential for concrete spalls to fall to deck from height. Difference in ratings between Options1c) and 2c) is due to different campaign durations and significantly different quantity of materials recovered.
Option 3) Leave In-situ and Monitor/ Impact on Commercial Fisheries	Moderate Impact (Amber)	Low Impact (Green)	The large diameter concrete coated lines are over trawlable.

Under this Sensitivity Analysis 1 Options 2b) and 2c) become ranked 1st equal, where during the workshop evaluation Option 2c) was ranked 2nd. The difference in ratings for these two options in the original evaluation was very marginal, with the risk to project personnel being the only difference across all criteria for the two options. Under this sensitivity the risk to project personnel is now rated the same for both options, Low Impact (Green)

The other options remain ranked the same as the original evaluation discussed in Section 6.1.1 above.

The recommendation for this group remains that Option 2b) should be identified in the DP as the most preferred option but that since Options 2a), 2b) and 2c) are rated only marginally different, it is recommended that all three options are carried forward to the C&P tendering phase to enable the EPRD contractors to contribute to the assessment of the preferred option from an economic and overall campaign strategy taking account of other pipeline groups in the field.

It also remains the recommendation that Options 1c) and 3) may be discounted and not considered further in the CA report or in the DP.

Refer to Appendix E, page 93 for more detail of this analysis for Group A.

Sensitivity Analysis 2 – Economic Risk Discounted:

This sensitivity analysis demonstrates across all decommissioning options that cost does not influence the conclusion on the most preferred option to be recommended in the DP, nor does it influence the subsidiary recommendations on:

- Options to be carried forward to the C&P tendering phase to enable the EPRD contractors to contribute to the assessment of the preferred option from an economic and overall campaign strategy;
- Options to be discounted and not considered further.

Refer to Appendix E, page 94 for more detail of this analysis for Group A.

6.1.2 Group B - Rigid and Flexible Pipelines and Umbilicals, Surface Laid

This group consists of one 8" flexible x 7.5km long, four 6" rigid x 13.1km (combined length) and four umbilicals x 13.3km (combined length). All lines are surface laid with no natural burial evident along the lines. See Table 6 in Section 4.1.4 for details of individual pipelines and umbilicals.

The CA Evaluation Workshop ranking and recommendation for each decommissioning option was as follows:

Decommissioning Option[1]	1. Total Removal by:		2. Remediate In-situ with exposed sections:	
	a) Reverse Reeling	c) Cut & Lift	a) Rock Covered	b) Trenched & Buried
Ranking	1st	4th	3rd	2nd
Recommendation	Most Preferred Option	Discounted option in DP	Discounted option in DP	Discounted option in DP

Notes for Table:

[1]Option 1b) Total Removal by Reverse S-lay was screened out in the Pre-Screening Report [7], see Section 5.1 for a summary of the pre-screening reasoning. Option 2c) Remediate In-situ with exposed sections cut and removed was not evaluated by CA since all lines are surface laid and fully exposed for this pipeline group Option 1c) Total Removal by Cut and Lift is the same as Option 2c). Option 3 Leave In-situ and Monitor was not evaluated by CA as this option was confirmed as not applicable for smaller diameter pipelines which make up this group. See Section 3.2.7.

Key influencing factors in ranking this group:

Option 1a) has been rated significantly better than the other options evaluated during the CA workshop. It is rated Low Impact (Green) or "not significantly different" for 12 of the 14 sub-criteria and only rated Moderate Impact (Amber) for Risk to Those on Land and Environmental Impact of Waste Processing. These Moderate Impact (Amber) ratings were applied since Option 1a) recovers *c.*1,577te of material (equivalent to 33.9km of pipeline and umbilical) to an onshore yard to be managed. It is recognised in the environmental rating that the plastics and some other materials (*c.*182te), cannot be recycled and may be disposed to landfill. It is also noted that Option 1a) is the lowest cost option from all options evaluated.

Option 2b) although ranked 2nd performs much more poorly than Option 1a) since the lines are surface laid the full 33.9km of lines would need to be trenched and buried, this could not be achieved at the many pipelines crossings and may require an alternative solution such as spot rock cover at the many crossings, due to this uncertainty Option 2b) has been rated more poorly than Option 1a) for all options other than Safety.

Option 2a) is ranked 3rd and is rated poorly across all main criteria, other than technical feasibility, this is due to the significant quantity of new rock berms that would be introduced to the seabed, *c.*187,470te over *c.*33.9km of pipeline. This was considered to be a moderate residual (long term) risk and commercial impact to fisheries if the rock berms were to become unstable overtime. The Tartan Development Area, is considered to meet the criteria for the OSPAR listed threatened and/or declining habitat 'Sea pen and burrowing megafauna communities' as well as the UK Habitat Feature of Conservation Importance and UKBAP habitat 'mud habitats in deep water'. Given the habitat types and volume of rock required, the long-term impact of rock covering the full length of lines in this group is considered higher impact from long term change of habitat perspective.

Option 1c) is ranked 5th equal, and is rated poorly across all main criteria, other than Societal, this is due to the significantly longer vessel activity estimated and the significant additional materials recovered that needs to be managed compared to the other options.

The output sheets providing more detail of the original evaluation are provided in Appendix E pages 95 to 100 for Group B.

Sensitivity Analysis

Sensitivity Analysis 1 – By specific sub-criteria:

There was only one sub-criterion / decommissioning option combination identified for specific change of ratings in Group B, see Table 12.

Table 12: Group B Sensitivity Analysis 1

Option / Sub-Criteria	Original Rating	Revised Rating	Reason for sensitivity analysis
Option 2b) Remediate In-situ with exposed sections trenched and buried/ Residual (Long Term) Risk to Other Users of the Sea	Low Impact (Greed)	Moderate Impact (Amber)	There are a significant number of pipeline crossings associated with this pipeline group where trenching and burying at the crossing could not be achieved, therefore rock cover of the crossings may be an alternative option for each crossing, this would result in a similar risk from snagging for trawlers as Option 2a).

The overall ranking of the decommissioning options evaluated under this sensitivity analysis have not changed from the original evaluation described in Section 6.1.2 above. Decommissioning Option 2b) is rated only marginally worse than previously but remains ranked 2nd behind Option 1a) which remains the most preferred option.

The recommendation for this group remains that Option 1a) should be identified in the DP as the most preferred option and that all other options are rated sufficiently worse overall than Option 1a). Therefore, it remains the recommendation that all other options may be discounted and not considered further in the CA report or in the DP.

Refer to Appendix E, page 100 for more detail of this analysis for Group B.

Sensitivity Analysis 2 – Economic Risk Discounted:

This sensitivity analysis demonstrates across all decommissioning options that cost does not influence the conclusion on the most preferred option to be recommended in the DP, nor does it influence the subsidiary recommendations on:

- Options to be carried forward to the C&P tendering phase to enable the EPRD contractors to contribute to the assessment of the preferred option from an economic and overall campaign strategy;
- Options to be discounted and not considered further.

Refer to Appendix E, page 101 for more detail of this analysis for Group B.

6.1.3 Group C - Rigid Pipelines and Umbilicals, Trenched and Buried

This group consists of nine rigid pipelines of various diameter from 3" to 12" x 101km (combined length) and seven umbilicals x 83km (combined length). All lines are buried to an average depth between 0.65 and 1.21m with some supplementary rock cover at intervals where adequate cover was not achieved. Some lines are in shared trenches and some lines are piggy-backed to other lines. See Table 6 in Section 4.1.4 for details of individual pipelines and umbilicals.

The CA Evaluation Workshop ranking and recommendation for each decommissioning option was as follows:

Decommissioning Option[1]	1. Total Removal by:	2. Remediate In-situ with exposed sections:		
	a) Reverse Reeling	a) Rock Covered	b) Trenched & Buried	c) Cut & Removed
Ranking	4th	3rd	1st =	1st =
Recommendation	Discounted option in DP	Although Option 2b) is ranked as the most preferred option, the difference in rating between 2b) , 2a) and 2c) is marginal and all three options will be carried through to a C&P phase of the project to allow contractors to tender and propose the overall preferred option. If the C&P tendering phase results in either options 2a) or 2c) being considered more favourable than option 2b) the Operator will engage with OPRED before a decision is taken on overall strategy .		

Notes for Table:

[1]Options 1b) Total Removal by Reverse S-lay and 1c) Total Removal by Cut and Lift were screened out in the Pre-Screening Report [7], see Section 5.1 for a summary of the pre-screening reasoning. Option 3 Leave In-situ and Monitor was not evaluated by CA as this option was confirmed as not applicable for smaller diameter pipelines which make up this group. See Section 3.2.7.

Key influencing factors in ranking this group:

The remediate In-situ options 2b) and 2c) are rated identically and Low Impact (Green) or "not significantly different" for 13 of the 14 sub-criteria and only rated Moderate Impact (Amber) for the sub-criterion "Cost for long term monitoring / Remediation activities". This Moderate rating recognises the anticipated ongoing and prolonged monitoring surveys and the increased potential of future remedial action required and therefore cost, compared to the other decommissioning options. The moderate rating recognises that large sections of the Galley pipelines have a partial rock berm covering, which will remain in-situ, and which may become unstable overtime.

Both Options 2b) and 2c) are ranked as 1st equal, however as a single preferred option needs to be identified in the DP, Option 2b) is declared as the "most preferred option" compared to Option 2c) on the basis that:

- There is a wider campaign strategy evident for the other pipeline groups where trench and burying of exposed sections is the most preferred option;
- Based on a review of the historic survey information on the already buried sections of these pipelines it is expected that once the exposed sections have been trenched and buried, they are expected to remain buried;
- Of the options evaluated, Option 2b) is the lowest cost option.

Option 2a) is ranked 3rd and is only rated marginally worse than options 2b) and 2c), and only for Residual (Long Term) Risk to Other Users of the Sea (Safety), Change of Habitat - Long Term (Environmental) and Impact on Commercial Fisheries (Societal). Option 2a) has been evaluated as Moderate Impact (Amber) rating for these 3 sub-criteria due to the introduction of 10,922te of rock berm applied over 1.897km of exposed pipeline.

Option 1a) is ranked 4th and is rated poorly across all main criteria, other than Societal. This is due to the significant additional materials recovered that needs to be managed onshore compared to the other options *c.*8,692te/33.9km of pipelines and umbilicals:

- Posing an additional safety risk to those at the quayside and at the dismantling yard where the pipelines and umbilicals will need to be unreeled and cut into manageable sections;
- Posing an additional environmental impact where *c.*662te of plastics from the umbilicals having to be disposed to landfill.

Notably none of the options attract any Higher Impact (Red) ratings, see Table 9.

The output sheets providing more detail of the original evaluation are provided in Appendix E, pages 102 to 106 for Group C.

Sensitivity Analysis

Sensitivity Analysis 1 – By specific sub-criteria

There were three separate sub-criteria / decommissioning options combinations identified for specific change of ratings in Group C, see Table 13.

Table 13: Group C Sensitivity Analysis 1

Option / Sub-Criteria	Original Rating	Revised Rating	Reason for sensitivity analysis
Option 1a) Total Removal by Reverse Reeling/ Cost for Decommissioning/Removal activities	Moderate Impact (Amber)	Higher Impact (Red)	Estimated cost of this option is >200% of lowest cost option.
Option 2a) Remediate In-situ with exposed sections rock covered/ Change of Habitat - Long Term	Moderate Impact (Amber)	Not significantly different	Rating changed to Low Impact (Green) which results in all options for this sub-criterion becoming "not significantly different". There is a relatively small quantity of rock added and taking account that one of the Galley pipelines already has 12.9km of rock cover.
Option 2a) Remediate In-situ with exposed sections rock covered/ Impact on Commercial Fisheries	Moderate Impact (Amber)	Not significantly different	Rating changed to Low Impact (Green) which results in all options for this sub-criterion becoming "not significantly different". The rock cover will be installed in existing open trenches, with less rock profile above mean seabed level.

The overall ranking of the decommissioning options evaluated under this sensitivity analysis have not changed from the original evaluation described in Section 6.1.3 above. Option 2a) is rated only marginally better than previously but remains ranked 3rd behind Option 2b) and Option 2c).

The recommendation for this group remains that Option 2b) should be identified in the DP as the most preferred option but that since Options 2a), 2b) and 2c) are rated only marginally different, it is recommended that all three options are carried forward to the C&P tendering phase to enable the EPRD contractors to contribute to the assessment of the preferred option from an economic and overall campaign strategy taking account of other pipeline groups in the field.

Therefore, it remains the recommendation that Option 1a) may be discounted and not considered further in the CA report or in the DP.

Refer to Appendix E, page 107 for more detail of this analysis for Group C.

Sensitivity Analysis 2 – Economic Risk Discounted:

This sensitivity analysis demonstrates across all decommissioning options that cost does not influence the conclusion on the most preferred option to be recommended in the DP, nor does it influence the subsidiary recommendations on:

- Options to be carried forward to the C&P tendering phase to enable the EPRD contractors to contribute to the assessment of the preferred option from an economic and overall campaign strategy;
- Options to be discounted and not considered further.

Refer to Appendix E, page 108 for more detail of this analysis for Group C.

6.1.4 Group D1 - Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL >0.6m

This group consists of four 8" rigid pipelines x 7.7km (combined length) and two umbilicals x 3.8km (combined length). All lines are trench laid with shallow cover of between 0.06m and 0.32m(average), with DOL of between 0.67m and 0.96m(average), with supplementary rock cover on some sections. Two lines share a common trench. See Table 6 in Section 4.1.4 for details of individual pipelines and umbilicals.

The CA Evaluation Workshop ranking and recommendation for each decommissioning option was as follows:

Decommissioning Option[1]	1. Total Removal by:	1. Total Removal by:	2. Remediate In-situ with exposed sections:		
	a) Reverse Reeling	c) Cut & Lift	a) Rock Covered	b) Trenched & Buried	c) Cut & Removed
Ranking	3rd =	5th	3rd =	1st =	1st =
Recommendation	Discounted option in DP's	Discounted option in DP's	Although Option 2b) is ranked as the most preferred option, the difference in rating between 2b) , 2a) and 2c) is marginal and all three options will be carried through to a C&P phase of the project to allow contractors to tender and propose the overall preferred option. If the C&P tendering phase results in either options 2a) or 2c) being considered more favourable than option 2b) the Operator will engage with OPRED before a decision is taken on overall strategy .		

Notes for Table:

[1]Option 1a) Total Removal by Reverse Reeling was identified as not technically feasible and Option 1b) Total Removal by Reverse S-lay was screened out in the Pre-Screening Report [7], see Section 5.1 for a summary of the pre-screening reasoning. Option 3 Leave In-situ and Monitor was not evaluated by CA as this option was confirmed as not applicable for smaller diameter pipelines which make up this group. See Section 3.2.7.

Key influencing factors in ranking this group:

The remediate In-situ options 2b) with exposed sections trenched and buried and 2c) with exposed sections cut and removed are rated identically and all Low Impact(Green) or "not significantly different" across all 14 sub-criteria. Both Options 2b) and 2c) are ranked as 1st equal, however as a single preferred option needs to be identified in the DP, Option 2b) therefore should declared as the "most preferred option" on the basis that:

- There is a wider campaign strategy evident for the other pipeline groups where trench and burying of exposed sections is the most preferred option;
- Option 2b) is also the lowest cost option from all options evaluated.

Option 2a) is ranked 3rd equal, with Option 1a), and is only rated marginally worse than options 2b) and 2c), and more specifically for Residual (Long Term) Risk to Other Users of the Sea(Safety), Change of Habitat - Long Term (Environmental) and Impact on Commercial Fisheries (Societal). Option 2a) has been evaluated as Moderate Impact (Amber) rating for these 3 sub-criteria due to the introduction of 3,975te of rock berm applied over 0.62km of exposed pipeline.

Option 1a) is ranked 3rd equal, with Option 2a), in terms of number of Moderate Impact (Amber) ratings. However, it is rated more poorly across different sub-criteria than Option 2a) i.e. Safety Risk to Project Personnel Note 2 and to Those on Land and Waste Processing (Environmental), since more materials are recovered and returned onshore (*c.*996te/11.4km of pipelines and umbilicals) than Options 2a), 2b) and 2c).

Note 2: Although Option 1a) is estimated to have the shortest vessel duration of all the decommissioning options and it is recognised that the reverse reeling techniques adopted means that deck crew are remote from most of the recovery activity, the Moderate impact (Amber) rating also recognises the potential for chemical release from blocked cores in the recovered umbilicals on the vessel deck or when unreeled and cut into sections at the yard. Option 1a) is also more cost than the remediate in-situ options due to the vessel type deployed and is estimated to be around 186% the cost of Option 2b), the most preferred option.

Taking account of the Sensitivity Analysis 1, Option 1a) becomes the 4th ranked options and it is therefore recommended that Option 1a) is discounted and not considered further.

Discounting Option 1a) for this pipeline group at this stage is consistent with the wider campaign strategy that has developed across all pipeline groups where the pipelines/umbilicals that are already predominantly trenched and buried to an adequate depth (or at least had an adequate DOL). i.e. Groups A, C, D1 and F are all already adequately trenched and buried and therefore all full removal options are discounted at this stage.

Option 1c) – Total Removal by Cut and Lift is ranked 5th and is rated as Moderate Impact (Amber) for 7 of the 14 sub-criteria and Higher Impact (Red) for a further sub-criterion. The poor ratings are spread across all main criteria except Societal and reflects the excessively more effort anticipated in terms for longer vessel duration of *c.*206 days Note 3 for this option compared to between 18 and 29 days for the other options

evaluated, additional materials recovered (996te) that needs to be managed compared to the other remediate in-situ options. Option 1c is also the most expensive option by some margin (682% of the lowest cost option).

Note 3 Although this option is a significantly longer duration than other decommissioning options in this group, the scope could still be executed within one vessel campaign of *c.*7 months, for that reason it was rated as "not significantly different" for the sub-criteria "Risk of major project failure" as it is considered that the risk of major project failure remains low across all decommissioning options.

It is highlighted that Moderate Impact (Amber) to the criteria "Risk of Major Project Failure" has only been applied for Option 1c) in Groups A, B, D2 and F, all of these groups except group F had significantly long durations of a number of years (4 years for D2) by comparison to group D1 which can be completed in one campaign of less than 7months.

Group F whilst similar duration to Group D1 was rated Moderate Impact Amber, since it was concrete coated, and it was reported to have integrity issues where a loss of wall thickness of 60 to 70% was reported. Neither of these concerns are applicable to the pipelines in Group D1.

The output sheets providing more detail of the original evaluation are provided in Appendix E, pages 109 to 113 for Group D1.

Sensitivity Analysis

Sensitivity Analysis 1 – By specific sub-criteria:

There were seven separate sub-criteria / decommissioning options combinations identified for specific change of ratings in Group D1, see Table 14.

Table 14: Group D1 Sensitivity Analysis 1

Option / Sub-Criteria	Original Rating	Revised Rating	Reason for sensitivity analysis
Option 1a) Total Removal by Reverse Reeling/ Risk of Major Project Failure	Not significantly different	Moderate Impact (Amber)	In recognition that there is *c.*11.5km of pipelines/ umbilicals to be recovered with this option compared to only *c.* 620m in Option 2c) and no pipelines recovered for Option 2a) and 2b). There is therefore and order of magnitude of more effort involved and therefore potential for schedule slippage.
Option 1a) Total Removal by Reverse Reeling/ Risk to Project Personnel	Moderate Impact (Amber)	Low Impact (Green)	In recognition that Option 1a) has the shortest vessel duration (*c.*18days) of all options.
Option 1a) Total Removal by Reverse Reeling/ Cost for Decommissioning/ Removal activities	Moderate Impact (Amber)	Low Impact (Green)	Although the estimated cost of this option is 186% of the lowest cost option it is still within £1.0M of other Options rated as Low Impact (Green)
Option 1c) Total Removal by Cut and Lift/ Risk of Major Project Failure	Not significantly different	Moderate Impact (Amber)	In recognition that there is *c.*11.5km of pipelines/ umbilicals to be recovered with this option compared to only *c.* 620m in Option 2c) and no pipelines recovered for Option 2a) and 2b). There is therefore and order of magnitude of more effort involved and therefore potential for schedule slippage.
Option 1c) Total Removal by Cut and Lift/ Seabed Disturbance- Short Term	Not significantly different	Moderate Impact (Amber)	During recovery the pipelines sections may laid down in groups on the on the seabed or into baskets to be recovered which would lead to additional seabed disturbance.
Option 2a) Remediate In-situ with exposed sections rock covered/ Residual (Long Term) Risk to Other Users of the Sea	Moderate Impact (Amber)	Not significantly different	Rating changed to Low Impact (Green) which results in all options for this sub-criterion becoming "not significantly different". The new the rock cover will be installed in existing open trenches, therefore not as intrusive to the fishing industry.
Option 2a) Remediate In-situ with exposed sections rock covered/ Impact on Commercial Fisheries	Moderate Impact (Amber)	Not significantly different	Rating changed to Low Impact (Green) which results in all options for this sub-criterion becoming "not significantly different", The new the rock cover will be installed in existing open trenches, therefore not as intrusive to the fishing industry.

The overall ranking of the decommissioning options evaluated under this sensitivity analysis have not changed from the original evaluation described in Section 6.1.4 above. Except Option 2a) is now rated better (ranked 3rd on its own) where it had previously been ranked 3rd equal with Option 1a).

The recommendation for this group remains that Option 2b) should be identified in the DP as the most preferred option but that since Options 2a), 2b) and 2c) are rated only marginally different, it is recommended that all three options are carried forward to the C&P tendering phase to enable the EPRD contractors to contribute to the assessment of the preferred option from an economic and overall campaign strategy taking account of other pipeline groups in the field.

Therefore, the original recommendation that Option 1a) and 1c) may be discounted and not considered further in the CA report or in the DP is reinforced by this sensitivity analysis.

Refer to Appendix E, page 114 for more detail of this analysis for Group D1.

Sensitivity Analysis 2 – Economic Risk Discounted:

This sensitivity analysis demonstrates across all decommissioning options that cost does not influence the conclusion on the most preferred option to be recommended in the DP, nor does it influence the subsidiary recommendations on:

- Options to be carried forward to the C&P tendering phase to enable the EPRD contractors to contribute to the assessment of the preferred option from an economic and overall campaign strategy;
- Options to be discounted and not considered further.

Refer to Appendix E, page 115 for more detail of this analysis for Group D1.

6.1.5 Group D2 - Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL < 0.6m

This group consists of one 12" dia. and three 8" dia. rigid pipelines with a combined length of 51.8km plus two umbilicals with a combined length of 25.7km.

Unlike the other trenched pipeline groups in the field, all lines in this group are in shallow trenches, with some lines in shared trenches. The average DOL of the lines from top of pipe to mean seabed level is less than the trench depths of other pipeline groups and is between 0.37m and 0.45m and average depth of burial of the lines in these trenches is between 0.24m and 0.37m to top of pipe.

97.1% (88.25km) of the combined pipeline/ umbilcal length do not meet the DOC criteria of 0.6m nor the DOL and therefore has been considered as exposed for the purpose of the CA evaluation. Although 2.9% (2.65km) of the lines meet the DOC of 0.6m these sections of line are spread intermittently along the lengths of the pipelines/ umbilicals and occur at numerous locations of very short lengths.

It was considered that it would not be efficient nor technically feasible in terms of rock dumping or trenching activities to not remediate these small sections. Therefore, during this CA evaluation, it was assumed the Remediate In-situ Options 2a) and 2b) are to be carried out on the whole length of the pipelines and umbilicals (90.9km).

The CA Evaluation Workshop ranking and recommendation for each decommissioning option was as follows:

Decommissioning Option[1]	1. Total Removal by:		2. Remediate In-situ with exposed sections:	
	a) Reverse Reeling	c) Cut & Lift	a) Rock Covered	b) Trenched & Buried
Ranking	1st	4th	3rd	2nd
Recommendation	Most Preferred Option	Discounted option in DP's	Discounted option in DP's	To be carried through to a C&P phase of the project to allow contractors to tender and propose the overall preferred option.[2]

Notes for Table:

[1]Option 1b) Total Removal by Reverse S-lay was screened out in the Pre-Screening Report [7], see Section 5.1 for a summary of the pre-screening reasoning. Option 2c) Remediate In-situ with exposed sections cut and removed was not evaluated by CA since all lines have exposed for this pipeline group Option 1c) Total Removal by Cut and Lift is the same as Option 2c). Option 3 Leave In-situ and Monitor was not evaluated by CA as this option was confirmed as not applicable for smaller diameter pipelines which make up this group. See Section 3.2.7.

[2]Although Option 1a) is ranked as the most preferred option, the difference in rating between 1a) and 2b) Remediate In-situ with exposed sections trenched and buried is marginal and both options will be carried through to a C&P phase of the project to allow contractors to tender and propose the overall preferred option. If the C&P tendering phase results in Option 2b) being considered more favourable than Option 1a) the Operator will engage with OPRED before a decision is taken on overall strategy.

Key influencing factors in ranking this group:

Option 1a) has been rated significantly better than Options 1c) and 2a) during the CA workshop. It is rated Low Impact (Green) or "not significantly different" for 12 of the 14 sub-criteria and only rated Moderate Impact (Amber) for Risk to Those on Land and Environmental Impact of Waste Processing. Option 1a) has been rated as Moderate Impact (Amber) as it results in *c.*4,454te (the equivalent of 90.9km of pipeline and umbilical) to an onshore yard to managed. It is recognised in the environmental rating that the plastics and other materials, *c.*105te, cannot be recycled and may be disposed to landfill. It is noted that Option 1a) is also the lowest cost option of all options evaluated.

From a wider project perspective Option 1a) also eliminates legacy risk and future liability uncertainties compared to the remediate in-situ options, as it results in total removal of the pipelines and umbilicals. Also, if executed as a campaign in conjunction with other pipelines groups in the field (i.e. Groups B and E) this will result in infield synergies for reverse reel activities and the potential economic value this will realise.

Option 2b) is ranked 2nd being evaluated as Moderate Impact (Amber) for three sub-criteria, both Technical Feasibility sub-criteria and Seabed Disturbance-Short Term (Environmental), These Moderate Impact (Amber) ratings are due to:

- Uncertainty of being able to achieve the required burial depth of 0.6m:
  - when this was not achieved during the original installation of the lines;
  - Original installation records for these lines is poor and it is not clear if the original trench depth specification was deeper but not achieved due to seabed conditions;
- There will also be added technical complexity and more seabed disturbance in trenching and burying the lines that are in shared trenches where jetting techniques would need to be adopted;
- It is noted that Option 2b) is also only 15% greater than the cost of Option 1a).

Option 2a) is ranked 3rd and is rated as Moderate Impact (Amber) for 5 of the 14 sub-criteria and Higher Impact (Red) for a further sub-criterion. The poor ratings are spread across all main criteria except Technical Feasibility, the relatively poor ratings are due to the significant quantity of new rock berms that would be introduced to the seabed, *c.*534,094te over *c.*90.9km of pipeline. This was considered to be a moderate commercial impact to the fishing industry and in terms of economic risk should the rock berms become unstable overtime and required further remedial action.

The Tartan Development Area, is considered to meet the criteria for the OSPAR listed threatened and/or declining habitat 'Sea pen and burrowing megafauna communities' as well as the UK Habitat Feature of Conservation Importance and UKBAP habitat 'mud habitats in deep water'. Given the habitat types and volume of rock required, the long-term impact of rock covering the full length of lines in this group is considered Higher Impact (Red) from long term change of habitat.

Option 1c) is ranked 4th and is rated as Moderate Impact (Amber) for 6 of the 14 sub-criteria and Higher Impact (Red) for a further sub-criterion. The poor ratings are spread across all main criteria except Societal and reflects the excessively more effort anticipated in terms for longer vessel duration *c.*1,523 days for this option compared to between 30 and 141 days for the other options evaluated, Also, additional materials recovered (*c.*4,454te) that needs to be managed compared to the remediate in-situ options. Option 1c is also the most expensive option by some margin (1,652% of the lowest cost option).

The output sheets providing more detail of the original evaluation are provided in Appendix E, pages 116 to 120 for Group D2.

Sensitivity Analysis

Sensitivity Analysis 1 – By specific sub-criteria:

There were four separate sub-criteria / decommissioning options combinations identified for specific change of ratings in Group D2, see Table 15.

Table 15: Group D2 Sensitivity Analysis 1

Option / Sub-Criteria	Original Rating	Revised Rating	Reason for sensitivity analysis
Option 1a) Total Removal by Reverse Reeling/ Risk to Project Personnel	Low Impact (Green)	Moderate Impact (Amber)	Due to the large quantity of pipelines and umbilicals to be recovered (*c.* 90.9km) compared to the Remediate In-Situ Options.
Option 1c) Total Removal by Cut and Lift/ Risk to Project Personnel	Moderate Impact (Amber)	Higher Impact (Red)	Due to the large quantity of pipelines and umbilicals to be recovered (*c.* 90.9km) and handled by the deck crew compared to the Remediate In-Situ Options.
Option 2a) Remediate In-situ with exposed sections rock covered/ Cost for Decommissioning/ Removal activities	Moderate Impact (Amber)	Higher Impact (Red)	Due to the estimate being significantly more (263%) than the lowest cost option.
Option 2b) Remediate In-situ with exposed sections trenched and buried/ Cost for Decommissioning/ Removal activities	Low Impact (Green)	Moderate Impact (Amber)	In recognition of the technical uncertainties of being able to achieve the trench depth to enable required burial depth, this could lead to additional passes and therefore additional cost.

The overall ranking of the decommissioning options evaluated under this sensitivity analysis have not changed from the original evaluation described in Section 6.1.5 above.

The recommendation for this group remains that Option 1a) should be identified in the DP as the most preferred option but that since Option2b) is rated only marginally different, it is recommended that both options are carried forward to the C&P tendering phase to enable the EPRD contractors to contribute to the assessment of the preferred option from an economic and overall campaign strategy taking account of other pipeline groups in the field. Therefore, it remains the recommendation that Option 1c) and 2a) may be discounted and not considered further in the CA report or in the DP. Refer to Appendix E, page 121 for more detail of this analysis of Group D2.

Sensitivity Analysis 2 – Economic Risk Discounted:

This sensitivity analysis demonstrates across all decommissioning options that cost does not influence the conclusion on the most preferred option to be recommended in the DP, nor does it influence the subsidiary recommendations on:

- Options to be carried forward to the C&P tendering phase to enable the EPRD contractors to contribute to the assessment of the preferred option from an economic and overall campaign strategy;
- Options to be discounted and not considered further.

Refer to Appendix E, page 122 for more detail of this analysis of Group D2.

6.1.6 Group E - Flexible Pipeline and Umbilical, Surface Laid and Rock Covered

This group consists of one 6" Flexible Pipeline and one umbilical, both are 4.5km long. Both lines are protected by a shared rock berm for their full length except for exposures at each end to enable tie-ins to be connected. See Table 6 in Section 4.1.4 for details of individual pipelines and umbilicals.

The CA Evaluation Workshop ranking and recommendation for each decommissioning option was as follows:

Decommissioning Option[1]	1. Total Removal by:	2. Remediate In-situ with exposed sections:		
	a) Reverse Reeling	a) Rock Covered	b) Trenched & Buried	c) Cut & Removed
Ranking	1st	2nd =	2nd =	2nd =
Recommendation	Although Option 1a) is the most preferred option, it is rated only marginally better than the other 3 remediate in-situ options evaluated, which have all been rated equal by CA. Therefore, all four options will be carried through to a C&P phase of the project to allow contractors to tender and propose the overall preferred option. If the C&P tendering phase results in any of the Remediate In-situ options being considered more favourable than option 1a) the Operator will engage with OPRED before a decision is taken on overall strategy.			

Notes for Table:

[1]Options 1b) Total Removal by Reverse S-lay and 1c) Total Removal by Cut and Lift were screened out in the Pre-Screening Report [7], see Section 5.1 for a summary of the pre-screening reasoning. Option 3 Leave In-situ and Monitor was not evaluated by CA as this option was confirmed as not applicable for smaller diameter pipelines which make up this group. See Section 3.2.7.

Key influencing factors in ranking this group:

11 of the 14 sub-criteria evaluated during the CA returned a rating of "not significantly different" across all decommissioning options, with all Remediate In-Situ Options 2a), 2b) and 2c) being ranked 2nd equal as they were rated only marginally more poorly than Option 1a). The poorer rating applied to the sub-criteria Residual (Long Term) Risk To Other Users of the Sea and "Cost for long term monitoring / Remediation activities". In both sub-criteria the Moderate Impact (Amber) rating recognises the fact the pipelines would remain in place below the existing rock berm which could become unstable over time and require future remediation, additional cost, to reduce residual risk from snagging.

Option 1a) was ranked 1st and only rated more poorly than all Remediate In-Situ Options for one sub-criteria, Environmental – Waste Processing, recognising the quantity of materials returned onshore to be managed, *c.*348te (the equivalent of 9km of pipeline/umbilcal) and *c.*74te of plastics and other materials being unable to be recycled and may be disposed to landfill, although the total quantities of materials in this group were not regarded as significant. It should be noted that Option 1a) is the 2nd lowest cost option at 109% of the lowest cost option. The lowest cost option being Option 2b) Remediate In-Situ with exposed sections trenched and buried.

From a wider project perspective Option 1a) also eliminates legacy risk and future liability uncertainties compared to the remediate in-situ options, as it results in total removal of the pipeline and umbilical. Also, if executed as a campaign in conjunction with other pipelines groups in the field (i.e. Groups B and D2) this will result in infield synergies for reverse reel activities and the potential economic value this will realise.

The output sheets providing more detail of the original evaluation are provided in Appendix E, pages 123 to 127 for Group E.

Sensitivity Analysis:

Sensitivity Analysis 1 – By specific sub-criteria:

There were two separate sub-criteria / decommissioning options combinations identified for specific change of ratings in Group E, see Table 16.

Table 16: Group E Sensitivity Analysis 1

Option / Sub-Criteria	Original Rating	Revised Rating	Reason for sensitivity analysis
Option 1a) Total Removal by Reverse Reeling/ Risk to Those on Land	Not significantly different	Moderate Impact (Amber)	Has comparatively more materials returned onshore to be handled than all other options
Option 1a) Total Removal by Reverse Reeling/ Waste Processing	Moderate Impact (Amber)	Not significantly different	Although this option has comparatively more materials returned onshore than other options it is relatively small quantity in the wider scale from a waste processing perspective.

The overall ranking of the decommissioning options evaluated under this sensitivity analysis have not changed from the original evaluation described in Section 6.1.6 above.

The recommendation for this group remains that Option 1a) should be identified in the DP as the most preferred option but that since Options 2a), 2b) and 2c) are rated only marginally different, it is recommended that all options are carried forward to the C&P tendering phase to enable the EPRD contractors to contribute to the assessment of the preferred option from an economic and overall campaign strategy taking account of other pipeline groups in the field.

Refer to Appendix E, page 128 for more detail of this analysis for Group E.

Sensitivity Analysis 2 – Economic Risk Discounted:

Under this sensitivity analysis, the three Remediate In-situ Options 2a), 2b), and 2c) were ranked 2nd equal in the original evaluation for Group E, but when economic risk is discounted all 4 Decommissioning options 1a), 2a), 2b), and 2c) all become ranked 1st equal.

Since Option 1a) remains 1st ranked option for the original evaluation and for Sensitivity Analysis 1, the original recommendations for Group E should remain that Option 1a) should be identified in the DP as the most preferred option but that since Options 2a), 2b) and 2c) are rated only marginally different, it is recommended that all options are carried forward to the C&P tendering phase to enable the EPRD contractors to contribute to the assessment of the preferred option from an economic and overall campaign strategy. This remains aligned to the original recommendation prior to the Sensitivity Analysis being carried out.

Refer to Appendix E, page 129 for more detail of this analysis for Group E.

6.1.7 Group F - Rigid Trunk Pipeline, Concrete Coated and Shallow Trenched and Partially Covered

This group consists of the remaining section of the 24" Oil Trunk Pipeline x 11km (KP15.602) being the point where the pipeline transitions into the shallow trench. This section of pipeline has been evaluated separately under group F as its status on the seabed is different from the upstream pipeline section evaluated under Group A. This section of trunk line has an average DOC of 0.44m and with mid line exposures of *c.*1.48km with some exposures currently covered with mattresses and concrete blocks. See Table 6 for details of individual pipelines and umbilicals.

The CA Evaluation Workshop ranking and recommendation for each decommissioning option was as follows:

Decommissioning Option[1]	1. Total Removal by:	2. Remediate In-situ with exposed sections:			Leave In-situ and Monitor
	c) Cut & Lift	a) Rock Covered	b) Trenched & Buried	c) Cut & Removed	
Ranking	4th	3rd [2]	1st	2nd	5th
Recommendation	Discounted option in DP	Although Option 2b) is ranked as the most preferred option, the difference in rating between 2b) , 2a) and 2c) is marginal and all three options will be carried through to a C&P phase of the project to allow contractors to tender and propose the overall preferred option.If the C&P tendering phase results in either options 2a) or 2c) being considered more favourable than option 2b) the Operator will engage with OPRED before a decision is taken on overall strategy .			Discounted option in DP

Notes for Table:

[1]Option 1a) Total Removal by Reverse Reeling and Option 1b) Total Removal by Reverse S-lay were screened out in the Pre-Screening Report [7], see Section 5.1 for a summary of the pre-screening reasoning.

[2] Option 2a) was initially discounted during the initial evaluation during the workshop but has been reinstated as an option to be carried through to C&P phase following the Sensitivity Analysis 2 on cost described below.

Key influencing factors in ranking this group:

Option 2b) is ranked 1st and is rated Low Impact(Green) or "not significantly different" across 12 of the 14 sub-criteria, being evaluated as Moderate Impact (Amber) for Risk of Major Project Failure and Seabed

Disturbance-Short Term (Environmental), these Moderate Impact (Amber) ratings are due to uncertainty of being able to achieve the required burial depth of 0.6m by trenching and bury techniques on the exposed sections when this was not achieved during the original installation of the lines. Original installation records for these lines is poor and it is not clear if the original trench depth specification was deeper but not achieved due to seabed conditions. If the trenching depth could not be achieved alternative techniques may need to be developed leading to additional project duration and additional seabed disturbance. It is noted that Option 2b) is also the second lowest cost option (Option 3 is the lowest cost option).

Option 2c) is only rated marginally worse than Option 2b), by two additional Moderate Impact (Amber) ratings. However, it is rated more poorly across different sub-criteria than Option 2b) i.e. Safety Risk to Project Personnel and to Those on Land and Waste Processing (Environmental), since more materials are recovered and returned onshore (*c.*710te/1.48km of pipeline).

Option 2a) is ranked 3rd and is rated as Moderate Impact (Amber) for 6 of the 14 sub-criteria. The poor ratings are spread across all main criteria except Technical Feasibility, the relatively poor ratings are due to the quantity of new rock berms that would be introduced to the seabed, *c.*22,396te over *c.*1.49km of pipeline. This was considered to be a moderate commercial impact to the fishing industry and in terms of economic risk if the rock berms were to become unstable overtime and required further remedial action.

The Tartan Development Area, is considered to meet the criteria for the OSPAR listed threatened and/or declining habitat 'Sea pen and burrowing megafauna communities' as well as the UK Habitat Feature of Conservation Importance and UKBAP habitat 'mud habitats in deep water'. Given the habitat types and volume of rock required, the long-term change of habitat remediating the exposed section by adding rock cover is considered to be Moderate Impact (Amber).

Option 1c) is ranked 4th and is rated as Moderate Impact (Amber) for 7 of the 14 sub-criteria and Higher Impact (Red) for a further subcriteria. The poor ratings are spread across all main criteria except Societal and reflects the excessively more effort anticipated in terms for longer vessel durations (*c.*223 days) for this option compared to between 15 and 37 days for the other options evaluated, additional materials recovered (5,233te) that needs to be managed compared to the other options. Option 1c) is also the most expensive option by some margin (941% of the lowest cost option).

Option 3) is ranked 5th and is rated more poorly on the Main Criteria of Safety, Societal and Economic Risk as this option results in increased risk to other users of the sea from exposed sections of pipeline decommissioned in-situ, with no mitigation introduced to prevent snagging from over trawling. The exposed pipeline sections will deteriorate overtime which may lead to increased snagging risk to trawling nets. This snagging risk may also have a commercial impact on the fishing industry (under the main criteria Societal), due to the potential for lost nets and the fishermen introducing a self-imposed exclusion zone. The Economic Risk of this option was rated as Moderate Impact (Amber) due to anticipated ongoing and prolonged monitoring surveys and the increased potential of future remedial action required and therefore cost, compared to the other decommissioning options.

The output sheets providing more detail of the original evaluation are provided in Appendix E, pages 130 to 136 for Group F.

Sensitivity Analysis:

Sensitivity Analysis 1 – By specific sub-criteria:

There were nine separate sub-criteria / decommissioning options combinations identified for specific change of ratings in Group F, see Table 17.

Table 17: Group F Sensitivity Analysis 1

Option / Sub-Criteria	Original Rating	Revised Rating	Reason for sensitivity analysis
Option 1c) Total Removal by Cut and Lift/ Technical Complexity & Track Record	Not significantly different	Moderate Impact (Amber)	Aged concrete coating is in poor condition and may result in more complex recovery methods, than initial evaluation assumes.
Option 1c) Total Removal by Cut and Lift/ Risk to Project Personnel	Moderate Impact (Amber)	Higher Impact (Red)	The comparatively larger quantity of materials to be handled by the deck crew and over a longer duration compared to Option 2c).

Table 17; Continued

Option / Sub-Criteria	Original Rating	Revised Rating	Reason for sensitivity analysis
Option 1c) Total Removal by Cut and Lift/ Risk to Those on Land	Moderate Impact (Amber)	Higher Impact (Red)	The comparatively larger quantity of materials to be handled by personnel at the yard and over a longer duration compared to Option 2c).
Option 1c) Total Removal by Cut and Lift/ Waste Processing	Moderate Impact (Amber)	Not significantly different	Rating changed to Low Impact (Green) which results in all options for this sub-criterion becoming "not significantly different". If circumstances allow the concrete coating to recycled rather than go to landfill.
Option 2a) Remediate In-situ with exposed sections rock covered/ Impact on Commercial Fisheries	Moderate Impact (Amber)	Low Impact (Green)	The new the rock cover will be installed in existing open trenches, with less rock profile above mean seabed level than with surface laid pipelines.
Option 2b) Remediate In-situ with exposed sections trenched and buried/ Risk of Major Project Failure	Moderate Impact (Amber)	Higher Impact (Red)	Uncertainty in being able to achieve adequate trench depth at exposures.
Option 2c) Remediate In-situ with exposed sections cut and removed/ Risk to Those on Land	Moderate Impact (Amber)	Low Impact (Green)	Comparatively much less materials to be handled compared to Option 1c) and over a much shorter period.
Option 2c) Remediate In-situ with exposed sections cut and removed/ Waste Processing	Moderate Impact (Amber)	Not significantly different	Changed to Low Impact (Green)* If circumstances allow the concrete coating to recycled rather than go to landfill. *Since other options are already Low Impact (Green), changes to not significantly different
Option 3) Leave In-situ and Monitor/ Impact on Commercial Fisheries	Higher Impact (Red)	Moderate Impact (Amber)	Pipeline exposures are left un-remediated are in an open trench with top of pipe below mean seabed level, and less of a snag hazard.

Under this Sensitivity Analysis 1 Options 2b) and 2c) swap places, with Option 2c) ranked 1st, and Option 2b) now ranked 2nd. This mainly due to the change in rating of Risk of Major Project Failure of Option 2b) due to the uncertainty of ability to achieve the required trench depth at current pipeline exposed sections which remains a technical uncertainty and may be reviewed and resolved during C&P phase of the project. The other options remain ranked the same as the original evaluation discussed in Section 6.1.7 above.

Therefore, it remains the recommendation that Option 1c) and 3) may be discounted and not considered further in the CA report or in the DP.

Refer to Appendix E, page 135 for more detail of this analysis for Group F.

Sensitivity Analysis 2 – Economic Risk Discounted:

Under this sensitivity analysis, Option 2a) rating improves compared to the original evaluation such that it is now recommended to be carried forward to the C&P tendering phase to enable the EPRD contractors to contribute to the assessment of the preferred option from an economic and overall campaign strategy, together with Options 2b) and 3c), where previously during the original evaluation Option 2a) was recommended to be discounted and not considered further.

Refer to Appendix E, page 136 for more detail of this analysis for Group F.

7. REFERENCES

Reference Number	Document Title	Document Number / Revision/Date
1	BEIS Guidance Notes: Decommissioning of Offshore Oil and Gas Installations and Pipelines under the Petroleum Act 1998,	November 2018
2	Subsea Decommissioning Environmental Appraisal (EA)	RP-DTATAR001-HS-0151/ R01/ Sep. 2020
3	Subsea Decommissioning Programme – Tartan, Highlander and Petronella (THP)	RP-DTATAR001-DC-0083/ R04/ Oct. 2020
4	Subsea Decommissioning Programme - Duart	RP-DTATAR001-DC-0084/ R04/ Oct. 2020
5	Subsea Decommissioning Programme - Galley	RP-DTATAR001-DC-0085/ R04/ Oct. 2020
6	Subsea Material and Waste Inventories for the Tartan Development Area Infrastructure	RP-DTATAR001-SS-0143/ C01/ Nov. 2020
7	Subsea Decommissioning Options Pre-screening Report	RP-DTATAR001-SS-0147/ C02/ Sep. 2020
8	Oil and Gas UK Guidelines for Comparative Assessment in Decommissioning Programmes.	October 2015.
9	Pipeline Status and Historical Review Report - THP	RP-DTATAR001-SS-0144/ C02/ June 2020
10	Pipeline Status and Historical Review Report - Duart	RP-DTATAR001-SS-0145/ R01/ May 2020
11	Pipeline Status and Historical Review Report - Galley	RP-DTATAR001-SS-0146/ R01/ May 2020
12	Pipelines HIRA and ENVID Workshop Report	RP-DTATAR001-HS-0104/ C01/ Aug 2020
13	Stakeholder Management Plan	RP-DTATAR001-HS-0156/ C01/ April 2020
14	Environmental Appraisal Scoping Report	RP-DTATAR001-HS-0157/ C01/ June 2020
15	Drill Cuttings Modelling Report	RP-DTATAR001-HS-0154/ C01/ July 2020

APPENDIX A – HIRA RESULTS

The HIRA was completed on 23 June2020 and although a separate HIRA and ENVID Report [12] has been published, summary tables of the results of the HIRA were prepared to inform the workshop participants. These summary tables are provided herein for reference.

Risk Assessment Matrix

CONSEQUENCE				SEVERITY	LIKELIHOOD				
People / Safety	Environment	Asset / Business / Production Change (annualised)	Reputation		Very Unlikely A freak combination of factors would be required for an incident to result	Unlikely A rare combination of factors would be required for an incident to result	Possible Could happen when additional, unusual factors are present but otherwise unlikely to occur	Likely Not certain to happen under normal conditions but could happen if a predictable additional factor was present	Very Likely Almost inevitable that an incident would result.
P	E	A	R		A	B	C	D	E
Two or more fatalities	Critical Release: Release from a catastrophic pipeline failure or freeflowing hydrocarbons from the reservoir (either from a well or uncontrollable release from the topsides). Released mass ≥50 tonnes.	Extensive damage - Multiple system damage. Business value change >£10m >100k boe.	Serious international reputation impact. Revocation of Permit or corporate prosecution.	5	Medium / Alert	Medium	High	High	High / Alarm
Single Fatality or Total Permanent Disability	Major Release: ≥20 and <50 tonnes hydrocarbon or non-PLONOR chemical.	Major damage - system shutdown. Business value change <£10M >10k boe.	Major national reputation impact. Prohibition notice.	4	Low / Caution	Medium	Medium	High	High
Major Injury *Includes injuries requiring >7 consecutive days off work as per RIDDOR definition.*	Serious Release: ≥1 and <20 tonnes hydrocarbon or non-PLONOR chemical.	Moderate damage - system requires some isolation. Business value change <£1M >1k boe.	Local reputation impact. Improvement notice or enforcement notice.	3	Low	Low	Medium	Medium	High
Moderate Injury *Includes injuries requiring 3 or more consecutive days off work and recordable under RIDDOR.*	Minor Release: <1 tonne hydrocarbon or non-PLONOR chemical. <10 tonnes of a PLONOR chemical.	Minor damage - system requires partial isolation. Business value change <£500k >100 boe.	Internal reputation impact. Informal notification of opportunities for improvement or letter.	2	Very Low / Care	Low	Low	Medium	Medium
Minor Injury *Injuries requiring <3 days off work, or no time off. Not recordable or reportable under RIDDOR.*	Negligible Release: Release of 10 tonnes or less of a PLONOR chemical. *None or minimal clean-up required.* *PLONOR: Considered to pose little or no risk to the environment*	Slight damage - system still safe to operate. Business value change <£100K <100 boe.	Scrutiny from Internal Auditor - ICP Action	1	Very Low	Very Low	Low	Low	Medium
No injury	No release or environmental impact	No damage/ cost	No impact	0	Very Low				

HIRA Summary Tables

The scoring and colour coding of each facet of each sub-criterion and for each decommissioning option was agreed at the HIRA whilst adopting the RAM above.

PIPELINE GROUP A Concrete Coated Rigid Trunk Lines, Trenched & Buried					
Hazard / Guideword	1. Total Removal by	2. Remediate in-situ with exposed sections			3. Leave In-situ and Monitor
	c) Cut & Lift	a) Rock Covered	b) Trench & Buried	c) Cut & Removed	
RISK TO PROJECT PERSONNEL					
Release @ deck - Residual HCs/ NORM	2A	n/a	n/a	2A	n/a
Release @ sea – Residual HCs/ NORM	1A	n/a	n/a	1A	n/a
Fire	1A	n/a	n/a	1A	n/a
Explosion	1A	n/a	n/a	1A	n/a
Impact - Lifting Operations	4B	1A	1A	4A	n/a
Impact - Rock dumping activity.	n/a	4A	n/a	n/a	n/a
Equipment Failure	4B	2A	2A	4B	n/a
Structural Failure	4A	n/a	n/a	4A	n/a
Climatic - Adverse weather.	1B	1A	1A	1B	n/a
Occupational - congestion/ complication	3B	2A	2A	3B	n/a
Escape Evacuation and Rescue (EER)	2B	2B	2B	2B	n/a
SIMOPs - offshore	3B	n/a	n/a	3B	n/a
SIMOPs - onshore	4B	n/a	n/a	4B	n/a
Project interaction with adjacent live hydrocarbon system	5A	n/a	5A	5A	s/o
RISK TO THOSE ON LAND					
Release	3C	n/a	n/a	3B	n/a
Fire	3C	n/a	n/a	3B	n/a
Explosion	3C	n/a	n/a	3B	n/a
Impact	4B	n/a	n/a	4A	n/a
Structural Failure	4B	n/a	n/a	4A	n/a
Transport of material from quay	5B	n/a	n/a	5A	n/a
Climatic	2A	n/a	n/a	2A	n/a
Occupational - Cutting	4A	n/a	n/a	4A	n/a
Occupational – Noise and vibration	2B	n/a	n/a	2B	n/a
Occupational - Odour	1C	n/a	n/a	1C	n/a
Occupational - congestion/ complication	2C	n/a	n/a	2B	n/a
Occupational - Security	1C	n/a	n/a	1C	n/a
EER	1B	n/a	n/a	1B	n/a
RISK TO OTHER USERS OF THE SEA (During Project Execution)					
Impact – during activity	3C	n/a	n/a	n/a	n/a
Climatic - Adverse weather.	1B	1A	1A	1B	n/a
RESIDUAL RISK TO OTHER USERS OF THE SEA					
Impact – post activity	n/a	n/a	n/a	2A	5C

PIPELINE GROUP B Surface Laid Rigid and Flexible Pipelines & Umbilicals				
Hazard / Guideword	1. Full removal by		2. Remediate In-Situ with Exposed Sections	
	a) Reverse Reeling	c) Cut & Lift	a) Rock Covered	b) Trench & Buried
RISK TO PROJECT PERSONNEL				
Release @ deck – Residual HCs/ NORM	1A	2A	n/a	n/a
Release @ sea – Residual HCs/ NORM	1A	1A	n/a	n/a
Release @ deck - Residual chemicals (hydraulic, Methanol etc).	2C	2C	n/a	n/a
Fire	1A	1A	n/a	n/a
Explosion	1A	1A	n/a	n/a
Impact - Lifting Operations	4B	4B	1A	1A
Impact - Rock dumping activity.	n/a	n/a	4A	n/a
Impact - Snagging subsea during reeling activity.	4B	n/a	n/a	n/a
Equipment Failure	4B	4B	2A	2A
Structural Failure	3A	4A	n/a	n/a
Climatic - Adverse weather.	1B	1B	1A	1A
Occupational - congestion/ complication	3B	3B	2A	2A
Escape Evacuation and Rescue (EER)	2B	2B	2B	2B
SIMOPs - offshore	n/a	3B	n/a	n/a
SIMOPs - onshore	4B	4B	n/a	n/a
RISK TO THOSE ON LAND				
Release	3C	3C	n/a	n/a
Fire	3C	3C	n/a	n/a
Explosion	3C	3C	n/a	n/a
Impact	4B	4B	n/a	n/a
Structural Failure	4A	4B	n/a	n/a
Transport of material from quay	5B	5B	n/a	n/a
Climatic	2A	2A	n/a	n/a
Occupational - Cutting	4B	4A	n/a	n/a
Occupational – Noise and vibration	2C	2B	n/a	n/a
Occupational - Odour	1C	1C	n/a	n/a
Occupational - congestion/ complication	2C	2C	n/a	n/a
Occupational - Security	1C	1C	n/a	n/a
EER	1B	1B	n/a	n/a
RISK TO OTHER USERS OF THE SEA (During Project Execution)				
Climatic	1B	1B	1A	1A
RESIDUAL RISK TO OTHER USERS OF THE SEA				
Impact – post activity	n/a	n/a	2B	2A

PIPELINE GROUP C Trenched & Buried Rigid Pipelines & Umbilicals				
Hazard / Guideword	1. Total Removal by	2. Remediate In-Situ with Exposed Sections		
	a) Reverse reeling	a) Rock Covered	b) Trench & Buried	c) Cut & Removed
RISK TO PROJECT PERSONNEL				
Release @ deck – Residual HCs/ NORM	1A	n/a	n/a	2A
Release @ sea – Residual HCs/ NORM	1A	n/a	n/a	1A
Release @ deck - Residual chemicals (hydraulic, Methanol etc).	2C	n/a	n/a	2C
Fire	1A	n/a	n/a	1A
Explosion	1A	n/a	n/a	1A
Impact – Lifting Operations	4B	1A	1A	4A
Impact - Rock dumping activity.	n/a	4A	n/a	n/a
Impact - Snagging subsea during reeling activity.	4B	n/a	n/a	n/a
Equipment Failure	4B	2A	2A	4B
Structural Failure	3A	n/a	n/a	4A
Climatic - Adverse weather.	1B	1A	1A	1B
Occupational - congestion/ complication	3B	2A	2A	3B
Escape Evacuation and Rescue (EER)	2B	2B	2B	2B
SIMOPs - offshore	n/a	n/a	n/a	3B
SIMOPs - onshore	4B	n/a	n/a	4B
RISK TO THOSE ON LAND				
Release	3C	n/a	n/a	3B
Fire	3C	n/a	n/a	3B
Explosion	3C	n/a	n/a	3B
Impact	4B	n/a	n/a	4A
Structural Failure	4A	n/a	n/a	4A
Transport of material from quay	5B	n/a	n/a	5A
Climatic	2A	n/a	n/a	2A
Occupational - Cutting	4B	n/a	n/a	4A
Occupational – Noise and vibration	2C	n/a	n/a	2B
Occupational - Odour	1C	n/a	n/a	1C
Occupational - congestion/ complication	2C	n/a	n/a	2B
Occupational - Security	1C	n/a	n/a	1C
EER	1B	n/a	n/a	1B
RISK TO OTHER USERS OF THE SEA (During Project Execution)				
Impact – during activity	3B	n/a	n/a	3A
Climatic	1B	1A	1A	1B
RESIDUAL RISK TO OTHER USERS OF THE SEA				
Impact – post activity	n/a	2B	2A	2A

PIPELINE GROUP D* Trenched & Shallow Covered Rigid Pipelines & Umbilicals					
Hazard / Guideword	1. Total Removal by		2. Remediate In-Situ with Exposed Sections		
	a) Reverse Reeling	c) Cut & Lift	a) Rock Covered	b) Trench & Buried	c) Cut & Removed
RISK TO PROJECT PERSONNEL					
Release @ deck – Residual HCs/ NORM	1A	2A	n/a	n/a	2A
Release @ sea – Residual HCs/ NORM	1A	1A	n/a	n/a	1A
Release @ deck - Residual chemicals (hydraulic, Methanol etc).	2C	2C	n/a	n/a	2C
Fire	1A	1A	n/a	n/a	1A
Explosion	1A	1A	n/a	n/a	1A
Impact - Lifting Operations	4B	4B	1A	1A	4A
Impact - Rock dumping activity.	n/a	n/a	4A	n/a	n/a
Impact - Snagging subsea during reeling activity.	4B	n/a	n/a	n/a	n/a
Equipment Failure	4B	4B	2A	2A	4B
Structural Failure	3A	4A	n/a	n/a	4A
Climatic - Adverse weather.	1B	1B	1A	1A	1B
Occupational - congestion/ complication	3B	3B	2A	2A	3B
Escape Evacuation and Rescue (EER)	2B	2B	2B	2B	2B
SIMOPs - offshore	n/a	3B	n/a	n/a	3B
SIMOPs - onshore	4B	4B	n/a	n/a	4B
RISK TO THOSE ON LAND					
Release	3C	3C	n/a	n/a	3B
Fire	3C	3C	n/a	n/a	3B
Explosion	3C	3C	n/a	n/a	3B
Impact	4B	4B	n/a	n/a	4A
Structural Failure	4A	4B	n/a	n/a	4A
Transport of material from quay	5B	5B	n/a	n/a	5A
Climatic	2A	2A	n/a	n/a	2A
Occupational - Cutting	4B	4A	n/a	n/a	4A
Occupational – Noise and vibration	2C	2B	n/a	n/a	2B
Occupational - Odour	1C	1C	n/a	n/a	1C
Occupational - congestion/ complication	2C	2C	n/a	n/a	2B
Occupational - Security	1C	1C	n/a	n/a	1C
EER	1B	1B	n/a	n/a	1B
RISK TO OTHER USERS OF THE SEA (During Project Execution)					
Impact – during activity	3B	3C	n/a	n/a	3A
Climatic	1B	1B	1A	1A	1B
RESIDUAL RISK TO OTHER USERS OF THE SEA					
Impact – post activity	n/a	n/a	2B	2A	2A

* Note: The split of Group D into Group D1 and D2 occurred at the CA workshop and after the HIRA had been completed. It was agreed at the CA workshop to use the Group D HIRA table to inform the CA evaluation for both Groups D1 and D2 as it remained applicable.

PIPELINE GROUP E Surface Laid & Rock covered Flexible Pipelines & Umbilicals				
Hazard / Guideword	1. Total Removal by	2. Remediate In-Situ with Exposed Sections		
	a) Reverse reeling	a) Rock Covered	b) Trench & Buried	c) Cut & Removed
RISK TO PROJECT PERSONNEL				
Release @ deck – Residual HCs/ NORM	1A	n/a	n/a	2A
Release @ sea – Residual HCs/ NORM	1A	n/a	n/a	1A
Release @ deck - Residual chemicals (hydraulic, Methanol etc).	2C	n/a	n/a	2C
Fire	1A	n/a	n/a	1A
Explosion	1A	n/a	n/a	1A
Impact - Lifting Operations	4B	1A	1A	4A
Impact - Rock dumping activity.	n/a	4A	n/a	n/a
Impact - Snagging subsea during reeling activity.	4B	n/a	n/a	n/a
Equipment Failure	4B	2A	2A	4B
Structural Failure	3A	n/a	n/a	4A
Climatic - Adverse weather.	1B	1A	1A	1B
Occupational - congestion/ complication	3B	2A	2A	3B
Escape Evacuation and Rescue (EER)	2B	2B	2B	2B
SIMOPs - offshore	n/a	n/a	n/a	3B
SIMOPs - onshore	4B	n/a	n/a	4B
RISK TO THOSE ON LAND				
Release	3C	n/a	n/a	3B
Fire	3C	n/a	n/a	3B
Explosion	3C	n/a	n/a	3B
Impact	4B	n/a	n/a	4A
Structural Failure	4A	n/a	n/a	4A
Transport of material from quay	5B	n/a	n/a	5A
Climatic	2A	n/a	n/a	2A
Occupational - Cutting	4B	n/a	n/a	4A
Occupational – Noise and vibration	2C	n/a	n/a	2B
Occupational - Odour	1C	n/a	n/a	1C
Occupational - congestion/ complication	2C	n/a	n/a	2B
Occupational - Security	1C	n/a	n/a	1C
EER	1B	n/a	n/a	1B
RISK TO OTHER USERS OF THE SEA (During Project Execution)				
Impact – during activity	3B	n/a	n/a	3A
Climatic	n/a	1A	1A	1B
RESIDUAL RISK TO OTHER USERS OF THE SEA				
Impact – post activity	n/a	2B	2A	2A

PIPELINE GROUP F Concrete Coated Rigid Trunk Line, Trenched and Shallow Covered					
Hazard / Guideword	1. Total Removal by	2. Remediate In-Situ with Exposed Sections			3. Leave In-situ and Monitor
	c) Cut & Lift	a) Rock Covered	b) Trench & Buried	c) Cut & Removed	
RISK TO PROJECT PERSONNEL					
Release @ deck – Residual HCs/ NORM	2A	n/a	n/a	2A	n/a
Release @ sea – Residual HCs/ NORM	1A	n/a	n/a	1A	n/a
Fire	1A	n/a	n/a	1A	n/a
Explosion	1A	n/a	n/a	1A	n/a
Impact - Lifting Operations	4B	1A	1A	4A	n/a
Impact - Rock dumping activity.	n/a	4A	n/a	n/a	n/a
Equipment Failure	4B	2A	2A	4B	n/a
Structural Failure	4A	n/a	n/a	4A	n/a
Climatic - Adverse weather.	1B	1A	1A	1B	n/a
Occupational - congestion/ complication	3B	2A	2A	3B	n/a
Escape Evacuation and Rescue (EER)	2B	2B	2B	2B	n/a
SIMOPs - offshore	3B	n/a	n/a	3B	n/a
SIMOPs - onshore	4B	n/a	n/a	4B	n/a
Project interaction with adjacent live hydrocarbon system	5A	n/a	5A	5A	n/a
RISK TO THOSE ON LAND					
Release	3C	n/a	n/a	3B	n/a
Fire	3C	n/a	n/a	3B	n/a
Explosion	3C	n/a	n/a	3B	n/a
Impact	4B	n/a	n/a	4A	n/a
Structural Failure	4B	n/a	n/a	4A	n/a
Transport of material from quay	5B	n/a	n/a	5A	n/a
Climatic	2A	n/a	n/a	2A	n/a
occupational - Cutting	4A	n/a	n/a	4A	n/a
Occupational – Noise and vibration	2B	n/a	n/a	2B	n/a
Occupational - Odour	1C	n/a	n/a	1C	n/a
Occupational - congestion/ complication	2C	n/a	n/a	2B	n/a
Occupational - Security	1C	n/a	n/a	1C	n/a
EER	1B	n/a	n/a	1B	n/a
RISK TO OTHER USERS OF THE SEA (During Project Execution)					
Impact – during activity	3B	n/a	n/a	n/a	n/a
Climatic	1B	1A	1A	1B	n/a
RESIDUAL RISK TO OTHER USERS OF THE SEA					
Impact – post activity	n/a	2B	2A	2A	5C

APPENDIX B – ENVID DATA SHEETS

The ENVID was completed on 23 June2020 and although a separate HIRA and ENVID Report [12] has been published, ENVID data sheets summarising the results of the ENVID were prepared to inform the workshop participants. These data sheets are provided herein for reference.

PIPELINE GROUP A
Concrete Coated Rigid Trunk Lines, Trenched & Buried.

CA sub-criteria	ENVID Nodes within each sub-criterion	Decommissioning Options				
		1.Total Removal by	2. Remediate In-Situ with Exposed Sections			3. Leave In-situ and Monitor
		c) Cut-and-Lift	a) Rock-Covered	b) Trenched and Buried	c) Cut & Removed	
Environmental sub-criteria						
Impact of Decommissioning Operations Offshore	**Vessel emissions**	MoE: Minor (2) IS: Moderate	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		As shown the ENVID found the Magnitude of Effect (MoE) and subsequent Impact Significance (IS) of the atmospheric emissions associated with the different vessel campaigns varied among some options. Cognisance of this difference should be considered in the CA Workshop.				
	Underwater vessel noise	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low
		As shown, the ENVID considered the MoE and IS of underwater vessel noise to be the same across all options. For note: the MoE of underwater noise associated with cutting, rock dumping and trenching activities was considered Negligible and the resultant IS Low for all options. Cognisance of this similarity should be considered in the CA such that underwater noise could be ranked the same across all options.				
	Discharges to sea from vessels, flowline, concrete falling off	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		The ENVID considered discharges from the vessels and flowlines and the discharge of concrete during line recovery separately. MoE and IS for each aspect and each option was considered the same (as shown). Cognisance of this difference should be considered in the CA Workshop.				
Seabed Disturbance - Short Term	**Disturbance to the seabed** *note for this group the Tartan Alpha drill cuttings pile will be disturbed.*	MoE: Serious (3) IS: Moderate	MoE: Minor (2) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	N/A
		As shown, the ENVID found that the MoE and IS differed between the different options. Cognisance of this difference should be considered in the CA Workshop.				
Loss of Habitat - Long Term	**Impact of physical presence of materials left on the seabed** *only on benthic species- not fishing.*	N/A	MoE: Minor (2) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		As shown, the ENVID found that though the IS was the same (Low) for all relevant options, the MoE varied. Cognisance of this difference and the fact that this aspect is not relevant to one of the options should be considered in the CA Workshop.				
Waste Processing i.e. processing of returned materials and use of landfill	**Generation of waste/use of landfill**	MoE: Minor (2) IS: Low	N/A	N/A	MoE: Negligible (1) IS: Low	N/A
		As shown, the ENVID found that though the IS was the same (Low) for the relevant options, the MoE varied. Cognisance of this difference and the fact that this aspect is not relevant to one of the options should be considered in the CA Workshop.				
Societal sub-criteria						
Impact on Commercial Fisheries	**Impact of materials left on the seabed on other users**	N/A	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Serious (3) IS: Moderate
		As shown, the ENVID found that though the IS was the same (Low) for the relevant options, the MoE varied. Cognisance of this difference and the fact that this aspect is not relevant to some of the options should be considered in the CA Workshop.				
Socio-economic impact on communities and amenities	**Yard activities**	MoE: Minor (2) IS: Low	N/A	N/A	MoE: Minor (2) IS: Low	N/A
		As shown, the ENVID considered the MoE and IS to be the same for the relevant options. Cognisance of fact that this aspect is not relevant to some of the options should be considered in the CA.				

PIPELINE GROUP B
Surface Laid Rigid and Flexible Pipelines & Umbilicals.

CA sub-criteria	ENVID Nodes within each sub-criterion	Decommissioning Options			
		1.Total Removal by		2. Remediate In-Situ with Exposed Sections	
		a) Reverse Reeling	c) Cut-and-Lift	a) Rock-Covered	b) Trenched and Buried
Environmental sub-criteria					
Impact of Decommissioning Operations Offshore	**Vessel emissions**	MoE: Negligible (1) IS: Low	MoE: Minor (2) IS: Moderate	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		As shown the ENVID found the Magnitude of Effect (MoE) and subsequent Impact Significance (IS) of the atmospheric emissions associated with the different vessel campaigns varied among some options. Cognisance of this difference should be considered in the CA Workshop.			
	Underwater vessel noise	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low
		As shown, the ENVID considered the MoE and IS of underwater vessel noise to be the same across all options. For note: the MoE of underwater noise associated with cutting, rock dumping and trenching activities was considered Negligible and the resultant IS Low for all options. Cognisance of this similarity should be considered in the CA such that underwater noise could be ranked the same across all options.			
	Discharges to sea from vessels, flowlines and umbilicals	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low
		The ENVID considered discharges from the vessels and flowlines/umbilicals separately. The MoE for discharges from the pipelines and umbilicals was considered Minor (as shown) for all options and Negligible (not shown here) for vessel discharges for all options. For both discharges (vessels and pipelines/umbilicals) the IS was considered Low. Cognisance of these similarities across each discharge should be considered in the CA such that discharges could be ranked the same across all options.			
Seabed Disturbance - Short Term	**Disturbance to the seabed** *note for this group the Tartan Alpha drill cuttings pile and those at the Tartan North West and South East drill centres.*	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low
		As shown, the ENVID found that though the IS was Low for all options, the MoE varied. Cognisance of this difference should be considered in the CA Workshop.			
Loss of Habitat - Long Term	**Impact of physical presence of materials left on the seabed** *only on benthic species- not fishing.*	N/A	N/A	MoE: Serious (3) IS: Moderate	MoE: Negligible (1) IS: Low
		As shown, the ENVID found that the MoE and IS differed between the different options. Cognisance of this difference and the fact that this aspect is not relevant to two of the options should be considered in the CA Workshop.			
Waste Processing i.e. processing of returned materials and use of landfill	**Generation of waste/use of landfill**	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	N/A	N/A
		As shown, the ENVID considered the MoE and IS to be the same for the relevant options. However, cognisance of fact that this aspect is not relevant to some of the options should be considered in the CA.			
Societal sub-criteria					
Impact on Commercial Fisheries	**Impact of materials left on the seabed on other users**	N/A	N/A	MoE: Minor (2) IS: Low	MoE: Negligible (1) IS: Low
		As shown, the ENVID found that though the IS was the same (Low) for the relevant options, the MoE varied. Cognisance of this difference and the fact that this aspect is not relevant to some of the options should be considered in the CA Workshop.			
Socio-economic impact on communities and amenities	**Yard activities**	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	N/A	N/A
		As shown, the ENVID considered the MoE and IS to be the same for the relevant options. Cognisance of fact that this aspect is not relevant to some of the options should be considered in the CA.			

PIPELINE GROUP C
Trenched & Buried Rigid Pipelines & Umbilicals.

CA sub-criteria	ENVID Nodes within each sub-criterion	Decommissioning Options			
		1.Total Removal by	2. Remediate in-situ with Exposed Sections		
		a) Reverse Reeling	a) Rock-Covered	b) Trenched and Buried	c) Cut and Removed
Environmental sub-criteria					
Impact of Decommissioning Operations Offshore	**Vessel emissions**	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		As shown the ENVID found the Magnitude of Effect (MoE) and subsequent Impact Significance (IS) of the atmospheric emissions associated with the different vessel campaigns was found to be the same across all options. Cognisance of this similarity should be considered in the CA.			
	Underwater vessel noise	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low
		As shown, the ENVID considered the MoE and IS of underwater vessel noise to be the same across all options. For note: the MoE of underwater noise associated with cutting, rock dumping and trenching activities was considered Negligible and the resultant IS Low for all options. Cognisance of this similarity should be considered in the CA such that underwater noise could be ranked the same across all options.			
	Discharges to sea from vessels, flowlines and umbilicals	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low
		The ENVID considered discharges from the vessels and flowlines/umbilicals separately. The MoE for discharges from the pipelines and umbilicals was considered Minor (as shown) for all options and Negligible (not shown here) for vessel discharges for all options. For both discharges (vessels and pipelines/umbilicals) the IS was considered Low. Cognisance of these similarities across each discharge should be considered in the CA such that discharges could be ranked the same across all options.			
Seabed Disturbance - Short Term	**Disturbance to the seabed** *note for this group the Tartan Alpha drill cuttings pile and the cuttings at the Highland Field could be disturbed.*	MoE: Serious (3) IS: Moderate	MoE: Minor (2) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		As shown, the ENVID found that though the IS was the same (Low) for all relevant options, the MoE varied. Cognisance of this difference should be considered in the CA Workshop.			
Loss of Habitat - Long Term	**Impact of physical presence of materials left on the seabed** *only on benthic species- not fishing.*	N/A	MoE: Minor (2) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		As shown, the ENVID found that though the IS was the same (Low) for all relevant options, the MoE varied. Cognisance of this difference and the fact that this aspect is not relevant to one of the options should be considered in the CA Workshop.			
Waste Processing i.e. processing of returned materials and use of landfill	**Generation of waste/use of landfill**	MoE: Minor (2) IS: Low	N/A	N/A	MoE: Negligible (1) IS: Low
		As shown, the ENVID found that though the IS was the same (Low) for the relevant options, the MoE varied. Cognisance of this difference and the fact that this sub-criterion is not relevant to two of the options should be considered in the CA Workshop.			
Societal sub-criteria					
Impact on Commercial Fisheries	**Impact of materials left on the seabed on other users**	N/A	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		As shown, the ENVID found that though the IS was the same (Low) for the relevant options, the MoE varied. Cognisance of this difference and the fact that this aspect is not relevant to some of the options should be considered in the CA Workshop.			
Socio-economic impact on communities and amenities	**Yard activities**	MoE: Minor (2) IS: Low	N/A	N/A	MoE: Negligible (1) IS: Low
		As shown, the ENVID found that though the IS was Low for the relevant options, the MoE varied. Cognisance of this difference and the fact that this aspect is not relevant to some of the options should be considered in the CA Workshop.			

PIPELINE GROUP D*
Trenched & Shallow Covered Rigid Pipelines & Umbilicals.

CA sub-criteria	ENVID Nodes within each sub-criterion	Decommissioning Options				
		1.Total Removal by		2. Remediate in-situ with Exposed Sections		
		a) Reverse Reeling	c) Cut-and-Lift	a) Rock-Covered	b) Trenched and Buried	c) Cut and Removed
Environmental sub-criteria						
Impact of Decommissioning Operations Offshore	**Vessel emissions**	MoE: Negligible (1) IS: Low	MoE: Minor (2) IS: Moderate	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		As shown the ENVID found the Magnitude of Effect (MoE) and subsequent Impact Significance (IS) of the atmospheric emissions associated with the different vessel campaigns varied among some options. Cognisance of this difference should be considered in the CA Workshop.				
	Underwater vessel noise	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low
		As shown, the ENVID considered the MoE and IS of underwater vessel noise to be the same across all options. For note: the MoE of underwater noise associated with cutting, rock dumping and trenching activities was considered Negligible and the resultant IS Low for all options. Cognisance of this similarity should be considered in the CA such that underwater noise could be ranked the same across all options.				
	Discharges to sea from vessels, flowlines and umbilicals	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low
		The ENVID considered discharges from the vessels and flowlines/umbilicals separately. The MoE for discharges from the pipelines and umbilicals was considered Minor (as shown) for all options and Negligible (not shown here) for vessel discharges for all options. For both discharges (vessels and pipelines/umbilicals) the IS was considered Low. Cognisance of these similarities across each discharge should be considered in the CA such that discharges could be ranked the same across all options.				
Seabed Disturbance - Short Term	**Disturbance to the seabed** *note for this group the Tartan Alpha drill cuttings pile and the cuttings at the Galley Field could be disturbed.*	MoE: Serious (3) IS: Moderate	MoE: Serious 3 IS: Moderate	MoE: Minor (2) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		As shown, the ENVID found that though the IS was Low for all options, the MoE varied. Cognisance of this difference should be considered in the CA Workshop.				
Loss of Habitat - Long Term	**Impact of physical presence of materials left on the seabed** *only on benthic species- not fishing.*	N/A	N/A	MoE: Minor (2) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		As shown, the ENVID found that though the IS was the same (Low) for the relevant options, the MoE varied. Cognisance of this difference and the fact that this aspect is not relevant to two of the options should be considered in the CA Workshop.				
Waste Processing i.e. processing of returned materials and use of landfill	**Generation of waste/use of landfill**	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	N/A	N/A	MoE: Negligible (1) IS: Low
		As shown, the ENVID found that though the IS was the same (Low) for the relevant options, the MoE varied. Cognisance of this difference and the fact that this aspect is not relevant to two of the options should be considered in the CA Workshop.				
Societal sub-criteria						
Impact on Commercial Fisheries	**Impact of materials left on the seabed on other users**	N/A	N/A	MoE: Minor (2) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		As shown, the ENVID found that though the IS was the same (Low) for the relevant options, the MoE varied. Cognisance of this difference and the fact that this aspect is not relevant to two of the options should be considered in the CA Workshop.				
Socio-economic impact on communities and amenities	**Yard activities**	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	N/A	N/A	MoE: Minor (2) IS: Low
		As shown, the ENVID considered the MoE and IS to be the same for the relevant options. Cognisance of fact that this aspect is not relevant to some of the options should be considered in the CA.				

* Note: The split of Group D into Group D1 and D2 occurred at the CA workshop and after the ENVID had been completed. It was agreed at the CA workshop to use the Group D ENVID Data Sheet to inform the CA evaluation for both Groups D1 and D2 as it remained applicable.

PIPELINE GROUP E
Two Lines: both 4.5 km (total length 9.0 km). Surface Laid & Rock covered Flexible Pipelines & Umbilicals. Total Weight 348 te. Total Exposed Length 0.5 km.

CA sub-criteria	ENVID Nodes within each sub-criterion	Decommissioning Options			
		1.Total Removal by	2. Remediate in-situ with Exposed Sections		
		a) Reverse Reeling	a) Rock-Covered	b) Trenched and Buried	c) Cut and Removed
Environmental sub-criteria					
Impact of Decommissioning Operations Offshore	**Vessel emissions**	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		As shown the ENVID found the Magnitude of Effect (MoE) and subsequent Impact Significance (IS) of the atmospheric emissions associated with the different vessel campaigns was found to be the same across all options. Cognisance of this similarity should be considered in the CA.			
	Underwater vessel noise	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low
		As shown, the ENVID considered the MoE and IS of underwater vessel noise to be the same across all options. For note: the MoE of underwater noise associated with cutting, rock dumping and trenching activities was considered Negligible and the resultant IS Low for all options. Cognisance of this similarity should be considered in the CA such that underwater noise could be ranked the same across all options.			
	Discharges to sea from vessels, flowlines and umbilicals	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low
		The ENVID considered discharges from the vessels and flowlines/umbilicals separately. The MoE for discharges from the pipelines and umbilicals was considered Minor (as shown) for all options and Negligible (not shown here) for vessel discharges for all options. For both discharges (vessels and pipelines/umbilicals) the IS was considered Low. Cognisance of these similarities across each discharge should be considered in the CA such that discharges could be ranked the same across all options.			
Seabed Disturbance - Short Term	**Disturbance to the seabed** *note for this group the drill cuttings the Galley field could be disturbed.*	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		As shown, the ENVID found that the MoE and IS differed between the different options. Cognisance of this difference should be considered in the CA Workshop.			
Loss of Habitat - Long Term	**Impact of physical presence of materials left on the seabed** *only on benthic species- not fishing.*	MoE: Negligible (1) IS: Low	MoE: Minor (2) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		As shown the ENVID found the MoE and IS to be the same across all options. Cognisance of this similarity should be considered in the CA (note for Option 1a, the impacts are associated with the distributed rock berm).			
Waste Processing i.e. processing of returned materials and use of landfill	**Generation of waste/use of landfill**	MoE: Minor (2) IS: Low	N/A	N/A	MoE: Negligible (1) IS: Low
		As shown, the ENVID found that though the IS was the same (Low) for the relevant options, the MoE varied. Cognisance of this difference and the fact that this sub-criterion is not relevant to two of the options should be considered in the CA Workshop.			
Societal sub-criteria					
Impact on Commercial Fisheries	**Impact of materials left on the seabed on other users**	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low
		As shown, the ENVID found that though the MoE and IS was the same for all options. Cognisance of this similarity should be considered in the CA (note for Option 1a, the impacts are associated with the distributed rock berm).			
Socio-economic impact on communities and amenities	**Yard activities**	MoE: Minor (2) IS: Low	N/A	N/A	MoE: Minor (2) IS: Low
		As shown, the ENVID considered the MoE and IS to be the same for the relevant options. Cognisance of fact that this aspect is not relevant to some of the options should be considered in the CA.			

PIPELINE GROUP F - Consists:
One Line: 10.7 km Concrete Coated Rigid Trunk Line, Trenched and Shallow Covered Total weight 5,109 te. Exposed Length 1.5 km.

CA sub-criteria	ENVID Nodes within each sub-criterion	Decommissioning Options				
		1.Total Removal by	2. Remediate in-situ with Exposed Sections			3. Leave In-situ and Monitor
		c) By Cut-and-Lift	a) Rock-Covered	b) Trenched and Buried	c) Cut and Removed	
Environmental sub-criteria						
Impact of Decommissioning Operations Offshore	**Vessel emissions**	MoE: Minor (2) IS: Moderate	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		As shown the ENVID found the Magnitude of Effect (MoE) and subsequent Impact Significance (IS) of the atmospheric emissions associated with the different vessel campaigns varied among some options. Cognisance of this difference should be considered in the CA Workshop.				
	Underwater vessel noise	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low
		As shown, the ENVID considered the MoE and IS of underwater vessel noise to be the same across all options. For note: the MoE of underwater noise associated with cutting, rock dumping and trenching activities was considered Negligible and the resultant IS Low for all options. Cognisance of this similarity should be considered in the CA such that underwater noise could be ranked the same across all options.				
	Discharges to sea from vessels, flowline, concrete falling off	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		The ENVID considered discharges from the vessels and flowlines and the discharge of concrete during line recovery separately. MoE and IS for each aspect and each option was considered the same (as shown). Cognisance of this difference should be considered in the CA Workshop.				
Seabed Disturbance - Short Term	**Disturbance to the seabed**	MoE: Minor (2) IS: Low	MoE: Minor (2) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	N/A
		As shown, the ENVID found that the MoE and IS differed between the different options. Cognisance of this difference should be considered in the CA Workshop.				
Loss of Habitat - Long Term	**Impact of physical presence of materials left on the seabed** *only on benthic species- not fishing.*	N/A	MoE: Minor (2) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low
		As shown, the ENVID found that though the IS was the same (Low) for all relevant options, the MoE varied. Cognisance of this difference and the fact that this aspect is not relevant to one of the options should be considered in the CA Workshop.				
Waste Processing i.e. processing of returned materials and use of landfill	**Generation of waste/use of landfill**	MoE: Minor (2) IS: Low	N/A	N/A	MoE: Negligible (1) IS: Low	N/A
		As shown, the ENVID found that though the IS was the same (Low) for the relevant options, the MoE varied. Cognisance of this difference and the fact that this aspect is not relevant to one of the options should be considered in the CA Workshop.				
Societal sub-criteria						
Impact on Commercial Fisheries	**Impact of materials left on the seabed on other users**	N/A	MoE: Minor (2) IS: Low	MoE: Negligible (1) IS: Low	MoE: Negligible (1) IS: Low	MoE: Serious (3) IS: Moderate
		As shown, the ENVID found that though the IS was the same (Low) for the relevant options, the MoE varied. Cognisance of this difference and the fact that this aspect is not relevant to some of the options should be considered in the CA Workshop.				
Socio-economic impact on communities and amenities	**Yard activities**	MoE: Minor (2) IS: Low	N/A	N/A	MoE: Minor (2) IS: Low	N/A
		As shown, the ENVID considered the MoE and IS to be the same for the relevant options. Cognisance of fact that this aspect is not relevant to some of the options should be considered in the CA.				

APPENDIX C – TECHNICAL FACT SHEETS

Technical factsheets were prepared by the subsea engineer on completion of the engineering/ supporting study listed in Section 4.1.1.

Group ID	Basis of Rating	Decommissioning Options				
		1. Total Removal by	2. Remediate in-situ with exposed sections:			3. Leave In-situ and Monitor
		c) Cut-and-Lift	a) Rock-Covered	b) Trenched and Buried	c) Cut and Removed	
A	Total vessel days	639 (3,550%)	25 (139%)	23 (128%)	27 (150%)	18 (100%)
	Vessel SIMOPS days	237	0	0	0	0
	Mob and demob days	67	17	14	18	11
	Number vessel transit days	21.7 (868%)	3.3 (132%)	3.3 (132%)	3.3 (132%)	2.5 (100%)
	Quantity of materials returned to shore (te)	13,579	0	0	30	0
	Quantity of materials for land fill (te)	5,390.9	0	0	12.1	0
	Quantity of materials left on or in seabed (te)	0	13,579	13,579	13,549	13,579
	Quantity of rock cover applied (te)	0	978	0	0	0
	Cost estimate (kGBP)*	27,787 (2266%)	1,799 (147%)	1,595 (130%)	1,698 (138%)	1,226 (100%)

* Commercial figures are confidential and will be removed from the public version and % difference only will be quoted.

Group ID	Basis of Rating	Decommissioning Options			
		1. Total Removal by		2. Remediate in-situ with exposed sections:	
		a) Reverse Reeling	c) Cut-and-Lift	a) Rock-Covered	b) Trenched and Buried
B	Total vessel days	20 (100%)	570 (2850%)	65 (325%)	36 (180%)
	Vessel SIMOPS days	0	235	0	0
	Mob and demob days	11	15	17	14
	Number vessel transit days	1.7 (100%)	10.8 (635%)	4.2 (247%)	3.3 (194%)
	Quantity of materials returned to shore (te)	1577	1577	0	0
	Quantity of materials for land fill (te)	0	182.2	0	0
	Quantity of materials left on or in seabed (te)	0	0	1577	1577
	Quantity of rock cover applied (te)	0	0	187470	0
	Cost estimate (kGBP)*	2,833 (111%)	26,380 (1032%)	5,075 (199%)	2,556 (100%)

* Commercial figures are confidential and will be removed from the public version and % difference only will be quoted.

Group ID	Basis of Rating	Decommissioning Options			
		1. Total Removal by	2. Remediate in-situ with exposed sections:		
		a) Reverse Reeling	a) Rock-Covered	b) Trenched and Buried	c) Cut and Removed
C	Total vessel days	79 (180%)	48 (109%)	44 (100%)	60 (136%)
	Vessel SIMOPS days	19	0	0	0
	Mob and demob days	12	17	14	14
	Number vessel transit days	3.3 (194%)	1.7 (100%)	1.7 (100%)	2.5 (147%)
	Quantity of materials returned to shore (te)	8,692	0	0	90
	Quantity of materials for land fill (te)	661.7	0	0	8.3
	Quantity of materials left on or in seabed (te)	0	8,692	8,692	8,602
	Quantity of rock cover applied (te)	0	10,922	0	0
	Cost estimate (kGBP)*	6,763 (223%)	3,407(112%)	3031 (100%)	4,117 (136%)

* Commercial figures are confidential and will be removed from the public version and % difference only will be quoted.

Group ID	Basis of Rating	Decommissioning Options				
		1. Total Removal by		2. Remediate in-situ with exposed sections:		
		a) Reverse Reeling	c) Cut-and-Lift	a) Rock-Covered	b) Trenched and Buried	c) Cut and Removed
D1	Total vessel days	18 (100%)	206 (1,144%)	23 (128%)	20 (111%)	29 (161%)
	Vessel SIMOPS days	0	79	0	0	0
	Mob and demob days	11	15	17	0	18
	Number vessel transit days	1.7 (100%)	5.8 (341%)	3.3 (194%)	3.3 (194%)	3.3 (194%)
	Quantity of materials returned to shore (te)	996	996	0	0	76
	Quantity of materials for land fill (te)	15.1	15.1	0	0	0.3
	Quantity of materials left on or in seabed (te)	0	0	996	996	920
	Quantity of rock cover applied (te)	0	0	3,975	0	0
	Cost estimate (kGBP)*	2,592 (186%)	9,490 (682%)	1,677 (121%)	1,391 (100%)	1,815 (130%)

* Commercial figures are confidential and will be removed from the public version and % difference only will be quoted.

Group ID	Basis of Rating	Decommissioning Options			
		1. Total Removal by		2. Remediate in-situ with exposed sections:	
		a) Reverse Reeling	c) Cut-and-Lift	a) Rock-Covered	b) Trenched and Buried
D2	Total vessel days	30 (100%)	1,532 (5,107%)	141 (470%)	20 (111%)
	Vessel SIMOPS days	0	631	0	0
	Mob and demob days	11	31	17	0
	Number vessel transit days	1.7 (100%)	27.5 (1,618%)	5.8 (341%)	3.3 (194%)
	Quantity of materials returned to shore (te)	4,454	4,454	0	0
	Quantity of materials for land fill (te)	104.8	104.8	0	0
	Quantity of materials left on or in seabed (te)	0	0	4,454	4,454
	Quantity of rock cover applied (te)	0	0	534,094	0
	Cost estimate (kGBP)*	4,250 (100%)	70,216 (1,652%)	11,175 (263%)	4,869 (115%)

* Commercial figures are confidential and will be removed from the public version and % difference only will be quoted.

Group ID	Basis of Rating	Decommissioning Options			
		1. Total Removal by	2. Remediate in-situ with exposed sections:		
		a) Reverse Reeling	a) Rock-Covered	b) Trenched and Buried	c) Cut and Removed
E	Total vessel days	18 (100%)	23 (128%)	20 (111%)	29 (161%)
	Vessel SIMOPS days	0	0	0	0
	Mob and demob days	12	17	14	18
	Number vessel transit days	2.5 (100%)	3.3 (132%)	3.3 (132%)	4.2 (168%)
	Quantity of materials returned to shore (te)	348	0	0	20
	Quantity of materials for land fill (te)	73.6	0	0	4.3
	Quantity of materials left on or in seabed (te)	0	348	348	327
	Quantity of rock cover applied (te)	0	2,820	0	0
	Cost estimate (kGBP)*	1,518 (109%)	1,677 (121%)	1,391 (100%)	1,815 (130%)

* Commercial figures are confidential and will be removed from the public version and % difference only will be quoted.

Group ID	Basis of Rating	Decommissioning Options				
		1. Total Removal by	2. Remediate in-situ with exposed sections:			3. Leave In-situ and Monitor
		c) Cut-and-Lift	a) Rock-Covered	b) Trenched and Buried	c) Cut and Removed	
F	Total vessel days	223 (1487%)	24 (160%)	20 (133%)	37 (247%)	15 (100%)
	Vessel SIMOPS days	76	0	0	0	0
	Mob and demob days	35	17	14	18	11
	Number vessel transit days	10 (400%)	3.3 (132%)	3.3 (132%)	3.3 (168%)	2.5 (100%)
	Quantity of materials returned to shore (te)	5,233	0	0	710	0
	Quantity of materials for land fill (te)	1,334.1	0	0	294.7	0
	Quantity of materials left on or in seabed (te)	0	5,233	5,233	4523	5233
	Quantity of rock cover applied (te)	0	22,396	0	0	0
	Cost estimate (kGBP)*	9,621 (941%)	1,759 (172%)	1,391 (136%)	2,406 (235%)	1,022 (100%)

* Commercial figures are confidential and will be removed from the public version and % difference only will be quoted.

APPENDIX D – CA RATINGS GUIDE TABLE

Assessment Criteria			RATING		
Main Criteria	**Sub- Criteria**		**LOW IMPACT**	**MODERATE IMPACT**	**HIGHER IMPACT**
TECHNICAL FEASIBILITY	**Risk of Major Project Failure**		Normal operational procedures proposed. Scope is straightforward and understood. Offshore Execution Phase Schedule unlikely to slip beyond planned schedule plus contingencies applied.	Some specialist operational procedures required. Some minor scope uncertainties to be resolved before execution. Potential for some schedule slippage activity resulting project delay but not leading to revisit to execution methods.	Unique operational procedures proposed. Major scope uncertainties will remain at execution. Potential for unplanned and unforeseen activity resulting in significant project delay or potential revisit to execution methods.
	Technical Complexity & Track Record		Uses established technology and/or working methods designed for this field of operation. Large experienced contractor pool available.	Uses proven technology and/or working method but in a diverse field of operation. Some experienced contractors available.	Uses novel technology untested in this field of operation or untried methods to be introduced. Likely to be new to contractors.
SAFETY	**Risk During Project Execution**	**To Project Personnel**	Relatively short campaign (exposure duration). No vessel SIMOPS. No diving. Minimal materials handling or interaction with deck crew.	Longer exposure duration. Low vessel SIMOPS (2 vessels). Some diving involved, but short duration. Some materials handling on deck (No toxic or high-risk materials, no heavy loads).	Long or multiple campaigns. High level vessel SIMOPs (>2 vessels). Significant diving activity anticipated. Significant materials handling on deck (involving either toxic or high-risk materials, or heavy loads).
		To Those on Land	Minimal materials returned onshore. Routine materials handling anticipated	More materials returned onshore for disposal. Some additional materials cutting and handling. No contaminated materials anticipated.	Significant volume of materials returned onshore with large cutting/ dismantling effort before disposal. Contaminated materials also to be managed.
		To Other Users of the Sea	No increased risk to other vessels than currently under normal operations.	Some additional risk to other vessels due to additional construction vessel activity and vessel transits but over short durations. Activities involved at seabed means construction vessels need little time before initiating evasive action from collision.	Increased risk to other vessels due to multiple construction vessels activity and vessel and barge transits over prolonged period. Activities involved at seabed means it is difficult for construction vessel to initiate evasive action from collision.
	Residual Risk to Other Users of the Sea		No increased risk to fishing trawlers introduced than currently present out with the current field exclusion zones.	Some additional risk to fishing vessels introduced due to infrastructure being decommissioned in-situ. However snagging risk mitigated by infrastructure expected to remain over trawlable.	Increased risk from structures / exposed sections of pipeline or protection / stabilisation features decommissioned in-situ, with no mitigation introduced to prevent snagging from over trawling.
ENVIRONMENTAL	**Impact of Decommissioning Operations Offshore** *(includes emissions to air, discharges to sea and underwater noise)*		Undetectable impact from emissions to air. No/minor permitted discharges to sea. Underwater noise generated is not expected to exceed existing background noise.	Effects of emissions to air are detectable. Potential for unplanned discharges not resulting in noticeable environmental impact. Noise generated could exceed existing background levels resulting in noticeable displacement of cetaceans.	Noticeable impact in air quality on local populations. Potential for unplanned discharges resulting in noticeable environmental impact. Underwater noise generated resulting in physical injury to cetacean species could be possible.
	Seabed Disturbance - Short Term *(includes disturbance to the cuttings piles)*		Localised disturbance to the seabed. Possible addition of small volumes of rock cover.	Localised changes to the seabed are possible e.g. addition of rock to sandy seabed area or resettlement of contaminated sediments (e.g. OBM contaminated cuttings) over a wider area.	Widespread mid-to long term (2 + years) degradation of the seabed e.g. resettlement of OBM contaminated cuttings over a much wider seabed area relatively to existing footprint.
	Change of Habitat - Long Term		No additional material added (e.g. rock dump) to support decommissioning activities. Benthic species in area are widespread. Any potential impact to the sediment and associated ecology is expected to be barely detectable.	Some additional material added (e.g. rock dump) to support decommissioning activities. Benthic species in area are widespread. Detectable impact to the sediment and associated ecology. (e.g. from plastics or wax at exposed sections).	Significant impact on a designated species. Detectable impacts to sediments and water column and associated ecologies (e.g. from plastics or wax at exposed sections).
	Waste Processing *(i.e. processing of returned materials and use of landfill)*		Minimal volumes of non-hazardous waste returned that cannot be recycled or re-used. Relatively small volumes of hazardous material.	Relatively small volumes of non-hazardous waste returned that cannot be recycled or re-used. Moderate volumes of hazardous material.	Large volumes of non- hazardous materials returned that cannot be recycled or re-used. Large volumes of hazardous material.
SOCIETAL	**Impact on Commercial Fisheries**		Option results in area becoming or continuing to be accessible to fishing gear.	Stabilisation features e.g. rock cover means that though seabed is accessible to fishing gear, this could change over time (e.g. potential for the rock berms to become dislodged following multiple trawl passes).	Available fishing area decreases, due to self-imposed exclusion zones by fishermen likely due to recurring snagging hazards.
	Socio-economic impact on communities and amenities		Additional employment created and minimal disruption to local communities.	Maintaining local jobs and minimal disruption to local communities.	Significant impact on local communities e.g. noise, traffic, odour. No additional employment.
ECONOMIC RISK	**Cost for Decommissioning/ Removal activities**		Lowest cost option or within 30% of lowest cost.	Between 130% and 200% of lowest cost option.	Greater than 200% of lowest cost option.
	Cost for long term monitoring / Remediation activities		Minimal potential ongoing cost liability. Post project assessment survey only.	Potential for 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities (e.g. re-profile unstable rock berms).	Requirement for more than 3 periodic monitoring surveys, and over a much more prolonged period to review behaviour of site post project completion. It is more likely that some post project remediation activities will be required.

APPENDIX E – CA EVALUATION WORKSHOP RESULTS WORKBOOK

This Appendix contains a large volume of information and has been provided with its own index for easy reference.

APPENDIX E CONTENTS

Rating Workbook - Tartan Group A.xlsx

Rigid Trunk Pipelines, Concrete Coated and Trenched and Buried

One 24" x 15.6km and one 18" x 18.5km.
Both lines are buried to >0.6m to top of pipe, exposures are mainly at pipeline ends, with very short mid-line exposure only.

TECHNICAL & SAFETY

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:			3. LEAVE IN-SITU
	Sub Criteria/ / Sub Options	c)	a)	b)	c)	
		CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED	AND MONITOR
TECHNICAL FEASIBILITY	Risk of Major Project Failure	Straightforward operation, however vessel durations offshore (at c.693 days in total) are significantly greater than Options 2a), b), c) and Option 3. Significant repetitive activity which if effort involved was underestimated only slightly could lead to significant schedule growth. Also, uncertainty exists on the integrity of the 24" Oil export line which has lost between 60% and 70% of its wall thickness overtime in some areas. This could result in further delays in lifting sections of the line if failures occur during the operation.	Only short exposures (*c* .100m overall) to be remediated Normal operational procedures proposed. Scope is straightforward and understood and is of short duration (c.25 days) Offshore Execution Phase schedule is unlikely to slip beyond planned schedule plus contingencies applied.	Only Short exposures (c.100m overall) to be remediated Normal operational procedures proposed. Scope is straightforward and understood and is of short duration (c.23 days) Offshore Execution Phase schedule is unlikely to slip beyond planned schedule plus contingencies applied.	Only Short exposures (c.100m overall) to be remediated Normal operational procedures proposed. Scope is straightforward and understood and is of short duration (c.27 days) Offshore Execution Phase schedule is unlikely to slip beyond planned schedule plus contingencies applied.	Scope involves vessel / ROV surveys only.
	RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Technical Complexity & Track Record	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical complexity not considered significantly different from other options. *Consider sensitivity analysis of Moderate Impact (Amber) for this option as aged concrete coating may be in poor condition and may result in more complex recovery methods.*	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical complexity not considered significantly different from other options.	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical complexity not considered significantly different from other options.	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical complexity not considered significantly different from other options.	A large experienced contractor pool executes this type survey activity annually in the North Sea.
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	TECHNICAL: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**
SAFETY	Risk During Project Execution. — To Project Personnel *(No diving support anticipated for any of the decommissioning options)*	Long and multiple vessel campaigns anticipated (*c.* 693 days overall). High level vessel SIMOPs (>2 vessels for *c* .237 days). Significant and repetitive materials handling on deck (*c.* 34.1km of pipeline returned to deck in cut up sections) with potential of dropped objects from spalling of aged concrete coating. *Consider sensitivity analysis of Moderate Impact (Amber) for this option as EPRD contractor will apply risk mitigation during recovery (e.g. recovery of pipeline sections in baskets) which would reduce both manual handling and potential for concrete spalls to fall to deck from height.*	Short duration campaign (*c.* 25 days) for single vessel. Minimal materials handling as application of rock cover is reasonably automatic with minimal deck crew intervention required.	Short duration campaign (*c.* 23 days) for single vessel. Minimal and routine equipment handling (launching and recovery of trenching equipment and ROV) for deck crew.	Short duration campaign (*c.* 27 days) for single vessel. Some repetitive materials handling on deck with potential of dropped objects from spalling of aged concrete coating. However much less handling than Option 1c) with only *c.* 100m of pipeline returned to deck. *Consider sensitivity analysis of Low Impact (Green) for this option as EPRD contractor will apply risk mitigation during recovery (e.g. recovery of pipeline sections in baskets)*	Short duration and repeated survey campaigns (*c* 18 days total across multiple surveys) and for single vessel only. Minimal and routine equipment handling (launching and recovery of survey equipment and ROV) for deck crew.
	RATING	Higher Impact	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
	To Those on Land	Management of materials returned onshore will be at licenced yards. Significant quantity of materials returned onshore (*c.* 34.1km/ *c.* 13,579te) to be managed however, most deconstruct work in yard is remote from personnel and carried out using appropriate equipment. *Consider sensitivity analysis of Higher Impact (RED) for this option, as there is significantly large quantities of materials to be handled at the yard than other options and over a prolonged period of >2 years.*	No materials returned onshore for dismantling, therefore no risk. Initial supply of Rock materials to quayside is routine and not considered a risk specific to this project.	No materials returned onshore for dismantling, therefore no risk. Mobilisation and demobilisation of trenching equipment is routine and not considered risk specific to this project.	Management of materials returned onshore will be at licenced yards. Only small quantity of materials returned onshore (*c.* 100m/ *c* .30te) to be managed.	No materials returned onshore for dismantling, therefore no risk. Mobilisation and demobilisation of survey equipment is routine and not considered risk specific to this project.
	RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	To Other Users of the Sea	More vessels and significantly longer campaign duration (*c.693 days*) than other options and working over a 34.1km stretch of pipeline. Many vessel transits (*c.* 22) to and from shore to unload recovered pipeline sections. However risk to other users of the sea can be mitigated.	No increased risk to other vessels than currently under normal operations. Campaign is relatively short duration, single vessel in field at any time, activity largely within 500m zone at each end of pipeline with a few locations at mid-line span exposures only. Minimum vessel transits to and from shore (mob and demob).	No increased risk to other vessels than currently under normal operations. Campaign is relatively short duration, single vessel in field at any time, activity largely within 500m zone at each end of pipeline with a few locations at mid-line span exposures only. Minimum vessel transits to and from shore (mob and demob).	No increased risk to other vessels than currently under normal operations. Campaign is relatively short duration, single vessel in field at any time, activity largely within 500m zone at each end of pipeline with a few locations at mid-line span exposures only. Minimum vessel transits to and from shore (mob and demob).	No increased risk to other vessels than currently under normal operations. Single survey vessel only for short duration (repeated surveys over a number of years)
	RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea	No residual risk as option will leave a safe seabed.	Additional rock cover at exposed sections will be installed to be over trawlable, rating recognises potential for new rock berms to become unstable over time and create a snag hazard.	No increased risk compared to existing operating condition, existing trenched and buried section remains over trawlable and exposed sections will be trenched and buried to become over trawlable and thus leave a safe seabed.	No increased risk compared to existing operating condition, existing trenched section remains over trawlable and exposed sections will be removed at cut ends buried or rock covered within trench to leave a safe seabed.	Increased risk from exposed sections of pipeline decommissioned in-situ, with no mitigation introduced to prevent snagging from over trawling. Pipeline exposures may deteriorate overtime leading to increased snagging risk.
	RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Higher Impact
	SAFETY: OVERALL RATING BASED ON AVERAGE	**Higher Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**	**Moderate Impact**

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Rigid Trunk Pipelines, Concrete Coated and Trenched and Buried

One 24" x 15.6km and one 18" x 18.5km.
Both lines are buried to >0.6m to top of pipe, exposures are mainly at pipeline ends, with very short mid-line exposure only.

ENVIRONMENTAL

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:			3. LEAVE IN-SITU
	Sub Criteria/ / Sub Options	c)	a)	b)	c)	
		CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED	AND MONITOR
ENVIRONMENTAL	**Impact of Decommissioning Operations Offshore** *(includes emissions to air, discharges to sea and underwater noise)*	Taking account of the length of vessel campaigns associated with this option (*c*.639 days) compared to the relatively short durations of the other options, the magnitude of effect of the emissions associated with Option 1c) is considered significantly greater than the effects associated with the other options. As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with cutting activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c*.25 days), the magnitude of effect is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the pipeline ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Sources of underwater noise will include the presence of vessels and the noise associated with rock dumping activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c*.23 days), the magnitude of effect is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the pipeline ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Sources of underwater noise will include the presence of vessels and the noise associated with trenching and burying activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c*.27 days), the magnitude of effect is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during recovery of the exposed end sections and subsequently overtime as the line degrades) are not expected to have a significant environmental impact. Sources of underwater noise will include the presence of vessels and the noise associated with cutting activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c*.18 days), the magnitude of effect is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the pipeline ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Sources of underwater noise will include the presence of vessels during the post -decommissioning surveys. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.
	RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term *(includes disturbance to the cuttings piles)*	Full length of pipelines to be deburied before removal (*c.* 34.1km). Noted that the main mound of the Tartan A cuttings piles will not be disturbed (all options) due to cut locations/ boundary limit of the pipelines at the Tartan A platform.	This option is recognised to result in short term localised disturbance during rock placement. The footprint of this short term disturbance is considered significantly smaller (c. 100m of pipeline) than the footprint of disturbance associated with Option 1c).	This option is recognised to result in short term localised disturbance during the trenching and burying activities. The footprint of this short term disturbance is considered significantly smaller (c.100m of pipeline) than the footprint of disturbance associated with Option 1c).	The short sections of line to be recovered (c. 100m of pipeline) are exposed and it is expected that cutting will be carried out using a hydraulic shears. The footprint of seabed to be disturbed is therefore considered significantly less than the area to be disturbed for Option 1c).	No seabed disturbance associated with this option, visual surveys of pipelines only.
	RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term	No additional material to be introduced to the seabed to support decommissioning activities. It is possible that some spalling of the concrete coating may result in small pieces of concrete falling from the pipelines during recovery, however impacts on the ecosystem are not expected to be significant given that there are naturally occurring rocks/boulders in the area that are likely be inhabited by ecosystems similar to those that would settle on any small pieces of concrete that may drop off and are not recovered. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of Option 1c) on the existing habitat is not considered significant.	Sediments across the Tartan Development Area are considered to represent three main habitats: circalittoral fine mud (EUNIS A5.36), circalittoral sandy mud (EUNIS A5.35) and deep circalittoral mixed sediment (EUNIS A5.45). In addition, the majority of the Tartan Development Area, is considered to meet the criteria for the OSPAR listed threatened and/or declining habitat 'Sea pen and burrowing megafauna communities' as well as the UK Habitat Feature of Conservation Importance and UKBAP habitat 'mud habitats in deep water'. This option requires the addition of *c.* 978te of new rock cover to be added to the exposed pipeline ends. Given the habitat types and volume of rock required, the long term impact of rock dumping is considered Moderate Impact (Amber).	No additional material to be introduced to the seabed to support this option. In addition no pieces of concrete expected to be left on the seabed, as described for Option 1c). Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of Option 2b) on the existing habitat is not considered significant.	No additional material to be introduced to the seabed to support decommissioning activities. It is possible that some spalling of the concrete coating may result in small pieces of concrete falling from the pipelines during recovery of the exposed sections, however impacts on the ecosystem are not expected to be significant given that there are naturally occurring rocks/boulders in the area that are likely be inhabited by ecosystems similar or those that would settle on any small pieces of concrete that may drop off and are not recovered. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of Option 2c) on the existing habitat is not considered significant.	Habitat will not be disturbed for this option, therefore no long term habitat change impacts.
	RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Waste Processing *(i.e. processing of returned materials and use of landfill)*	Application of this option would result in *c* 13,579te of materials returned onshore to be processed, with potentially *c.* 5,390te to landfill (note the CA workshop assumed that the concrete coating on the pipelines is of poor quality and assumes a worst case whereby it will go to landfill). *Consider sensitivity analysis of Low Impact (Green) for this option if circumstances allow the concrete coating to also be recycled.*	No materials returned onshore.	No materials returned onshore.	Application of this option would result in *c.* 30te of material returned onshore to be processed, with potentially *c.* 12te to landfill (as for Option 1c), assumed to be poor quality concrete coating expected to go to landfill). The ranking takes cognisance of the very small volumes of material to be returned when compared to Option 1c).	No materials returned onshore.
	RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	ENVIRONMENTAL: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**

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Rigid Trunk Pipelines, Concrete Coated and Trenched and Buried

One 24" x 15.6km and one 18" x 18.5km.
Both lines are buried to >0.6m to top of pipe, exposures are mainly at pipeline ends, with very short mid-line exposure only.

SOCIETAL & ECONOMIC RISK

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:			3. LEAVE IN-SITU
	Sub Criteria/ / Sub Options	c)	a)	b)	c)	
		CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED	AND MONITOR
SOCIETAL	**Impact on Commercial Fisheries**	Pipelines fully removed, option results in a safe seabed and should not therefore impact commercial fisheries.	Rock cover to be installed would be laid in line with industry standards and fishing industry requirements. Therefore, it should be possible for fishing gear to fish in the area. If the rock berm did become unstable over time such that bottom trawl gear could not be used in the area, given the length of rock berms (*c.* 100 m of pipelines) the area of seabed impacted is extremely small such that any potential impacts on commercial fishing is not considered significant. *Consider sensitivity analysis of Moderate Impact (Amber) for this option as Fishermen may feel the accumulation of rock berms across the pipeline groups may be unacceptable, where this is currently assessed as one group in isolation.*	Option results in a safe seabed as there would be no exposed line lengths remaining and should not therefore impact commercial fisheries.	Option results in a safe seabed as there would be no exposed line lengths remaining and should not therefore impact commercial fisheries	Option leaves exposed sections that could become snagging hazards leading to lost nets/income or self-imposed exclusion zones by fishermen. Rated only Moderate Impact (Amber) due to relatively short exposure lengths (*c* .100m in total). *Consider sensitivity analysis of Low Impact (Green) for this option as large diameter concrete coated lines are over trawlable.*
	RATING	Lower Impact	Lower Impact	Lower Impact	Lower Impact	Moderate Impact
	Socio-economic Impact on Communities and Amenities	Although significantly more materials returned onshore when compared to the other options, the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	Negligible quantity of materials returned such that impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant. In addition, no new onshore jobs anticipated.	No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	SOCIETAL: OVERALL RATING - BASED ON AVERAGE	**Lower Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**	**Moderate Impact**
ECONOMIC RISK	**Cost for Decommissioning/ Removal activities** *(the cost data provided here will be hidden in public version of the report)*	Estimated at £27.79M which is 2,226% of lowest cost option.	Estimated at £1.8M which is 147% of lowest cost option.	Estimated at £1.6M which is130% of lowest cost option.	Estimated at £1.7M which is 138% of lowest cost option.	Estimated at £1.23M which is lowest cost option.
	RATING	Higher Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Cost for long term monitoring / Remediation activities	Minimal potential ongoing cost liability as all pipelines removed. Post project assessment survey only.	Existing lines already buried will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities (e.g. re-profile unstable rock berms)	Existing lines already buried will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Less potential for remedial work post project as newly buried sections of line unlikely to unbury.	Existing lines already buried will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Less potential for remedial work post project as exposed sections of line have been removed.	Existing line already buried will continue to be monitored. Potential for more than 3 periodic monitoring surveys and over a much more prolonged period to review behaviour of site post project completion as sections of line are left exposed. More potential for remedial work post project as exposed sections of line remaining on the seabed deteriorate and become an increased snag hazard.
	RATING	Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact	Higher Impact
	ECONOMIC RISK: OVERALL RATING BASED ON AVERAGE	**Higher Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**	**Moderate Impact**

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Rigid Trunk Pipelines, Concrete Coated and Trenched and Buried

VISUAL RATING SUMMARY - HEATMAP

One 24" x 15.6km and one 18" x 18.5km.
Both lines are buried to >0.6m to top of pipe, exposures are mainly at pipeline ends, with very short mid-line exposure only.

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:			3. LEAVE IN-SITU
	Sub Criteria/ / Sub Options		c)	a)	b)	c)	
			CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED	AND MONITOR
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Higher Impact	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
		To Those on Land	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Higher Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term		Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Waste Processing		Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Lower Impact	Lower Impact	Lower Impact	Moderate Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
ECONOMIC RISK	Cost for Decommissioning/ Removal activities		Higher Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Cost for long term monitoring / Remediation activities		Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact	Higher Impact
OVERALL RATING			Higher Impact	Lower Impact	Lower Impact	Lower Impact	Moderate Impact
OVERALL RANKING			5th	3rd	1st	2nd	4th
Rating Count			Red =2	Red = 0	Red = 0	Red = 0	Red =2
			Amber =6	Amber = 3	Amber = 1	Amber = 2	Amber =1
			Green =4	Green = 9	Green = 11	Green = 10	Green =9
COMMENTS	Option 2b) is ranked as the most preferred option and should be identified as such in the CA report and in the Decommissioning Programme (DP). Option 2c) is only rated marginally worse than option 2b), by one additional Moderate Impact (Amber) under the sub-criterion "Risk to Project Personnel" due to the fact Option 2c) recovers a small quantity of materials to the vessel deck and Option 2b does not. Option 2a) is rated marginally worse than option 2c), by one additional Moderate Impact (Amber), although the Moderate Impact ratings for 2a) are on the sub-criteria Residual (Long Term) Risk to Other Users of the Sea and Change of Habitat - Long Term, in both cases this is because Option 2a) introduces a number of small new rock berms to the seabed. Notably Options 2a), 2b) and 2c) do not attract any Higher Impact (Red) ratings. Since Options 2a), 2b) and 2c) are rated only marginally different, it is recommended that all three options are carried forward to the C&P tendering phase to enable the EPRD contractors the input to the preferred option from an economic and overall campaign strategy taking account of other pipeline groups in the field. It is recommended that Option 1c) and Option 3 are both discounted at this stage and not considered further.						

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Rigid Trunk Pipelines, Concrete Coated and Trenched and Buried

One 24" x 15.6km and one 18" x 18.5km.
Both lines are buried to >0.6m to top of pipe, exposures are mainly at pipeline ends, with very short mid-line exposure only.

NARRATIVE SUMMARY:

Sub-criteria ratings have been averaged by main criteria.

Red / italic text in cells below highlights the main areas of influence in a combined rating evaluation poorer than Low Impact (Green).

SUMMARY	Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:			3. LEAVE IN-SITU
	Sub Criteria/ / Sub Options	c)	a)	b)	c)	
		CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED	AND MONITOR
	TECHNICAL FEASIBILITY	Straightforward operation using established technology and working methods, with experienced contractor pool available. *However ,vessel durations offshore are significantly greater than other options and involves significant repetitive activity which, if the effort involved was underestimated only slightly could lead to significant schedule growth.* *Also, uncertainty exists on the integrity of the 24" Oil export line which has lost between 60% and 70% of its wall thickness overtime in some areas. This could result in further delays in lifting sections of the line if failures occur during the operation.*	Straightforward operation using established technology and working methods, with experienced contractor pool available. Only short exposures (*c.* 100m) to be remediated. Scope is straightforward and understood and unlikely to slip beyond planned schedule plus contingencies applied.	Straightforward operation using established technology and working methods, with experienced contractor pool available. Only short exposures (*c.* 100m) to be remediated. Scope is straightforward and understood and unlikely to slip beyond planned schedule plus contingencies applied.	Straightforward operation using established technology and working methods, with experienced contractor pool available. Only short exposures (*c.* 100m) to be remediated. Scope is straightforward and understood and unlikely to slip beyond planned schedule plus contingencies applied.	Scope involves vessel / ROV surveys only. A large experienced contractor pool executes this type activity annually in the North Sea. Scope is straightforward and understood and unlikely to slip beyond planned schedule plus contingencies applied.
	AVERAGE RATING THIS CRITERION	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	SAFETY	*Long and multiple vessel campaigns with long vessel SIMOPs periods and many vessel transits to and from shore.* However, risk to other users of the sea can be mitigated. *Significant and repetitive materials handling on deck with potential for dropped objects due to spalling of concrete coating.* *Significant quantity of materials returned onshore to be managed,* but to licensed yards with personnel remote from deconstruct work as executed using appropriate equipment. No residual risk as option will leave a safe seabed.	Short duration campaign for single vessel and minimal vessel transits to and from shore. Minimal materials and routine equipment handling on deck. No materials returned onshore. No increased risk to other users of the sea than currently under normal operations. Additional rock berms at exposed sections will be installed to be over trawlable, however could become unstable over time and create a future long term snag hazard.	Short duration campaign for single vessel and minimal vessel transits to and from shore. Routine equipment handling on deck. No materials returned onshore. No increased risk to other users of the sea than currently under normal operations. No increased residual (long term) risk compared to existing operating condition, existing trenched and buried section remains over trawlable and exposed sections will be trenched and buried to become over trawlable and thus leave a safe seabed.	Short duration campaign for single vessel and minimal vessel transits to and from shore. Minimal materials or routine equipment handling on deck. Minimal materials returned onshore but with potential for dropped objects due to spalling of concrete coating. No increased risk to other users of the sea than currently under normal operations. No increased Residual (long term) risk compared to existing operating condition, existing trenched and buried section remains over trawlable and exposed sections will be removed with cut ends buried or rock covered within trench to leave a safe seabed.	Short duration and repeated survey campaigns and for single vessel only. Minimal and routine equipment handling (launching and recovery of survey equipment and ROV) for deck crew. No materials returned onshore. No increased risk to other users of the sea than currently under normal operations. *Some residual risk from exposed sections of pipeline decommissioned in-situ, with no mitigation introduced to prevent snagging from over trawling. Exposed sections of pipelines may deteriorate overtime leading to increased snagging risk.*
	AVERAGE RATING THIS CRITERION	Higher Impact	Lower Impact	Lower Impact	Lower Impact	Moderate Impact
	ENVIRONMENTAL	*Taking account of the length of vessel campaigns and the subsequent magnitude of effect of the emissions associated with Option 1c) is considered significantly greater than the effects associated with the other options.* As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. *There is short-term seabed disturbance along full length of pipelines as it will be deburied before removal which is considered to be significantly greater than for the other options.* No additional material introduced to seabed to support decommissioning activities. It is possible that some spalling of the concrete coating may result in small pieces of concrete falling from the pipelines during recovery, however impacts on the ecosystem are not expected to be significant *Potentially c.5,391te of concrete to landfill.*	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the vessel emissions associated with this option is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the pipeline ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Some short term localised disturbance during rock placement, however footprint is small. This option requires the addition of *c* .978te of new rock cover to be added to the exposed pipeline ends. Given the habitat types and volume of rock required, the long term impact of rock dumping is considered Moderate Impact (Amber).	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the vessel emissions associated with this option is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the pipeline ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Some short term localised disturbance during trenching, however footprint is small. No additional material introduced to seabed to support decommissioning activities. No materials returned onshore.	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the vessel emissions associated with this option is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the pipeline ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. The very short sections of line to be recovered are exposed and it is expected that cutting will be carried out using a hydraulic shears. The footprint of seabed to be disturbed is therefore considered significantly less than the area to be disturbed for Option 1c). No additional material introduced to seabed to support decommissioning activities. Rated as Low Impact (Green) for waste processing as only very small quantity of materials returned onshore.	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the vessel emissions associated with this option is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the pipeline ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. No seabed disturbance associated with this option, visual surveys of pipelines only. No additional material introduced to seabed to support decommissioning activities. No materials returned onshore.
	AVERAGE RATING THIS CRITERION	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	SOCIETAL	Option results in a clear seabed and therefore not anticipated to impact on commercial fisheries. Although significantly more materials returned onshore when compared to the other options, the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	Rock cover to be installed would be laid in line with industry standards and fishing industry requirements. Therefore, it should be possible for fishing gear to fish in the area. If the rock berm did become unstable over time such that bottom trawl gear could not be used in the area, the length of rock berms (*c.* 100 m of pipelines) and therefore area of seabed impacted is relatively small such that any potential impacts on commercial fishing is not considered significant. No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	Option results in a safe seabed as there would be no exposed line lengths remaining and should not therefore impact commercial fisheries. No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	Option results in a safe seabed as there would be no exposed line lengths remaining and should not therefore impact commercial fisheries. Negligible quantity of materials returned such that impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant. In addition, no new onshore jobs anticipated.	*This option leaves exposed sections that could become snagging hazards leading to lost nets/income or self-imposed exclusion zones by fishermen. Rated only Moderate Impact (Amber) due to relatively short exposure lengths (c.100m in total).* No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.
	AVERAGE RATING THIS CRITERION	Lower Impact	Lower Impact	Lower Impact	Lower Impact	Moderate Impact
	ECONOMIC RISK	*Estimated at £27.79M which is 2,266% of lowest cost option.* Minimal potential ongoing cost liability as all pipelines removed.	Estimated at £1.8M which is 147% of lowest cost option. Existing line already buried will continue to be monitored. Potential for some remediation activities (e.g. re-profile unstable rock berms).	Estimated at £1.6M which is 130% of lowest cost option. Existing line already buried will continue to be monitored. Less potential for remedial work post project as newly buried sections of line unlikely to unbury.	Estimated at £1.7M which is138% of lowest cost option. Existing line already buried will continue to be monitored. Less potential for remedial work post project as exposed sections of line have been removed.	Estimated at £1.23M which is lowest cost option. Existing line already buried will continue to be monitored. *Potential for more than 3 periodic monitoring surveys and over a much more prolonged period.* *More potential for remedial work post project as exposed sections of line remaining on the seabed deteriorate and become an increased snag hazard .*
	AVERAGE RATING THIS CRITERION	Higher Impact	Lower Impact	Lower Impact	Lower Impact	Moderate Impact
	OVERALL RATING	Higher Impact	Lower Impact	Lower Impact	Lower Impact	Moderate Impact
	OVERALL RANKING	**5th**	**1st=**	**1st=**	**1st=**	**4th**
	COMMENTS	When average ratings by Main Criteria only are considered Options 2a), 2b) and 2c) are ranked first equal, with average ratings across all main criteria being Low Impact (Green). This reinforces the proposal to carry forward all three remediate in-situ options to the C&P tendering phase to enable the EPRD contractors the input to the preferred option from an economic and overall campaign strategy. It is recommended that Option 1c) and Option 3 are both discounted at this stage and not considered further.				

Rating Workbook - Tartan Group A.xlsx

Rigid Trunk Pipelines, Concrete Coated and Trenched and Buried

One 24" x 15.6km and one 18" x 18.5km.
Both lines are buried to >0.6m to top of pipe, exposures are mainly at pipeline ends, with very short mid-line exposure only.

VISUAL RATING SUMMARY: Sensitivity Analysis 1 - Specific Sub-Criteria

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:			3. LEAVE IN-SITU
	Sub Criteria/ / Sub Options		c)	a)	b)	c)	
			CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED	AND MONITOR
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Technical Complexity & Track Record		Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
SAFETY	Risk During Project Execution	To Project Personnel	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
		To Those on Land	Higher Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Higher Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term		Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Waste Processing		Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
ECONOMIC RISK	Cost for Decommissioning/ Removal activities		Higher Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Cost for long term monitoring / Remediation activities		Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact	Higher Impact
OVERALL RATING			**Higher Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**	**Moderate Impact**
OVERALL RANKING			**5th**	**3rd**	**1st=**	**1st=**	**4th**
Rating Count			Red =2 Amber =6 Green =4	Red = 0 Amber = 4 Green = 8	Red = 0 Amber = 1 Green = 11	Red = 0 Amber = 1 Green = 11	Red =2 Amber =0 Green =10
COMMENTS	Sensitivity Analysis 1 does not change the overall rankings nor recommendations compared to the original evaluation, except that option 2c) becomes ranked first equal with Option 2b), Options ranked 3, 4 and 5 remain the same as the original evaluation. Therefore the recommendations concluded for the original evaluation remain in place for this sensitivity analysis.						

Rating changed from Not Significantly Different (from other Options) to Moderate Impact (Amber).
Basis of sensitivity analysis is that aged concrete coating is in poor condition and may result in more complex recovery methods, than initial evaluation assumes.
Change to Moderate Impact (Amber) means that Options 2a), b) and c) and Option 3 revert to Low Impact (Green) for Technical Complexity

Rating changed from Higher Impact (Red) to Moderate Impact (Amber).
Basis of sensitivity analysis is that EPRD contractor may apply risk mitigation during recovery (e.g. recovery of pipeline sections in baskets), which would reduce both manual handling and potential for concrete spalls to fall to deck from height.

Rating changed from Moderate Impact (Amber) to Low Impact (Green) .
Basis of sensitivity analysis is that EPRD contractor will apply risk mitigation during recovery (e.g. recovery of pipeline sections in baskets), which would reduce both manual handling and potential for concrete spalls to fall to deck from height.
Difference in ratings between Options1c) and 2c) is due to different campaign durations and significantly different quantity of materials recovered.

Rating changed from Moderate Impact (Amber) to Higher Impact (Red).
Basis of sensitivity analysis is due to the fact there is significantly large quantities of materials to be handled at the yard than other options and over a prolonged period of >2 years.

Rating changed from Moderate Impact (Amber) to Low Impact (Green) .
Basis of sensitivity analysis is that as the large diameter concrete coated lines are over trawlable.

Rating changed from Moderate Impact (Amber) to Low Impact (Green) . Since other options are already rated Low Impact (Green) for Waste Processing, this results in all options being rated as Not Significantly Different.
Basis of sensitivity analysis for 1c) is that the rating may be improved to Low Impact (Green) if circumstances allow the concrete coating to recycled.

Rating changed from Low Impact (Green) to Moderate Impact (Amber).
Basis of sensitivity analysis is that the fishermen may feel the accumulation of rock berms across the pipeline groups may be unacceptable, where this was originally assessed as one group in isolation.

Rating Workbook - Tartan Group A.xlsx

Rigid Trunk Pipelines, Concrete Coated and Trenched and Buried

VISUAL RATING SUMMARY: Sensitivity Analysis 2 - Economic Risk Discounted

One 24" x 15.6km and one 18" x 18.5km.
Both lines are buried to >0.6m to top of pipe, exposures are mainly at pipeline ends, with very short mid-line exposure only.

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:			3. LEAVE IN-SITU
	Sub Criteria/ / Sub Options		c)	a)	b)	c)	
			CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED	AND MONITOR
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Higher Impact	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
		To Those on Land	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Higher Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term		Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Waste Processing		Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Lower Impact	Lower Impact	Lower Impact	Moderate Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
OVERALL RATING			Higher Impact	Lower Impact	Lower Impact	Lower Impact	Moderate Impact
OVERALL RANKING			5th	3rd	1st	2nd	4th
Rating Count			Red =1 Amber =6 Green =3	Red = 0 Amber = 2 Green = 8	Red = 0 Amber = 0 Green = 10	Red = 0 Amber = 1 Green = 9	Red =1 Amber =1 Green =8
COMMENTS			Sensitivity Analysis 2 with Economic Risk Evaluation results discounted does not change the overall rankings or recommendations compared to the original evaluation. Therefore the recommendations concluded for the original evaluation remain in place for this sensitivity analysis.				

Rating Workbook - Tartan Group B.xlsx

Rigid and Flexible Pipelines and Umbilicals, Surface Laid

TECHNICAL & SAFETY

One 8" flexible x 7.5km, four 6" rigid x 13.1km (combined) and four umbilicals x 13.3km (combined).

Assessment Criteria			Decommissioning Options	1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:	
			Sub Criteria/ / Sub Options	a)	c)	a)	b)
				REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED
TECHNICAL FEASIBILITY			Risk of Major Project Failure	Normal operational procedures proposed. Scope is straightforward and understood and with an experienced contractor pool available. Although there are many pipeline crossings within this group, careful planning of the order that the pipelines are recovered will ensure a straightforward campaign. Offshore Execution Phase schedule is unlikely to slip beyond planned schedule plus contingencies applied.	Straight forward operation, however vessel durations offshore (c. 570 days) are significantly greater than the other options: with vessel durations ranging from 20 to 65 days. Significant repetitive activity which if effort involved was underestimated only slightly could lead to significant schedule growth.	Normal operational procedures proposed. Scope is straightforward and understood and with an experienced contractor pool available. Offshore Execution Phase Schedule is unlikely to slip beyond planned schedule plus contingencies applied.	Significant amount of pipeline crossings and close proximity of lines to each other will make trenching and burying of the full length of many of the pipelines and umbilicals difficult to achieve. An alternative to trenching and burying will be required to be adopted (likely to be the application of rock cover) where the crossings occur leading to extended schedule.
			RATING	Lower Impact	Moderate Impact	Lower Impact	Moderate Impact
			Technical Complexity & Track Record	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical complexity not considered significantly different from other options.	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical complexity not considered significantly different from other options.	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical complexity not considered significantly different from other options.	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical complexity not considered significantly different from other options.
			RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
			TECHNICAL: OVERALL RATING BASED ON AVERAGE	**Lower Impact**	**Moderate Impact**	**Lower Impact**	**Moderate Impact**
SAFETY	Risk During Project Execution		To Project Personnel	Short duration campaign (*c* .20 days) for single vessel. Less crew interaction than Options 1c) as pipelines are loaded directly onto reel. Potential integrity risk when reeling as some pipelines were installed in the 1980's. However it is considered mitigation for potential line failure can be achieved by procedure and by inspection and or testing the jumper spools which will be recovered before the pipelines.	Long and multiple vessel campaigns anticipated (*c* .570 days overall). High level vessel SIMOPs (>2 vessels for *c* .235 days). Significant and repetitive materials handling on deck (*c* .33.9km of pipeline/umbilical returned to deck in cut up sections). Rigid pipelines will be cut into sections on the seabed before recovery (cut and lift) whereas Flexible pipelines and umbilicals will be lifted and raised to the vessel deck to then be cut into sections and stored (lift and cut) Potential for chemical release from recovered umbilical sections, where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery.	Short duration campaign (*c.* 65 days) for single vessel. Minimal materials handling as application of rock cover is reasonably automatic with minimal deck crew intervention required.	Short duration campaign (*c* .36 days) for single vessel. Minimal and routine equipment handling (launching and recovery of trenching and burying equipment and ROV) for deck crew. Although it is recognised under the technical feasibility criteria that there may be technical difficulties in achieving full trench and burying due to the amount of pipeline crossings and close proximity of lines to each other, the technical solution is not considered to introduce increased safety risk to the execution phase, which is considered to remain Lower Impact (Green).
			RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
			To Those on Land	Management of materials returned onshore will be at licenced yards. Materials returned onshore (*c* .33.9km/ *c.* 1,577te) to be managed however, most deconstruct work in yard is remote from personnel and carried out using appropriate equipment. Potential for chemical release from recovered umbilicals when unreeled and cut into sections at the yard (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery).	Management of materials returned onshore will be at licenced yards. Materials returned onshore (*c* .33.9km/ *c.* 1,577te) to be managed however, most deconstruct work in yard is remote from personnel and carried out using appropriate equipment. Potential for chemical release from recovered umbilicals when cut into sections at the yard (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery).	No materials returned onshore for dismantling, therefore no risk. Initial supply of rock materials to the quayside is routine and not considered a risk specific to this project.	No materials returned onshore for dismantling, therefore no risk. Mobilisation and demobilisation of trenching and burying equipment is routine and not considered risk specific to this project.
			RATING	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
			To Other Users of the Sea	Relative to normal operations there is minimal increased risk to other sea users given that the campaign is a relatively short duration (*c* .20 days), with a single vessel in the field at any one time. Minimum vessel transits to and from shore (mob and demob).	More vessels and significantly longer campaign duration (*c* .570 days) than other options and working over a 33.9km stretch of pipeline. Many vessel transits (*c* .11) to and from onshore to unload recovered pipeline and umbilical sections. However, risk to other users of the sea can be mitigated.	Relative to normal operations there is minimal increased risk to other sea users given that the campaign is a relatively short duration (*c.* 65 days), with a single vessel in the field at any one time. Minimum vessel transits to and from shore (mob and demob).	Relative to normal operations there is minimal increased risk to other sea users given that the campaign is a relatively short duration (*c* .36 days), with a single vessel in the field at any one time. Minimum vessel transits to and from shore (mob and demob).
			RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
			Residual (Long Term) Risk To Other Users of the Sea	No residual risk as option will leave a clear seabed.	No residual risk as option will leave a clear seabed.	Application of rock cover across all pipelines will be installed to be over trawlable, rating recognises potential for new rock berms to become unstable over time and create a snag hazard. The close proximity of pipelines to each other may mean wide rock berms across multiple lines - or potentially less than 50m gap between adjacent and parallel rock berms.	No increased risk compared to existing operating condition, where trenching and burying has been successful as leaves a clear seabed. However, the significant amount of pipeline crossings and in near proximity to each other will have to be managed, potentially by the application of rock cover at the crossings. *Consider sensitivity analysis of Moderate Impact (Amber) for this option since there are a significant number of pipeline crossings associated with this pipeline group where trenching and burying at the crossing could not be achieved, therefore rock cover of the crossings may be an alternative option for each crossing, this would result in a similar risk from snagging for trawlers as Option 2a).*
			RATING	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
			SAFETY: OVERALL RATING BASED ON DISCUSSION	**Lower Impact**	**Moderate Impact**	**Moderate Impact**	**Lower Impact**
			COMMENTS	The workshop participants considered Option 2a) should be a Moderate Impact (Amber) overall from a Safety perspective as it was agreed the residual risk from the introduction of multiple rock berms is considered to have more influence than the other safety sub-criteria.			

Rating Workbook - Tartan Group B.xlsx

Rigid and Flexible Pipelines and Umbilicals, Surface Laid

ENVIRONMENTAL

One 8" flexible x 7.5km, four 6" rigid x 13.1km (combined) and four umbilicals x 13.3km (combined).

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:	
	Sub Criteria/ / Sub Options	a)	c)	a)	b)
		REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED
ENVIRONMENTAL	**Impact of Decommissioning Operations Offshore** *(includes emissions to air, discharges to sea and underwater noise)*	Given the relatively short duration of the activities associated with this option (*c.* 20 days), the magnitude of effect of the emissions associated with the offshore campaign is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with reverse reeling. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Taking account of the length of the vessel campaigns associated with the different decommissioning options: *c* .570 days compared to other options, the magnitude of effect of the emissions associated with Option 1c) is considered significantly greater than the effects associated with the other options. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with cutting activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c.* 65 days which includes days for subsequent post-decommissioning surveys), the magnitude of effect is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the line ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Sources of underwater noise will include the presence of vessels and the noise associated with rock dumping activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (c.36 days which includes days for subsequent post-decommissioning surveys), the magnitude of effect is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the line ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Sources of underwater noise will include the presence of vessels and the noise associated with trench and burial activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.
	RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term *(includes disturbance to the cuttings piles)*	As the lines are surface laid with little or no sediment cover, disturbance to the seabed during recovery will be minimal and is not considered a significant impact for this option.	As the lines are surface laid with little or no sediment cover, disturbance to the seabed during recovery will be minimal and is not considered a significant impact for this option.	This option is recognised to result in short term localised disturbance during rock placement. The footprint of this short term disturbance will extend the full length of pipelines and umbilicals within the group (*c* .33.9km) and is therefore considered a Moderate Impact (Amber).	This option is recognised to result in short term localised disturbance during trenching. during the trenching and burying activities. The footprint of this short term disturbance will extend the full length of pipelines and umbilicals within the group (*c* .33.9km). Also potential for rock placement at pipelines crossings where trenching cannot be achieved and is therefore considered a Moderate Impact (Amber).
	RATING	Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
	Change of Habitat - Long Term	No additional material to be introduced to the seabed to support this option. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of Option 1a) on the existing habitat is not considered significant.	No additional material to be introduced to the seabed to support this option. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of Option 1c) on the existing habitat is not considered significant.	Sediments across the Tartan Development Area are considered to represent three main habitats: circalittoral fine mud (EUNIS A5.36), circalittoral sandy mud (EUNIS A5.35) and deep circalittoral mixed sediment (EUNIS A5.45). In addition, the majority of the Tartan Development Area, is considered to meet the criteria for the OSPAR listed threatened and/or declining habitat 'Sea pen and burrowing megafauna communities' as well as the UK Habitat Feature of Conservation Importance and UKBAP habitat 'mud habitats in deep water'. This option requires the addition of *c* .187,470te of new rock materials along the full length of the pipelines and umbilicals. Given the habitat types and volume of rock required, the long term impact of rock dumping the full length of lines in this group is considered Higher Impact (Red).	Although trenching and burying does not have a long term impact, the potential to introduce rock cover at the numerous crossings that cannot be trenched an buried is rated as Moderate Impact (Amber) due to habitat types in the area including the OSPAR listed threatened and/or declining habitat 'Sea pen and burrowing megafauna communities'
	RATING	Lower Impact	Lower Impact	Higher Impact	Moderate Impact
	Waste Processing *(i.e. processing of returned materials and use of landfill)*	Application of this option would result in *c* .1,577te of pipeline/ umbilical returned onshore to be processed, with potentially *c.* 182te to landfill (plastics and trapped chemicals from the umbilicals).	Application of this option would result *in c* .1,577te of pipeline/ umbilical returned onshore to be processed, with potentially *c.* 182te to landfill (plastics and trapped chemicals from the umbilicals).	No materials returned onshore.	No materials returned onshore.
	RATING	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
	ENVIRONMENTAL: OVERALL RATING BASED ON AVERAGE	**Lower Impact**	**Moderate Impact**	**Higher Impact**	**Moderate Impact**

Rating Workbook - Tartan Group B.xlsx

Rigid and Flexible Pipelines and Umbilicals, Surface Laid

SOCIETAL & ECONOMIC RISK

One 8" flexible x 7.5km, four 6" rigid x 13.1km (combined) and four umbilicals x 13.3km (combined).

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:	
	Sub Criteria/ / Sub Options	a)	c)	a)	b)
		REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED
SOCIETAL	Impact on Commercial Fisheries	Option results in a clear seabed and should not therefore impact commercial fisheries.	Option results in a clear seabed and should not therefore impact commercial fisheries.	Rock cover to be installed (*c* 187,470te) would be laid in line with industry standards and fishing industry requirements. Therefore, it should be possible for fishing gear to fish in the area. However if the rock berm did become unstable over time such that bottom trawl gear could not be used along the length of the rock berms *(c.* 33.9km of pipelines and umbilicals) the industry could self-impose exclusions zones along the line lengths to prevent snagging and potential loss of fishing equipment.	Although less rock applied than option 2a), if rock berms are applied at the numerous pipeline crossings that cannot be trenched and buried, these berms could become unstable overtime leading to snagging, lost nets, and the fishing industry creating a self-imposed exclusion zone.
	RATING	Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
	Socio-economic Impact on Communities and Amenities	Although significant volumes of materials would be returned onshore (when compared to the two remediate in-situ options where no materials are returned) the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	Although significant volumes of materials would be returned onshore (when compared to the two remediate in-situ options where no materials are returned) the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities..
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	SOCIETAL: OVERALL RATING - BASED ON AVERAGE	**Lower Impact**	**Lower Impact**	**Moderate Impact**	**Moderate Impact**
ECONOMIC RISK	Cost for Decommissioning/ Removal activities	Estimated at £2.83M which is 111% of lowest cost option. See Note1 under option 2b).	Estimated at £26.38M which is 1,032% of lowest cost option.	Estimated at £5.08M which is 199% of lowest cost option.	Estimated at £2.56M which is lowest cost option. Note 1 It is noted that the cost of the potential to rock cover the crossings that cannot be trenched and buried, has not been included in this estimate. The comparative cost of Option 2b) to Option1a) is likely to be closer than 111%, but will not affect the overall ranking of the options.
	RATING	Lower Impact	Higher Impact	Moderate Impact	Lower Impact
	Cost for long term monitoring / Remediation activities	Minimal potential ongoing cost liability as all pipelines removed. Post project assessment survey only.	Minimal potential ongoing cost liability as all pipelines removed. Post project assessment survey only.	Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities (e.g. re-profile unstable rock berms)	Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities (e.g. re-profile unstable rock berms, if these are installed to remediate the crossings)
	RATING	Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
	ECONOMIC RISK: OVERALL RATING BASED ON AVERAGE	**Lower Impact**	**Higher Impact**	**Moderate Impact**	**Moderate Impact**

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Rigid and Flexible Pipelines and Umbilicals, Surface Laid

VISUAL RATING SUMMARY

One 8" flexible x 7.5km, four 6" rigid x 13.1km (combined) and four umbilicals x 13.3km (combined).

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:	
	Sub Criteria/ / Sub Options		a)	c)	a)	b)
			REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Lower Impact	Moderate Impact	Lower Impact	Moderate Impact
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
		To Those on Land	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Lower Impact	Moderate Impact	Lower Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term		Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
	Change of Habitat - Long Term		Lower Impact	Lower Impact	Higher Impact	Moderate Impact
	Waste Processing		Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different
ECONOMIC RISK	Cost for Decommissioning/ Removal activities		Lower Impact	Higher Impact	Moderate Impact	Lower Impact
	Cost for long term monitoring / Remediation activities		Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
OVERALL RATING			Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
OVERALL RANKING			1st	4th	3rd	2nd
Rating Count			Red =0	Red =1	Red = 1	Red = 0
			Amber =2	Amber =6	Amber = 5	Amber = 5
			Green =10	Green =5	Green = 6	Green = 7
COMMENTS			Option 1a) is ranked as the most preferred option and should be identified as such in the CA report and in the Decommissioning Programme (DP). All other options are rated sufficiently worse than Option 1a) that they may be discounted and not considered further in the CA report or in the DP.			

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Rigid and Flexible Pipelines and Umbilicals, Surface Laid

NARRATIVE SUMMARY

Sub-criteria ratings have been averaged by main criteria.

Red italic text in cells below highlights the main areas of influence in a combined rating evaluation poorer than Low Impact (Green).

One 8" flexible x 7.5km, four 6" rigid x 13.1km (combined) and four umbilicals x 13.3km (combined).

SUMMARY	Decommissioning Options	1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:	
	Sub Criteria/ / Sub Options	a)	c)	a)	b)
		REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED
	TECHNICAL FEASIBILITY	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Technical complexity is not significantly different from other options. Although there are many pipeline crossings within this group, careful planning of the order that the pipelines are recovered will ensure a straightforward campaign.	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Technical complexity is not significantly different from other options. *However, vessel durations offshore are significantly greater than Options1a), 2a), 2b), 2c) and is c.570days.* *Significant repetitive activity which if effort involved was underestimated only slightly could lead to significant schedule growth.*	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Technical complexity is not significantly different from other options.	Straightforward operation using established technology and working methods and with an experienced contractor pool available. *Significant amount of pipeline crossings and close proximity of lines to each other will make trenching and burying of the full length of many of the pipelines difficult to achieve. An alternative to trenching and burying will be required to be adopted (likely to be the application of rock cover) where the crossings occur leading to extended schedule.*
	AVERAGE RATING THIS CRITERION	Lower Impact	Moderate Impact	Lower Impact	Moderate Impact
	SAFETY	Short duration campaign for single vessel and minimal vessel transits to and from shore. Less crew interaction than Options 1c) as pipelines and umbilicals are loaded directly onto reel. Potential integrity risk when reeling as some pipelines to be recovered were installed in the 1980's,, but potential line failure can be mitigated by procedure and by inspection and or testing the jumper spools which will be recovered before the pipelines. More materials returned onshore than Options 2a) and 2b), but to licensed yards with yard personnel remote from deconstruct activity as can executed using appropriate equipment. Potential for chemical release from recovered umbilicals when unreeled and cut into sections at the yard (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery). No residual risk as option will leave a clear seabed.	*Long and multiple vessel campaigns with long vessel SIMOPs periods and many vessel transits to and from shore* . However risk to other users of the sea can be mitigated. *Significant and repetitive materials handling on deck with potential of dropped objects and chemical release from umbilical cores.(e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery).* More materials returned onshore than Options 2a) and 2b), but to licensed yards with yard personnel remote from deconstruct work as executed using appropriate equipment. *Potential for chemical release from recovered umbilicals when cut into sections at the yard (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery).* No residual risk as option will leave a clear seabed.	Short duration campaign for single vessel and minimal vessel transits to and from shore. Minimal materials or routine equipment handling on deck. No materials returned onshore. No increased risk to other users of the sea than currently under normal operations. *Additional rock berms at exposed sections will be installed to be over trawlable, however could become unstable over time and create a future long term snag hazard.*	Short duration campaign for single vessel and minimal vessel transits to and from shore. Minimal and routine equipment handling on deck. Although technical feasibility criteria highlights technical difficulties in achieving full trench and burying due to the amount of pipeline crossings and close proximity of lines to each other, the technical solution is not considered to introduce increased safety risk to the execution phase. No materials returned onshore. No increased risk to other users of the sea than currently under normal operations. No increased residual (long term) risk compared to existing operating condition, existing trenched and buried section remains over trawlable and exposed sections will be trenched and buried to become over trawlable and thus leave a clean seabed.
	AVERAGE RATING THIS CRITERION	Lower Impact	Moderate Impact	Moderate Impact	Lower Impact
	ENVIRONMENTAL	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the emissions associated with the offshore campaign is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Surface laid lines means disturbance to the seabed during recovery will be minimal. No additional material introduced to seabed to support decommissioning activities. *c* .1,577te of pipeline/ umbilical returned onshore to be processed, with potentially *c.* 182te to landfill (plastics and trapped chemicals from the umbilicals).	*Given the relatively long duration of the activities associated with this option, the magnitude of effect of the emissions associated with Option 1c) is considered significantly greater than the effects associated with the other options.* As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Surface laid lines means disturbance to the seabed during recovery will be minimal. No additional material introduced to seabed to support decommissioning activities. *c.1,577te of pipeline/ umbilical returned onshore to be processed, with potentially c.182te to landfill (plastics and trapped chemicals from the umbilicals).*	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the emissions associated with the offshore campaign is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. *This option is recognised to result in short term localised disturbance during rock placement. The footprint of this short term disturbance will extend the full length of pipelines and umbilicals within the group (c.33.9km).* *This option requires the addition of c.187,470te of new rock materials along the full length of the pipelines and umbilicals. Given the habitat types and volume of rock required, the long term impact of rock dumping the full length of lines in this group is considered Higher Impact (Red).* No materials returned onshore.	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the emissions associated with the offshore campaign is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. *This option is recognised to result in short term localised disturbance during trenching. The footprint of this short term disturbance is full length of pipelines (c. 33.9km). There is also potential for rock placement at pipelines crossings where trenching cannot be achieved.* *Although trenching and burying does not have a long term impact, the potential to introduce rock cover at the numerous crossings that cannot be trenched and buried is rated as Moderate Impact (Amber) given the habitat types in the area.* No materials returned onshore.
	AVERAGE RATING THIS CRITERION	Lower Impact	Moderate Impact	Higher Impact	Moderate Impact
	SOCIETAL	Option results in a clear seabed and therefore not anticipated to impact on commercial fisheries. Although significant volumes of materials would be returned onshore (when compared to the two remediate in-situ options where no materials are returned) the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	Option results in a clear seabed and therefore not anticipated to impact on commercial fisheries. Although significant volumes of materials would be returned onshore (when compared to the two remediate in-situ options where no materials are returned) the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	*As rock cover to be installed would be laid in line with industry standards and fishing industry requirements, it should be possible for fishing gear to fish in the area.* *However, if the rock berm did become unstable over time such that bottom trawl gear could not be used along the length of the rock berms (c.33.9km of pipelines and umbilicals) the industry could self-impose exclusions zones along the line lengths to prevent snagging and potential loss of fishing equipment.* No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	*Although less rock applied than Option 2a), if rock berms are applied at the numerous pipeline crossings that cannot be trenched and buried, these berms could become unstable overtime leading to snagging, lost nets, and the fishing industry creating a self-imposed exclusion zone.* No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.
	AVERAGE RATING THIS CRITERION	Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
	ECONOMIC RISK	Estimated at £2.83M which is 111% of lowest cost option. See [Note1] under option 2b). Minimal potential ongoing cost liability as all pipelines removed. Post project assessment survey only.	*Estimated at £26.38M which is 1,032% of lowest cost option.* Minimal potential ongoing cost liability as all pipelines removed. Post project assessment survey only.	*Estimated at £5.08M which is 199% of lowest cost option.* *Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion.* *Potential for some remediation activities (e.g. re-profile unstable rock berms)*	Estimated at £2.56M which is lowest cost option. [Note 1] The cost of the potential to rock cover the crossings that cannot be trenched and buried, has not been included in this estimate. The comparative cost of Option 2b) to Option1a) is likely to be closer than 111%, but will not affect the overall ranking of the options. *Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion.* *Potential for some remediation activities (e.g. re-profile unstable rock berms at crossings)*
	AVERAGE RATING THIS CRITERION	Lower Impact	Higher Impact	Moderate Impact	Moderate Impact
	OVERALL RATING	Lower Impact	Higher Impact	Higher Impact	Moderate Impact
	OVERALL RANKING	**1st**	**4th**	**3rd**	**2nd**
	COMMENTS	When average ratings by Main Criteria only are considered the rankings of each option does not change compared to the original R/A/G evaluation. Therefore, the recommendations concluded for the original evaluation remain in place.			

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Rigid and Flexible Pipelines and Umbilicals, Surface Laid

One 8" flexible x 7.5km, four 6" rigid x 13.1km (combined) and four umbilicals x 13.3km (combined).

VISUAL RATING SUMMARY: Sensitivity Analysis 1 - Specific Sub-Criteria

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:	
	Sub Criteria/ / Sub Options		a)	c)	a)	b)
			REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Lower Impact	Moderate Impact	Lower Impact	Moderate Impact
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
		To Those on Land	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term		Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
	Change of Habitat - Long Term		Lower Impact	Lower Impact	Higher Impact	Moderate Impact
	Waste Processing		Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different
ECONOMIC RISK	Cost for Decommissioning/ Removal activities		Lower Impact	Higher Impact	Moderate Impact	Lower Impact
	Cost for long term monitoring / Remediation activities		Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
OVERALL RATING			Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
OVERALL RANKING			1st	4th	3rd	2nd
Rating Count			Red =0 Amber =2 Green =10	Red =1 Amber =6 Green =5	Red = 1 Amber = 5 Green = 6	Red = 0 Amber = 6 Green = 6
COMMENTS	Option 1a) is ranked as the most preferred option and should be identified as such in the CA report and in the Decommissioning Programme (DP). All other options are rated sufficiently worse than Option 1a) that they may be discounted and not considered further in the CA report or in the DP.					

Rating changed from Low Impact (Green) to Moderate Impact (Amber).
Basis of sensitivity analysis is that there are a significant number of pipeline crossings associated with this pipeline group where trenching and burying at the crossing could not be achieved, therefore rock cover of the crossings may be an alternative option for each crossing, this would result in a similar risk from snagging for trawlers as Option 2a).

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Rigid and Flexible Pipelines and Umbilicals, Surface Laid

VISUAL RATING SUMMARY: Sensitivity Analysis 2 - Economic Risk Discounted

One 8" flexible x 7.5km, four 6" rigid x 13.1km (combined) and four umbilicals x 13.3km (combined).

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:	
	Sub Criteria/ / Sub Options		a)	c)	a)	b)
			REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Lower Impact	Moderate Impact	Lower Impact	Moderate Impact
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
		To Those on Land	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Lower Impact	Moderate Impact	Lower Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term		Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
	Change of Habitat - Long Term		Lower Impact	Lower Impact	Higher Impact	Moderate Impact
	Waste Processing		Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different
OVERALL RATING			Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
OVERALL RANKING			1st	3rd	4th	2nd
Rating Count			Red =0	Red =0	Red = 1	Red = 0
			Amber =2	Amber =6	Amber = 3	Amber = 4
			Green =8	Green =4	Green = 6	Green = 6
COMMENTS	Sensitivity Analysis 2 with Economic Risk Evaluation results discounted does not change the recommended most preferred option which remains Option 1a). Therefore, the recommendations concluded for the original evaluation remain in place for this sensitivity analysis. It is worth noting that Option 1c) improves slightly by discounting Economic Risk and becomes 3rd best option, however all other options remain rated sufficiently worse than Option 1a) that they may be discounted and not considered further in the CA report or in the DP.					

Rating Workbook - Tartan Group C.xlsx

Rigid Pipelines and Umbilicals, Trenched and Buried

TECHNICAL & SAFETY

Nine rigid pipelines from 3" to 12" dia. and combined length of 101km. Seven umbilicals with combined length of 83km. All buried to > 0.6m TOP.

Assessment Criteria			Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
			Sub Criteria/ / Sub Options	a)	a)	b)	c)
				REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY			Risk of Major Project Failure	Normal operational procedures proposed. Scope is straightforward and understood. Although the overall vessel campaign (*c*.79 days) is not significantly longer than each of the other options (ranging from *c*.48 to 60 days) there is significantly more material to be returned (184 km of line compared to *c.* 1.897km associated with Option 2c). There is therefore an order of magnitude of more effort involved and therefore potential for schedule slippage. Some 3rd party crossings associated with Tweedsmuir would be left to be decommissioned with the Tweedsmuir lines, as currently fully rock covered at the crossing.	Normal operational procedures proposed. Scope is straightforward and understood. Overall vessel duration similar to other options (*c*. 48 days), with only *c.* 1.897km of exposures to be rock covered. Offshore Execution Phase schedule is unlikely to slip beyond planned schedule plus contingencies applied. Some 3rd party crossings associated with Tweedsmuir would be left to be decommissioned with the Tweedsmuir lines, as currently fully rock covered at the crossing.	Normal operational procedures proposed. Scope is straightforward and understood. Overall vessel duration similar to other options (*c.* 44 days), with only *c.* 1.897km of exposures to be trenched and buried. Offshore Execution Phase schedule is unlikely to slip beyond planned schedule plus contingencies applied. Some 3rd party crossings associated with Tweedsmuir would be left to be decommissioned with the Tweedsmuir lines, as currently fully rock covered at the crossing.	Normal operational procedures proposed. Scope is straightforward and understood. Overall vessel duration similar to other options (*c.* 60 days), with only *c.* 1.897km of exposures to be recovered. Offshore Execution Phase schedule is unlikely to slip beyond planned schedule plus contingencies applied. Some 3rd party crossings associated with Tweedsmuir would be left to be decommissioned with the Tweedsmuir lines, as currently fully rock covered at the crossing.
			RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
			Technical Complexity & Track Record	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical Complexity not considered significantly different from other options.	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical Complexity not considered significantly different from other options.	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical Complexity not considered significantly different from other options.	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical Complexity not considered significantly different from other options.
			RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
			TECHNICAL: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**
SAFETY	Risk During Project Execution		To Project Personnel	Relatively short duration campaign (c.79 days). Some vessel SIMOPs (>2 vessels for up to 19 days). Deck crew interaction/ deck handling is low since pipelines and umbilicals are loaded directly onto reel. However, rated Moderate Impact (Amber) due to being an order of magnitude of more activity involved relative to the other options since *c*.184km/ *c.* 8,692te of pipeline/ umbilical is to be recovered, compared to *c.* 1.897km to be mitigated for the remaining options.	Short duration campaign (*c*.48 days) for single vessel. Minimal materials handling as application of rock cover is reasonably automatic with minimal deck crew intervention required.	Short duration campaign (c.44 days) for single vessel. Minimal and routine equipment handling (launching and recovery of trenching equipment and ROV) for deck crew.	Short duration campaign (c.60 days) for single vessel. Although materials are recovered to the vessel, it is a relatively small quantity (*c*.1.897km / *c.* 90te) and pipelines are not concrete coated, therefore no risk from spalling concrete when handling
			RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
			To Those on Land	Management of materials returned onshore will be at licenced yards. Rated as Moderate Impact (Amber) due to the significant quantity of materials returned onshore for dismantling (*c*.184km/ *c*.8,692te). Most deconstruct work in yard is remote from personnel and carried out using appropriate equipment. Potential for chemical release from recovered umbilicals when unreeled and cut into sections at the yard (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery).	No materials returned onshore for dismantling, therefore no risk. Initial supply of rock materials to the quayside is routine and not considered a risk specific to this project.	No materials returned onshore for dismantling, therefore no risk. Mobilisation and demobilisation of trenching equipment is routine and not considered risk specific to this project.	Management of materials returned onshore will be at licenced yards. Rated as Low Impact (Green) due to the negligible quantity of materials returned onshore for dismantling (*c*.1.897km / *c.* 90te)
			RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
			To Other Users of the Sea	No increased risk to other vessels than currently under normal operations. Campaign is relatively short duration (*c*.79 days), Few vessel transits to and from shore.	No increased risk to other vessels than currently under normal operations. Campaign is relatively short duration (*c*.48 days), requiring a single vessel in field at any time and given that activity is largely within 500m zone at each end of pipeline with a few locations at mid-span exposures only. In addition, there will be minimum vessel transits to and from shore (mob and demob).	No increased risk to other vessels than currently under normal operations. Campaign is relatively short duration (*c*.44 days), requiring a single vessel in field at any time and given that activity is largely within 500m zone at each end of pipeline with a few locations at mid-span exposures only. In addition, there will be minimum vessel transits to and from shore (mob and demob).	No increased risk to other vessels than currently under normal operations. Campaign is relatively short duration (c.60 days), requiring a single vessel in field at any time and given that activity is largely within 500m zone at each end of pipeline with a few locations at mid-span exposures only. In addition, there will be minimum vessel transits to and from shore (mob and demob).
			RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
			Residual (Long Term) Risk To Other Users of the Sea	No residual risk as option will leave a clear seabed.	Additional rock cover at exposed sections will be installed to be over trawlable, rating recognises potential for new rock berms to become unstable over time and create a snag hazard.	No increased risk compared to existing operating condition, existing trenched and buried section remains over trawlable and exposed sections will be trenched and buried to become over trawlable and thus leave a safe seabed.	No increased risk compared to existing operating condition, existing trenched section remains over trawlable and exposed sections will be removed at cut ends buried by redistribution of existing soils within the trench to leave a safe seabed.
			RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
			SAFETY: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**

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Rigid Pipelines and Umbilicals, Trenched and Buried

Nine rigid pipelines from 3" to 12" dia. and combined length of 101km. Seven umbilicals with combined length of 83km. All buried to > 0.6m TOP.

ENVIRONMENTAL

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options	a)	a)	b)	c)
		REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
ENVIRONMENTAL	**Impact of Decommissioning Operations Offshore** *(includes emissions to air, discharges to sea and underwater noise)*	Given the relatively short duration of the activities associated with this option (*c.* 79 days) the impact of the atmospheric emissions associated with the vessels is not considered significant. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with reverse reeling. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c.* 48 days) the impact of the atmospheric emissions associated with the vessels is not considered significant. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with the application of rock cover. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c.* 44 days) the impact of the atmospheric emissions associated with the vessels is not considered significant. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with trench and burial activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c* .60 days) the impact of the atmospheric emissions associated with the vessels is not considered significant. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with cutting of pipelines. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Seabed Disturbance- Short Term *(includes disturbance to the cuttings piles)*	Full length of pipelines to be deburied before removal (*c.* 184km). Noted that the main mound of the Tartan A cuttings piles will not be disturbed (all options) due to cut locations/ boundary limit of the pipelines at the Tartan A platform.	This option is recognised to result in short term localised disturbance during rock placement. The footprint of this short term disturbance is considered significantly smaller (*c.* 1.897km of pipeline) than the footprint of disturbance associated with 1a).	This option is recognised to result in short term localised disturbance during the trenching and burying activities. The footprint of this short term disturbance is considered significantly smaller (*c* .1.897km of pipeline) than the footprint of disturbance associated with 1a).	The short sections of line to be recovered (*c* .1.897km of pipeline) are exposed and it is expected that cutting will be carried out using hydraulic shears. The footprint of seabed to be disturbed is therefore considered significantly less than the area to be disturbed for Option 1a).
	RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term	No additional material to be introduced to the seabed to support decommissioning activities. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of Option 1a) on the existing habitat is not considered significant.	Sediments across the Tartan Development Area are considered to represent three main habitats: circalittoral fine mud (EUNIS A5.36), circalittoral sandy mud (EUNIS A5.35) and deep circalittoral mixed sediment (EUNIS A5.45). In addition, the majority of the Tartan Development Area, is considered to meet the criteria for the OSPAR listed threatened and/or declining habitat 'Sea pen and burrowing megafauna communities' as well as the UK Habitat Feature of Conservation Importance and UKBAP habitat 'mud habitats in deep water'. This options requires *c* .10,922te of new rock materials added to the 1.897km of exposed pipeline and umbilical sections. Given the habitat types and volume of rock required, the long term impact of rock dumping the full length of lines in this group is considered Moderate Impact (Amber). *Consider sensitivity analysis of Low Impact (Green) for this option (resulting in "not significantly different" across all option) due to relatively small quantity of rock added and taking account that one of the Galley pipelines already have 13km of rock cover.*	No additional material introduced to support decommissioning activities. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of Option 2b) on the existing habitat is not considered significant.	No additional material to be introduced to the seabed to support decommissioning activities. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of Option 2c) on the existing habitat is not considered significant.
	RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Waste Processing *(i.e. processing of returned materials and use of landfill)*	Application of this option would result in *c* .8,692te of materials returned onshore to be processed, with *c* .662te to landfill (plastics and trapped chemicals from the umbilicals).	No materials returned onshore.	No materials returned onshore.	Application of this option would result in *c.* 90te of material returned onshore to be processed, with potentially *c.* 8te to landfill (plastics and trapped chemicals from the umbilicals). The rating takes cognisance of the very small volumes of material to be returned when compared to Option 1a).
	RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	ENVIRONMENTAL: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**

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Rigid Pipelines and Umbilicals, Trenched and Buried

SOCIETAL & ECONOMIC RISK

Nine rigid pipelines from 3" to 12" dia. and combined length of 101km. Seven umbilicals with combined length of 83km. All buried to > 0.6m TOP.

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
		a)	a)	b)	c)
	Sub Criteria/ / Sub Options	REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
SOCIETAL	Impact on Commercial Fisheries	Option results in a clear seabed and therefore no anticipated impact commercial fisheries.	Rock cover to be installed will be laid in line with industry standards and fishing industry requirements. Therefore, it should be possible for bottom trawl fishing gear to be used in the area. However, it is recognised that the rock berm could become unstable overtime leading to snagging, lost nets, and the fishing industry creating a self-imposed exclusion zone. Therefore, given the length of exposed sections (*c.* 1.897km of pipelines) and the anticipated volume of rock to be added (*c .* 10,922 te) the impact on commercial fisheries is considered to be a Moderate Impact (Amber) when compared against other options. *Consider sensitivity analysis of Low Impact (Green) for this option (resulting in "not significantly different" across all options) since the rock cover will be installed in existing open trenches, with less rock profile above mean seabed level.*	Option results in a safe seabed as there would be no pipeline exposures remaining and therefore no anticipated impact on commercial fisheries.	Option results in a safe seabed as there would be no pipeline exposures remaining and therefore no anticipated impact on commercial fisheries.
	RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Socio-economic Impact on Communities and Amenities	Although significantly more materials returned onshore when compared to the other options, the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	Negligible quantity of materials returned such that impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant. In addition, no new onshore jobs anticipated.
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	SOCIETAL: OVERALL RATING - BASED ON AVERAGE	**Lower Impact**	**Moderate Impact**	**Lower Impact**	**Lower Impact**
ECONOMIC RISK	Cost for Decommissioning/ Removal activities	Estimated at £6.76M which is 223% of lowest cost option. Relative costs of this option (£2.64M greater than option 2c)) does not merit a rating of Higher Impact (Red). *Consider sensitivity analysis of Higher Impact (Red) for this option since estimated cost of this option is >200% of lowest cost option.*	Estimated at £3.41M which is 112% of lowest cost option.	Estimated at £3.03M which is the lowest cost option.	Estimated at £4.12M which is 136% of lowest cost option.
	RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Cost for long term monitoring / Remediation activities	Minimal potential ongoing cost liability as all pipelines removed. Post project assessment survey only.	Existing lines already buried will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities e.g. re-profile of existing rock berms (over the Galley pipeline) if it becomes unstable.	Existing lines already buried will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities e.g. re-profile of existing rock berms (over the Galley pipeline) if it becomes unstable.	Existing lines already buried will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities e.g. re-profile of existing rock berms (over the Galley pipeline) if it becomes unstable.
	RATING	Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
	ECONOMIC RISK: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**

Rating Workbook - Tartan Group C.xlsx

Rigid Pipelines and Umbilicals, Trenched and Buried

VISUAL RATING SUMMARY - HEATMAP

Nine rigid pipelines from 3" to 12" dia. and combined length of 101km. Seven umbilicals with combined length of 83km. All buried to > 0.6m TOP.

Assessment Criteria			Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
			Sub Criteria/ / Sub Options	a)	a)	b)	c)
				REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY			Risk of Major Project Failure	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
			Technical Complexity & Track Record	Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution		To Project Personnel	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
			To Those on Land	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
			To Other Users of the Sea	Not significantly different	Not significantly different	Not significantly different	Not significantly different
			Residual (Long Term) Risk To Other Users of the Sea	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
ENVIRONMENTAL			Impact of Decommissioning Operations Offshore	Not significantly different	Not significantly different	Not significantly different	Not significantly different
			Seabed Disturbance- Short Term	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
			Change of Habitat - Long Term	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
			Waste Processing	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
SOCIETAL			Impact on Commercial Fisheries	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
			Socio-economic Impact on Communities and Amenities	Not significantly different	Not significantly different	Not significantly different	Not significantly different
ECONOMIC RISK			Cost for Decommissioning/ Removal activities	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
			Cost for long term monitoring / Remediation activities	Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
			OVERALL RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
			OVERALL RANKING	4th	3rd	1st=	1st=
			Rating Count	Red =0	Red = 0	Red = 0	Red = 0
				Amber =6	Amber = 4	Amber = 1	Amber = 1
				Green =4	Green = 6	Green = 9	Green = 9
			COMMENTS	Options 2b) and 2c) are rated as first equal as individual sub-criteria ratings are identical across all ratings. However for the purpose of declaring a single "most preferred option" in the Decommissioning Programme (DP) Option 2b) will be declared as the most preferred option as it aligns with other pipeline group most preferred which would result in a consistent and wider campaign strategy across the pipeline groups. Option 2a) is rated only marginally worse than options 2b) and 2c), because Option 2a) introduces a number of small new rock berms to the seabed. Since Options 2a), 2b) and 2c) are rated only marginally different, it is recommended that all three options are carried forward to the C&P tendering phase to enable the EPRD contractors the input to the preferred option from an economic and overall campaign strategy taking account of other pipeline groups in the field. It is recommended that Option 1a) is discounted at this stage and not considered further.			

Rating Workbook - Tartan Group C.xlsx

Rigid Pipelines and Umbilicals, Trenched and Buried

NARRATIVE SUMMARY:

Sub-criteria ratings have been averaged by main criteria.

Red / italic in the cells text below highlights the main areas of influence in a combined rating evaluation poorer than Low Impact (Green).

Nine rigid pipelines from 3" to 12" dia. and combined length of 101km. Seven umbilicals with combined length of 83km. All buried to > 0.6m TOP.

SUMMARY

Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
Sub Criteria/ / Sub Options	a)	a)	b)	c)
	REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Technical complexity is not significantly different from other options. *Although the overall vessel campaign (c.79 days) is not significantly longer than each of the other options (ranging from c. 48 to 60 days) there is significantly more material to be returned (184 km of line compared to c.1.897km associated with Option 2c). There is therefore an order of magnitude of more effort involved and therefore potential for schedule slippage.*	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Technical complexity is not significantly different from other options. Overall vessel duration similar to other options (*c* .48 days) with only *c* .1.897km of exposures to be rock covered. Campaign unlikely to slip beyond planned schedule plus contingencies applied.	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Technical complexity is not significantly different from other options. Overall vessel duration similar to other options (*c.* 44 days) with only *c.* 1.897km of exposures to be trenched and buried. Campaign unlikely to slip beyond planned schedule plus contingencies applied.	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Technical complexity is not significantly different from other options. Overall vessel duration similar to other options (*c* . 60 days) with only *c.* 1.897km of exposures to be cut and removed. Campaign unlikely to slip beyond planned schedule plus contingencies applied.
AVERAGE RATING THIS CRITERION	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
SAFETY	Relatively short duration campaign (*c* .79 days). Some vessel SIMOPs (>2 vessels for up to 19 days). Deck crew interaction/ deck handling is low since pipelines and umbilicals are loaded directly onto reel. *However rated Moderate Impact (Amber) due to being an order of magnitude of more activity involved relative to the other options since c.184km/ c.8,692te of pipeline/ umbilical is to be recovered, compared to c.1.897km to be mitigated for the remaining options.* *Management of materials returned onshore will be at licenced yards. Rated as Moderate Impact (Amber) due to the significant quantity of materials returned onshore for dismantling (c.184km/ c.8,692te) compared to Option 2c) (c.1.897km/ c.90te). Most deconstruct work in yard is remote from personnel and carried out using appropriate equipment.* *Potential for chemical release from recovered umbilicals when unreeled and cut into sections at the yard (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery).* No increased risk to other vessels than currently under normal operations. No residual risk as option will leave a safe seabed.	Short duration campaign (*c.* 48 days) for single vessel in field at any time activity largely within 500m zone at each end of pipeline with a few locations at mid-span exposures only. Minimum vessel transits to and from shore (mob and demob). Minimal materials handling as application of rock cover is reasonably automatic with minimal deck crew intervention required. No materials returned onshore for dismantling, therefore no risk. Initial supply of rock materials to the quayside is routine and not considered a risk specific to this project. No increased risk to other vessels than currently under normal operations. Additional rock cover at exposed sections will be installed to be over trawlable, rating recognises potential for new rock berms to become unstable over time and create a snag hazard.	Short duration campaign (*c.* 44 days) for single vessel in field at any time activity largely within 500m zone at each end of pipeline with a few locations at mid-span exposures only. Minimum vessel transits to and from shore (mob and demob). Minimal and routine equipment handling (launching and recovery of trenching and burying equipment and ROV) for deck crew. No materials returned onshore for dismantling, therefore no risk. No increased risk to other vessels than currently under normal operations. No increased risk compared to existing operating condition, existing trenched and buried section remains over trawlable and exposed sections will be trenched and buried to become over trawlable and thus leave a safe seabed.	Short duration campaign (*c*.60 days) for single vessel in field at any time activity largely within 500m zone at each end of pipeline with a few locations at mid-span exposures only. Few vessel transits to and from shore (mob and demob). Although materials are recovered to the vessel, it is a relatively small quantity (*c*.1.879km /90te). Management of materials returned onshore will be at licenced yards. Rated as Low Impact (Green) due to the negligible quantity of materials returned onshore for dismantling. No increased risk to other vessels than currently under normal operations. No increased risk compared to existing operating condition, existing trenched section remains over trawlable and exposed sections will be removed at cut ends buried or rock covered within trench to leave a safe seabed.
AVERAGE RATING THIS CRITERION	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
ENVIRONMENTAL	Given the relatively short duration of the activities associated with this option (*c.* 79 days) the impact of the atmospheric emissions associated with the vessels is not considered significant. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. *Rated Moderate Impact (Amber) for short term seabed disturbance as the full length of pipelines to be deburied before removal (c.184km).* *No additional material to be introduced to the seabed to support decommissioning activities. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed.* *Rated Moderate Impact (Amber) for waste processing as application of this option would result in c.8,692te of materials returned onshore to be processed, with c.662te to landfill (plastics and trapped chemicals from the umbilicals).*	Given the relatively short duration of the activities associated with this option (*c.* 48 days) the impact of the atmospheric emissions associated with the vessels is not considered significant. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. This option is recognised to result in short term localised disturbance during rock placement. The footprint of this short term disturbance is considered significantly smaller than the footprint of disturbance associated with 1a). This option requires c.10,922te of new rock materials added to the 1.897km of exposed pipeline and umbilical sections. Given the habitat types and volume of rock required, the long term impact of rock dumping the full length of lines in this group is considered Moderate Impact (Amber) for change of habitat. No materials returned onshore.	Given the relatively short duration of the activities associated with this option (*c* .44 days) the impact of the atmospheric emissions associated with the vessels is not considered significant. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. This option is recognised to result in short term localised disturbance during the trenching and burying activities. The footprint of this short term disturbance is considered significantly smaller than the footprint of disturbance associated with 1a). No additional material introduced to support decommissioning activities. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. No materials returned onshore.	Given the relatively short duration of the activities associated with this option (*c* .60 days) the impact of the atmospheric emissions associated with the vessels is not considered significant. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. The short sections of line to be recovered are exposed and it is expected that cutting will be carried out using hydraulic shears. The footprint of seabed to be disturbed is therefore considered significantly less than the area to be disturbed for Option 1a). No additional material introduced to support decommissioning activities. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Application of this option would result in *c.* 90te of material returned onshore to be processed, with *c* .8te to landfill (plastics and trapped chemicals from the umbilicals). The rating takes cognisance of the very small volumes of material to be returned when compared to Option 1a).
AVERAGE RATING THIS CRITERION	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
SOCIETAL	Option results in a safe seabed and therefore no anticipated impact on commercial fisheries. Although significantly more materials returned onshore when compared to the other options, the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	*Rock cover to be installed would be laid in line with industry standards and fishing industry requirements. Therefore, it should be possible for fishing gear to fish in the area. However, it is recognised that the rock berm could become unstable overtime leading to snagging, lost nets, and the fishing industry creating a self-imposed exclusion zone. Therefore, given the length of exposed sections (c.1.897km of pipelines) and the anticipated volume of rock to be added (c.10,922 te) the impact on commercial fisheries is considered to be a Moderate Impact (Amber) when compared against other options.* No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	Option results in a safe seabed and therefore no anticipated impact on commercial fisheries. No materials returned, such that no new onshore jobs anticipated. Similarly no impact on communities and amenities.	Option results in a safe seabed and therefore no anticipated impact on commercial fisheries. Negligible quantity of materials returned such that impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant. In addition, no new onshore jobs anticipated.
AVERAGE RATING THIS CRITERION	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
ECONOMIC RISK	*Rated Moderate Impact (Amber) as estimated at £6.76M which is 223% of lowest cost option.* *Relative costs of this option (£1.3M greater than option 2c)) does not merit a rating of Higher Impact (Red).* Minimal potential ongoing cost liability as all pipelines removed. Post project assessment survey only.	Estimated at £3.41M which is 112% of lowest cost option. Existing lines already buried will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities e.g. re-profile of existing rock berms (over the Galley pipeline) if it becomes unstable.	Estimated at £3.03M which is the lowest cost option. Existing lines already buried will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities e.g. re-profile of existing rock berms (over the Galley pipeline) if it becomes unstable.	Estimated at £4.12M which is 136% of lowest cost option. Existing lines already buried will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities e.g. re-profile of existing rock berms (over the Galley pipeline) if it becomes unstable.
AVERAGE RATING THIS CRITERION	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
OVERALL RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
OVERALL RANKING	**4th**	**3rd**	**1st=**	**1st=**
COMMENTS	When average ratings by Main Criteria only are considered, the rankings of each option does not change compared to the original R/A/G evaluation. Therefore, the recommendations concluded for the original evaluation remain in place.			

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Rigid Pipelines and Umbilicals, Trenched and Buried

Nine rigid pipelines from 3" to 12" dia. and combined length of 101km. Seven umbilicals with combined length of 83km. All buried to > 0.6m TOP.

VISUAL RATING SUMMARY: Sensitivity Analysis 1 - Specific Sub-Criteria

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options		a)	a)	b)	c)
			REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Those on Land	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Moderate Impact	Lower Impact	Lower Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Seabed Disturbance- Short Term		Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term		Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different
	Waste Processing		Moderate Impact	Lower Impact	Lower Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different
ECONOMIC RISK	Cost for Decommissioning/ Removal activities		Higher Impact	Lower Impact	Lower Impact	Lower Impact
	Cost for long term monitoring / Remediation activities		Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
OVERALL RATING			Moderate Impact	Lower Impact	Lower Impact	Lower Impact
OVERALL RANKING			4th	3rd	1st=	1st=
Rating Count			Red =1 Amber =5 Green =2	Red = 0 Amber = 2 Green = 6	Red = 0 Amber = 1 Green = 7	Red = 0 Amber = 1 Green = 7
COMMENTS			Options 2b) and 2c) remain rated as first equal as individual sub-criteria ratings are identical across all ratings. However, for the purpose of declaring a single "most preferred option" in the Decommissioning Programme (DP) Option 2b) will be declared as the most preferred option as it aligns with other pipeline group most preferred which would result in a consistent and wider campaign strategy across the pipeline groups. Option 2a) performs better under this sensitivity analysis than the original R/A/G evaluation and is rated only marginally worse than options 2b) and 2c), where Residual Safety Risk is rated Moderate Impact (Amber) due to the fact that the rock berms could become unstable overtime and cause a future snagging hazard. Since Options 2a), 2b) and 2c) are rated only marginally different, it is recommended that all three options are carried forward to the C&P tendering phase to enable the EPRD contractors the input to the preferred option from an economic and overall campaign strategy taking account of other pipeline groups in the field. Option 1a) performs more poorly under this sensitivity analysis and is recommended t be discounted at this stage and not considered further.		

Rating changed from Moderate Impact (Amber) to Low Impact (Green) which results in all options for this sub-criterion becoming "not significantly different".
Basis of sensitivity analysis is that there is a relatively small quantity of rock added and taking account that one of the Galley pipelines already has 13km of rock cover.

Rating changed from Moderate Impact (Amber) to Low Impact (Green) which results in all options for this sub-criterion becoming "not significantly different".
Basis of sensitivity analysis is that the rock cover will be installed in existing open trenches, with less rock profile above mean seabed level.

Rating changed from Moderate Impact (Amber) to Higher Impact (Red).
Basis of sensitivity analysis is that estimated cost of this option is >200% of lowest cost option.

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Rigid Pipelines and Umbilicals, Trenched and Buried

VISUAL RATING SUMMARY: Sensitivity Analysis 2 - Economic Risk Discounted

Nine rigid pipelines from 3" to 12" dia. and combined length of 101km. Seven umbilicals with combined length of 83km. All buried to > 0.6m TOP.

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options		a)	a)	b)	c)
			REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Those on Land	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Moderate Impact	Lower Impact	Lower Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Seabed Disturbance- Short Term		Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term		Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Waste Processing		Moderate Impact	Lower Impact	Lower Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different
OVERALL RATING			Moderate Impact	Lower Impact	Lower Impact	Lower Impact
OVERALL RANKING			4th	3rd	1st=	1st=
Rating Count			Red =0	Red = 0	Red = 0	Red = 0
			Amber =5	Amber = 3	Amber = 0	Amber = 0
			Green =3	Green = 5	Green = 8	Green = 8
COMMENTS			Sensitivity Analysis 2 with Economic Risk Evaluation results discounted, does not change the overall rankings compared to the original R/A/G evaluation. Therefore the recommendations concluded for the original evaluation remain in place for this sensitivity analysis.			

Rating Workbook - Tartan Group D1.xlsx

Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL >0.6m

Four 8" dia rigid pipelines combined length of 7.7km. Two umbilicals with combined length of 3.8km.

TECHNICAL & SAFETY

Assessment Criteria		Decommissioning Options	1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:		
			a)	c)	a)	b)	c)
		Sub Criteria/ / Sub Options	REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY		Risk of Major Project Failure	Normal operational procedures proposed. Scope is straightforward and understood and this option has the shortest overall vessel duration of c.18 days. Given the routine nature of the operations, the risk of major project failure is not considered to be not significantly different from other options. Consider sensitivity analysis of Moderate Impact (Amber) for this option and Option 1c), with other options being Low Impact (Green) to recognise that there are c.11.4km of pipelines/ umbilicals to be recovered with this option compared to only c. 620m in Option 2c) and no pipelines recovered for Option 2a) and 2b). There is therefore and order of magnitude of more effort involved and therefore potential for schedule slippage.	Normal operational procedures proposed. Scope is straightforward and understood and this option has the longest overall vessel duration of c.206 days, but campaign expected to be within one season. Given the routine nature of the operations, the risk of major project failure is not considered to be not significantly different from other options. . Consider sensitivity analysis of Moderate Impact (Amber) for this option and Option 1a), with other options being Low Impact (Green) to recognise that there are c.11.4km of pipelines/ umbilicals to be recovered with this option compared to only c. 620m in Option 2c) and no pipelines recovered for Option 2a) and 2b). There is therefore and order of magnitude of more effort involved and therefore potential for schedule slippage.	Normal operational procedures proposed. Scope is straightforward and understood and this option has the overall vessel duration of *c.* 23 days. Given the routine nature of the operations, the risk of major project failure is not considered to be not significantly different from other options.	Normal operational procedures proposed. Scope is straightforward and understood and this option has the overall vessel duration of *c* .20 days. Given the routine nature of the operations, the risk of major project failure is not considered to be not significantly different from other options.	Normal operational procedures proposed. Scope is straightforward and understood and this option has the overall vessel duration of *c* .29 days. Given the routine nature of the operations, the risk of major project failure is not considered to be not significantly different from other options.
		RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
		Technical Complexity & Track Record	Uses established technology and working methods such that the activities have a low level of technical complexity associated with them. It is considered that reverse reeling of the Galley pipelines which have extra thick wall thickness and are part of this pipelines group will be achievable. In addition, there is a large experienced contractor pool available.	Uses established technology and working methods such that the activities have a low level of technical complexity associated with them. In addition, there is a large experienced contractor pool available.	Uses established technology and working methods such that the activities have a low level of technical complexity associated with them. In addition, there is a large experienced contractor pool available.	Uses established technology and working methods such that the activities have a low level of technical complexity associated with them. In addition, there is a large experienced contractor pool available.	Uses established technology and working methods such that the activities have a low level of technical complexity associated with them. In addition, there is a large experienced contractor pool available.
		RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
		TECHNICAL: OVERALL RATING BASED ON AVERAGE	**Not Significantly Different**	**Not Significantly Different**	**Not Significantly Different**	**Not Significantly Different**	**Not Significantly Different**
SAFETY	Risk During Project Execution	To Project Personnel	Short duration campaign (c.18 days) for single vessel and no vessel SIMOPS. Deck crew interaction/ deck handling is low since pipelines and umbilicals are loaded directly onto reel. However, rated Moderate Impact (Amber) since more effort and activity is involved relative to Options 2a), 2b) and 2c) since *c.* 11.4km / c.996te of pipeline/umbilical is to be recovered compared to c.620m/ 76te for Option 2c) and none for Options 2a) and 2b). Also potential for chemical release when umbilicals are recovered to deck. (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery). Consider sensitivity analysis of Low Impact (Green) for this option since it has the shortest vessel duration of all options.	Much longer vessel duration (*c.* 206 days) compared to other options. Some vessel SIMOPs (>2 vessels for up to 79 days). Pipelines would be cut and lifted to deck in *c.* 24m lengths, however umbilicals would be lifted as one piece and recovered to deck before being restrained and cut into manageable sections on deck. More deck crew interaction and significant repetitive materials handling than other Options and for a much longer period. Also potential for chemical release when umbilicals are recovered to deck. (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery).	Short duration campaign (*c* .23 days) for single vessel. No Minimal materials handling as application of rock cover is reasonably automatic with minimal deck crew intervention required.	Short duration campaign (*c* .20 days) for single vessel. Minimal and routine equipment handling (launching and recovery of trenching equipment and ROV) for deck crew.	Short duration campaign (*c.* 29 days) for single vessel. Although materials are recovered to the vessel, it is a relatively small quantity (*c* .620m / *c* .76te) and pipelines are not concrete coated, therefore no risk from spalling concrete when handling Also potential for chemical release when umbilicals are recovered to deck. (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery).
		RATING	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Those on Land	Management of materials returned onshore will be at licenced yards. Rated as Moderate Impact (Amber) due to the quantity of materials returned onshore for dismantling (*c.* 11.4km / *c.* 996te) compared to other options. Most deconstruct work in yard is remote from personnel and carried out using appropriate equipment. Potential for chemical release from recovered umbilicals when unreeled and cut into sections at the yard (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery).	Management of materials returned onshore will be at licenced yards. Rated as Moderate Impact (Amber) due to the quantity of materials returned onshore for dismantling (*c.* 11.4km / *c.* 996te) compared to other options. Most deconstruct work in yard is remote from personnel and carried out using appropriate equipment. Potential for chemical release from recovered umbilicals when cut into smaller sections at the yard (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery).	No materials returned onshore for dismantling, therefore no risk. Initial supply of rock materials to the quayside is routine and not considered a risk specific to this project.	No materials returned onshore for dismantling, therefore no risk. Mobilisation and demobilisation of trenching equipment is routine and not considered risk specific to this project.	Management of materials returned onshore will be at licenced yards. Rated as Low Impact (Green) due to the negligible quantity of materials returned onshore for dismantling (*c* .620m / *c* .76te).
		RATING	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	No increased risk to other vessels than currently under normal operations. Campaign is shortest duration of all options (*c.* 18 days) and few vessel transits to and from shore.	Longest vessel duration of all options (*c* .206 days) and more vessel transits than other options. However risk to other users of the sea can be mitigated therefore considered a Moderate Impact(Amber) impact when compared to other options.	No increased risk to other vessels than currently under normal operations. Relatively short campaign duration (*c.* 23 days) and few vessel transits to and from shore.	No increased risk to other vessels than currently under normal operations. Relatively short campaign duration (*c.* 20 days) and few vessel transits to and from shore.	No increased risk to other vessels than currently under normal operations. Relatively short campaign duration (*c* .29 days) and few vessel transits to and from shore.
		RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		Residual (Long Term) Risk To Other Users of the Sea	No residual risk as option will leave a clear seabed.	No residual risk as option will leave a clear seabed.	Additional rock cover at exposed sections will be installed to be over trawlable, rating recognises potential for new rock berms to become unstable over time and create a snag hazard. *Consider sensitivity analysis of Low Impact (Green) for this option since the rock application will be within existing open trench and therefore rock berm profile will be less evident above mean seabed level.*	No increased risk compared to existing operating condition, existing trenched and buried section remains over trawlable and exposed sections will be trenched and buried to become over trawlable and thus leave a clean safe seabed.	No increased risk compared to existing operating condition, existing trenched section remains over trawlable and exposed sections will be removed and cut ends buried within the trench to leave a safe seabed.
		RATING	Lower Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
		SAFETY: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Moderate Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**

Rating Workbook - Tartan Group D1.xlsx

Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL >0.6m

ENVIRONMENTAL

Four 8" dia rigid pipelines combined length of 7.7km. Two umbilicals with combined length of 3.8km.

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:		
		a)	c)	a)	b)	c)
	Sub Criteria/ / Sub Options	REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
ENVIRONMENTAL	**Impact of Decommissioning Operations Offshore** *(includes emissions to air, discharges to sea and underwater noise)*	Given the relatively short duration of the activities associated with this option (*c.* 18 days), the magnitude of effect of the emissions associated with the offshore campaign is considered significantly less than for Option 1c) (*c* .206 days). As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with reverse reeling. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Taking account of the length of the vessel campaigns associated with the different decommissioning options: *c.* 206 days for Option 1c) and between *c.* 18 and *c.* 29 days for the remaining options, the magnitude of effect of the emissions associated with Option 1c) is considered significantly greater than the effects associated with the other options. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with cutting activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c.* 23 days), the magnitude of effect of the emissions associated with the offshore campaign is considered significantly less than for Option 1c) (*c.* 206 days). As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with the application of rock cover. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c.* 20 days), the magnitude of effect of the emissions associated with the offshore campaign is considered significantly less than for Option 1c) (*c.* 206 days). As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with trench and burial activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c.* 29 days), the magnitude of effect of the emissions associated with the offshore campaign is considered significantly less than for Option 1c) (*c.* 206 days). As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with pipeline cutting. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.
	RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term *(includes disturbance to the cuttings piles)*	The full length of line may require to be deburied before reverse reeling, though it may also be possible to recover the lines without initial deburial by pulling them through the sediment. Design of pipelines and depth of sediment cover contributes to this assumption. As total line lengths is *c.* 11.4km short term seabed disturbance is not considered significant. In addition, none of the lines in this group tie into the Tartan platform such that the different decommissioning options do not impact on the Tartan A cuttings pile. It is recognised that some cuttings at the Galley field may be disturbed by each of the decommissioning options, however given the low concentration of hydrocarbons in the Galley cuttings, the impacts of any localised disturbance is not considered significant. Therefore, the short term impact is not considered significant different from the other options.	It is possible that only spot deburial will be required at cut locations and pipeline sections are then pulled through the sediment cover. As total line lengths is *c.* 11.4 km short term seabed disturbance is not considered significant different to the other options. *Consider sensitivity analysis of Moderate Impact (Amber) and Low Impact (Green) for all other options ias during recovery the pipelines sections may be laid down in groups on the seabed or into baskets to be recovered which would lead to additional seabed disturbance, compared to other options.*	This option is recognised to result in short term localised disturbance during rock placement. The footprint of this short term disturbance is small (*c.* 620m of pipeline). The impact of short term disturbance to the seabed is therefore not considered significantly different from other options.	This option is recognised to result in short term localised disturbance during the trenching and burying activities. The footprint of this short term disturbance is small (*c.* 620m of pipeline). The impact of short term disturbance to the seabed is therefore not considered significantly different from other options.	The short sections of line to be recovered (*c.* 620m of pipeline) are exposed and it is expected that cutting will be carried out using hydraulic shears. The impact of short term disturbance to the seabed is therefore not considered significantly different from other options.
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Change of Habitat - Long Term	No additional material to be introduced to the seabed to support decommissioning activities. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of this option on the existing habitat is not considered significant.	No additional material to be introduced to the seabed to support decommissioning activities. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of this option on the existing habitat is not considered significant.	Sediments across the Tartan Development Area are considered to represent three main habitats: circalittoral fine mud (EUNIS A5.36), circalittoral sandy mud (EUNIS A5.35) and deep circalittoral mixed sediment (EUNIS A5.45). In addition, the majority of the Tartan Development Area, is considered to meet the criteria for the OSPAR listed threatened and/or declining habitat 'Sea pen and burrowing megafauna communities' as well as the UK Habitat Feature of Conservation Importance and UKBAP habitat 'mud habitats in deep water'. This option requires the addition of *c* .3,975te of new rock cover to be added to the exposed line sections. Given the habitat types and volume of rock required, the long term impact of rock dumping is considered as Moderate Impact (Amber).	No additional material to be introduced to the seabed to support decommissioning activities. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of this option on the existing habitat is not considered significant.	No additional material to be introduced to the seabed to support decommissioning activities. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of this option on the existing habitat is not considered significant.
	RATING	Lower Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Waste Processing *(i.e. processing of returned materials and use of landfill)*	Application of this option would result in *c.* 996te of pipeline/ umbilical returned onshore to be processed, with *c.* 15te to landfill (i.e. plastics and trapped chemicals from the umbilicals).	Application of this option would result in *c.* 996te of pipeline/ umbilical returned onshore to be processed, with *c* .15te to landfill (i.e. plastics and trapped chemicals from the umbilicals).	No materials returned onshore.	No materials returned onshore.	Application of this option would result in *c.* 76te of pipeline/ umbilical returned onshore to be processed, with *c* .0.3te to landfill (i.e. plastics and trapped chemicals from the umbilicals). Low Impact (Green) rating as there is only small quantity of materials returned onshore.
	RATING	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	ENVIRONMENTAL: OVERALL RATING BASED ON AVERAGE	**Lower Impact**	**Moderate Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**

Rating Workbook - Tartan Group D1.xlsx

Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL >0.6m

SOCIETAL & ECONOMIC RISK

Four 8" dia rigid pipelines combined length of 7.7km. Two umbilicals with combined length of 3.8km.

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options	a)	c)	a)	b)	c)
		REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
SOCIETAL	Impact on Commercial Fisheries	Option results in a clear seabed and therefore not anticipated impact on commercial fisheries.	Option results in a clear seabed and therefore not anticipated impact on commercial fisheries.	Rock cover to be installed will be laid in line with industry standards and fishing industry requirements. Therefore, it should be possible for bottom trawl fishing gear to be used in the area. However, it is recognised that the rock berm could become unstable overtime leading to snagging, lost nets, and the fishing industry creating a self-imposed exclusion zone. Taking account of the short length of exposed sections (*c.* 620 m of pipelines) to be rock covered and the anticipated volume of rock to be added (*c* .3,975 te) the impact on commercial fisheries is considered to be a Moderate Impact (Amber) when compared against other options. *Consider sensitivity analysis of Low Impact (Green) for this option (resulting in "not significantly different" across all options) since the rock cover will be installed in existing open trenches, with less rock profile above mean seabed level.*	Option results in a safe seabed as there would be no exposed line lengths remaining and no anticipated impact on commercial fisheries.	Option results in a safe seabed as there would be no exposed line lengths remaining and no anticipated impact on commercial fisheries.
	RATING	Lower Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Socio-economic Impact on Communities and Amenities	Although more materials returned onshore when compared to the remediate in-situ options, the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	Although more materials returned onshore when compared to the remediate in-situ options, the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	Negligible quantity of materials returned such that impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant. In addition, no new onshore jobs anticipated.
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	SOCIETAL: OVERALL RATING - BASED ON AVERAGE	**Lower Impact**	**Lower Impact**	**Moderate Impact**	**Lower Impact**	**Lower Impact**
ECONOMIC RISK	Cost for Decommissioning/ Removal activities	Estimated at £2.59M which is 186% of lowest cost option. Relative costs of this option (£0.77M greater than option 2c)) does not merit a rating of Higher Impact (Red). *Consider sensitivity analysis of Low Impact (Green) for this option since estimated cost of this option is within £1.0M of other Options which have been rated as Low Impact (Green)*	Estimated at £9.49M which is 682% of lowest cost option.	Estimated at £1.68M which is 121% of lowest cost option.	Estimated at £1.39M which is the lowest cost option.	Estimated at £1.82M which is 130% of lowest cost option.
	RATING	Moderate Impact	Higher Impact	Lower Impact	Lower Impact	Lower Impact
	Cost for long term monitoring / Remediation activities	Minimal potential ongoing cost liability as all pipelines removed. Post project assessment survey only.	Minimal potential ongoing cost liability as all pipelines removed. Post project assessment survey only.	Existing lines already buried will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities (e.g. re-profile unstable rock berms)	Existing lines already buried will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Less potential for remedial work post project as newly buried sections of line unlikely to unbury.	Existing lines already buried will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Less potential for remedial work post project as exposed sections of line have been removed.
	RATING	Lower Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	ECONOMIC RISK: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Higher Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**

Rating Workbook - Tartan Group D1.xlsx

Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL >0.6m

Four 8" dia rigid pipelines combined length of 7.7km. Two umbilicals with combined length of 3.8km.

VISUAL RATING SUMMARY - HEATMAP

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options		a)	c)	a)	b)	c)
			REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Those on Land	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Loss of Habitat - Long Term		Lower Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Waste Processing		Moderate Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
ECONOMIC RISK	Cost for Decommissioning/ Removal activities		Moderate Impact	Higher Impact	Lower Impact	Lower Impact	Lower Impact
	Cost for long term monitoring / Remediation activities		Lower Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
OVERALL RATING			Moderate Impact	Higher Impact	Moderate Impact	Lower Impact	Lower Impact
OVERALL RANKING			3rd=	5th	3rd=	1st=	1st=
Rating Count			Red =0	Red =1	Red = 0	Red = 0	Red = 0
			Amber =4	Amber =5	Amber = 4	Amber = 0	Amber = 0
			Green =6	Green =4	Green = 6	Green = 10	Green = 10
COMMENTS	Options 2b) and 2c) are rated as first equal as individual sub-criteria ratings are identical across all ratings, all Low Impact (Green). However, for the purpose of declaring a single "most preferred option" in the Decommissioning Programme (DP) Option 2b) will be declared as the most preferred option as it aligns with other pipeline group most preferred which would result in a consistent and wider campaign strategy across the pipeline groups. Options 1a) and 2a) are rated as 3rd equal, each having four Moderate Impact (Amber) ratings more than the most preferred option. However, referring to Sensitivity Analysis 1, the performance of Option 2a) improves and is closer to Options 2b) and 2c) Option 2a) is rated only marginally worse than options 2b) and 2c), because Option 2a) introduces a number of small new rock berms to the seabed. Since Options 2a), 2b) and 2c) are rated only marginally different, it is recommended that all three options are carried forward to the C&P tendering phase to enable the EPRD contractors the input to the preferred option from an economic and overall campaign strategy taking account of other pipeline groups in the field. It is recommended that Options 1a)* and 1c) is discounted at this stage and not considered further. *See Sensitivity Analysis 1 results which reinforce the decision for option 1a)						

Rating Workbook - Tartan Group D1.xlsx

Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL >0.6m

NARRATIVE SUMMARY:

Sub-criteria ratings have been averaged by main criteria.

Red/ italic text in cells below highlights the main areas of influence in a combined rating evaluation poorer than Low Impact (Green).

Four 8" dia rigid pipelines combined length of 7.7km. Two umbilicals with combined length of 3.8km.

SUMMARY

Decommissioning Options	1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:		
Sub Criteria/ / Sub Options	a)	c)	a)	b)	c)
	REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Relatively short vessel durations. Given the routine nature of the operations, the risk of major project failure is not considered to be not significantly different from other options.	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Although the overall vessel duration is longer than other options, given the routine nature of the operations, the risk of major project failure is not considered to be not significantly different from other options.	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Relatively short vessel durations. Given the routine nature of the operations, the risk of major project failure is not considered to be not significantly different from other options.	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Relatively short vessel durations. Given the routine nature of the operations, the risk of major project failure is not considered to be not significantly different from other options.	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Relatively short vessel durations. Given the routine nature of the operations, the risk of major project failure is not considered to be not significantly different from other options.
AVERAGE RATING THIS CRITERION	Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different
SAFETY	Short duration campaign for single vessel with few vessel transits to and from shore. Deck crew interaction with materials is low as pipelines and umbilicals are loaded directly onto reel. *However, rated Moderate Impact (Amber) for risk to vessel deck crew and yard crew since more effort and activity is involved relative to Options 2a), 2b) and 2c) since c.11.4km / c.996te of pipeline/umbilical is to be recovered and managed onshore compared to only c.620m/ 76te for Option 2c) and none for Options 2a) and 2b).* *Also potential for chemical release from umbilicals (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery).* No increased risk to other vessels than currently under normal operations. No residual risk as option will leave a clear seabed.	*Much longer vessel duration compared to other options with multiple vessel SIMOPS and more vessel transit days than other options. However, risk to other users of the sea can be mitigated therefore considered a Moderate Impact (Amber) impact when compared to other options.* *More deck crew interaction and significant repetitive materials handling than other options, also potential for chemical release from umbilicals (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery).* Management of materials returned onshore will be at licenced yards, *however rated as Moderate Impact (Amber) risk to those on land due to the quantity of materials returned and potential for chemical release from umbilicals when cut into smaller sections at the yard.* No residual risk as option will leave a clear seabed.	Short duration campaign for single vessel with few vessel transits to and from shore. Minimal materials handling for deck crew as application of rock cover is reasonably automatic with minimal deck crew intervention required. No materials returned onshore for dismantling. No increased risk to other vessels than currently under normal operations. Additional rock cover at exposed sections (*c.* 620m of pipelines and c. 996te of new rock introduced) will be installed to be over trawlable, however potential for new rock berms to become unstable over time and create a snag hazard. Rating recognises relatively short length of new rock berms.	Short duration campaign for single vessel with few vessel transits to and from shore. Minimal and routine equipment handling for deck crew (launching and recovery of trenching equipment and ROV). No materials returned onshore for dismantling. No increased risk to other vessels than currently under normal operations. No increased risk compared to existing operating condition, existing trenched and buried section remains over trawlable and exposed sections will be trenched and buried to become overtrawlable and thus leave a safe seabed.	Short duration campaign for single vessel with few vessel transits to and from shore. Relatively small quantity of materials are recovered (c.620m /76te) with potential for chemical release from blocked umbilical cores. Management of materials returned onshore will be at licenced yards. No increased risk to other vessels than currently under normal operations. No increased risk compared to existing operating condition, existing trenched section remains over trawlable and exposed sections will be removed and cut ends buried within trench to leave a safe seabed.
AVERAGE RATING THIS CRITERION	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
ENVIRONMENTAL	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the emissions associated with the offshore campaign is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. The full length of line may require to be deburied before reverse reeling, though it may also be possible to recover the lines without initial deburial by pulling them through the sediment. As total line lengths is *c.* 11.4km short term seabed disturbance is not considered significant. No additional material to be introduced to the seabed to support decommissioning activities. Therefore, the long term impact of this option on the existing habitat is not considered significant. Application of this option would result in *c.* 996te of pipeline/ umbilical returned onshore to be processed, with *c.* 15te to landfill (i.e. plastics and trapped chemicals from the umbilicals).	*Taking account of the length of the vessel campaigns associated with the different decommissioning options: c.206 days for Option 1c) and between c.18 and c.29 days for the remaining options, the magnitude of effect of the emissions associated with Option 1c) is considered significantly greater than the effects associated with the other options.* Low seabed disturbance anticipated, as only spot deburial will be required at cut locations and pipeline sections are then pulled through the sediment cover. No additional material introduced to seabed. *c.996te of pipeline/ umbilical returned onshore to be processed, with potentially c.15te to landfill (plastics and trapped chemicals from the umbilicals).*	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the emissions associated with the offshore campaign is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. This option is recognised to result in short term localised seabed disturbance during rock placement. The footprint of this short term disturbance is small and not considered significantly different from other options. This option requires the addition of a relatively small quantity of new rock cover to be added to the exposed line sections only. Given the small volume of rock to be added, the long term impact of this option on the existing habitat is not considered significant. No materials returned onshore to be processed.	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the emissions associated with the offshore campaign is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. This option is recognised to result in short term localised seabed disturbance during trenching and burying. The footprint of this short term disturbance is small and not considered significantly different from other options. No additional material to be introduced to the seabed to support decommissioning activities. Therefore, the long term impact of this option on the existing habitat is not considered significant. No materials returned onshore to be processed.	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the emissions associated with the offshore campaign is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. The short sections of line to be recovered are exposed and it is expected that cutting will be carried out using hydraulic shears minimising seabed disturbance. The impact of short term disturbance to the seabed is therefore not considered significantly different from other options. No additional material to be introduced to the seabed to support decommissioning activities. Therefore, the long term impact of this option on the existing habitat is not considered significant. Negligible quantity of materials returned onshore. to be processed.
AVERAGE RATING THIS CRITERION	Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
SOCIETAL	Option results in a clear seabed and therefore not anticipated to impact on commercial fisheries. Although more materials returned onshore when compared to the remediate in-situ options, the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	Option results in a clear seabed and therefore not anticipated to impact on commercial fisheries. Although more materials returned onshore when compared to the remediate in-situ options, the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	Rock cover to be installed would be laid in line with industry standards and fishing industry requirements. Therefore, it should be possible for fishing gear to fish in the area. *However, it is recognised that the rock berm could become unstable overtime leading to snagging, lost nets, and the fishing industry creating a self-imposed exclusion zone.* Taking account of the short length of exposed sections (c.620 m of pipelines) to be rock covered and the anticipated volume of rock to be added (*c* .3,975 te) *the impact on commercial fisheries is considered to be a Moderate Impact (Amber) when compared against other options.* No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	Option results in a safe seabed as there would be no exposed line lengths remaining and no anticipated impact on commercial fisheries. No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	Option results in a safe seabed as there would be no exposed line lengths remaining and no anticipated impact on commercial fisheries. Negligible quantity of materials returned such that impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant. In addition, no new onshore jobs anticipated.
AVERAGE RATING THIS CRITERION	Lower Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
ECONOMIC RISK	*Estimated at £2.59M which is 186% of lowest cost option.* Minimal potential ongoing cost liability as all pipelines removed. Post project assessment survey only.	*Estimated at £9.49M which is 682% of lowest cost option.* Minimal potential ongoing cost liability as all pipelines removed. Post project assessment survey only.	Estimated at £1.68M which is 121% of lowest cost option. Existing lines already buried will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities (e.g. re-profile unstable rock berms)	Estimated at £1.39M which is the lowest cost option. Existing lines already buried will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Less potential for remedial work post project as newly buried sections of line unlikely to unbury.	Estimated at £1.82M which is130% of lowest cost option. Existing lines already buried will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Less potential for remedial work post project as exposed sections of line have been removed.
AVERAGE RATING THIS CRITERION	Moderate Impact	Higher Impact	Lower Impact	Lower Impact	Lower Impact
OVERALL RATING	Moderate Impact	Higher Impact	Lower Impact	Lower Impact	Lower Impact
OVERALL RANKING	**4th**	**5th**	**3rd**	**1st=**	**1st=**
COMMENTS	When average ratings by Main Criteria only are considered, the rankings of each option does not change compared to the original R/A/G evaluation. Therefore the recommendations concluded for the original evaluation remain in place.				

Rating Workbook - Tartan Group D1.xlsx

Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL >0.6m

Four 8" dia rigid pipelines combined length of 7.7km. Two umbilicals with combined length of 3.8km.

VISUAL RATING SUMMARY: Sensitivity Analysis 1 - Specific Sub-Criteria

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options		a)	c)	a)	b)	c)
			REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Moderate Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Those on Land	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea		Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Loss of Habitat - Long Term		Lower Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Waste Processing		Moderate Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
ECONOMIC RISK	Cost for Decommissioning/ Removal activities		Lower Impact	Higher Impact	Lower Impact	Lower Impact	Lower Impact
	Cost for long term monitoring / Remediation activities		Lower Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
OVERALL RATING			Moderate Impact	Higher Impact	Moderate Impact	Lower Impact	Lower Impact
OVERALL RANKING			4th	5th	3rd	1st=	1st=
Rating Count			Red =0 Amber =3 Green =7	Red =1 Amber =7 Green =2	Red = 0 Amber = 2 Green = 8	Red = 0 Amber = 0 Green = 10	Red = 0 Amber = 0 Green = 10
COMMENTS			Options 2b) and 2c) remain rated as first equal as individual sub-criteria ratings are identical across all ratings, all Low Impact (Green). However for the purpose of declaring a single "most preferred option" in the Decommissioning Programme (DP) Option 2b) will be declared as the most preferred option as it aligns with other pipeline group most preferred which would result in a consistent and wider campaign strategy across the pipeline groups. Option 2a) performs better under this sensitivity analysis than the original R/A/G evaluation and is rated only marginally worse than options 2b) and 2c), where Change of habitat and Cost of Long Term Monitoring are rated Moderate Impact (Amber) due to the fact that the rock berms introduces new materials and will incur long term and ongoing costs to monitor and maintain the rock berms Since Options 2a), 2b) and 2c) are rated only marginally different, it is recommended that all three options are carried forward to the C&P tendering phase to enable the EPRD contractors the input to the preferred option from an economic and overall campaign strategy taking account of other pipeline groups in the field. Option 1a) performs more poorly under this sensitivity analysis compared to option 2a) and drops to being ranked 4th rather than 3rd equal in the original R/A/G evaluation. On this basis the recommendation that Option 1a) is discounted at this stage and not considered further is reinforced by this sensitivity analysis. Option 1c) also performs more poorly under this sensitivity analysis than in the original R/A/G evaluation. The recommendation remains that Option 1c) is discounted at this stage and not considered further.			

Rating changed from "not significantly different" to Moderate Impact (Amber) with Options 2a) 2b) and 2c) reverting to Low Impact (Green). Basis of sensitivity analysis is in recognition that there is c.11.5km of pipelines/ umbilicals to be recovered with this option compared to only c. 620m in Option 2c) and no pipelines recovered for Option 2a) and 2b). There is therefore and order of magnitude of more effort involved and therefore potential for schedule slippage.

Rating changed from "not significantly different" to Moderate Impact (Amber) with Options 2a) 2b) and 2c) reverting to Low Impact (Green). Basis of sensitivity analysis is the same as Option 1a).

Rating changed from Moderate Impact (Amber) to Low Impact (Green) Basis of sensitivity analysis is that Option 1a) has the shortest vessel duration of all options.

Rating changed from Moderate Impact (Amber) to Low Impact (Green) which results in all options for this sub-criterion. becoming "not significantly different".
Basis of sensitivity analysis is that the rock cover will be installed in existing open trenches, with less rock profile above mean seabed level.

Rating changed from "not significantly different" to Moderate Impact (Amber) with all other options reverting to Low Impact (Green).
Basis of sensitivity analysis is that during recovery the pipelines sections may laid down in groups on the on the seabed or into baskets to be recovered which would lead to additional seabed disturbance.

Rating changed from Moderate Impact (Amber) to Low Impact (Green) which results in all options for this sub-criterion becoming "not significantly different".
Basis of sensitivity analysis is that the rock cover will be installed in existing open trenches, with less rock profile above mean seabed level.

Rating changed from Moderate Impact (Amber) to Low Impact (Green). Basis of sensitivity analysis is that although the estimated cost of this option is 186% of the lowest cost option it is still within £1.0M of other Options rated as Low Impact (Green)

Rating Workbook - Tartan Group D1.xlsx

Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL >0.6m

Four 8" dia rigid pipelines combined length of 7.7km. Two umbilicals with combined length of 3.8km.

VISUAL RATING SUMMARY: Sensitivity Analysis 2 - Economic Risk Discounted

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options		a)	c)	a)	b)	c)
			REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Those on Land	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Loss of Habitat - Long Term		Lower Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Waste Processing		Moderate Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
OVERALL RATING			Moderate Impact	Higher Impact	Moderate Impact	Lower Impact	Lower Impact
OVERALL RANKING			3rd=	5th	3rd=	1st=	1st=
Rating Count			Red =0	Red =1	Red = 0	Red = 0	Red = 0
			Amber =3	Amber =5	Amber = 3	Amber = 0	Amber = 0
			Green =5	Green =3	Green = 5	Green = 8	Green = 8
COMMENTS	Sensitivity Analysis 2 with Economic Risk Evaluation results discounted, does not change the overall rankings compared to the original R/A/G evaluation. Therefore the recommendations concluded for the original evaluation remain in place for this sensitivity analysis.						

Rating Workbook - Tartan Group D2.xlsx

Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL <0.6m

TECHNICAL & SAFETY

One 12" dia. and three 8" dia. rigid pipelines with a combined length of 51.8km plus two umbilicals with a combined length of 25.7km make up this pipeline group.
All lines are located in shallow trenches (some in shared trenches) with an average depth of lowering of between 0.37 and 0.45m and depth of cover of between 0.24 and 0.37 to top of pipe.
97.1% (75.25km) of the combined pipeline/ umbilcal length does not meet the burial criteria and is considered exposed. The 2.9% (2.25km) of the line that meets the burial criteria is spread intermittently along the lengths of the pipelines/ umbilical and are numerous and very short lengths.
It is therefore considered that remediate in-situ options, where the significant majority of the line needs to be remediated, with only short and intermittent sections at numerus points along the pipelines/ umbilicals do not need remediated, would not be efficient nor technically feasible in terms of rock dumping or trenching activities.
Therefore during this evaluation it is assumed the Remediate In-situ Options (Options 2a) and 2b)) are to be carried out on the whole length of the pipelines and umbilicals.(77.5km)

Assessment Criteria			Decommissioning Options	1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:	
			Sub Criteria/ / Sub Options	a)	c)	a)	b)
				REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED
TECHNICAL FEASIBILITY			Risk of Major Project Failure	Normal operational procedures proposed. Scope is straightforward and understood and this option has the shortest overall vessel duration (*c* .30 days). Activities considered to be not significantly different from other options. Offshore Execution Phase schedule is unlikely to slip beyond planned schedule plus contingencies applied.	Straightforward operation, however vessel durations offshore are significantly greater than Options 1a), 2a) and 2b) and is *c.* 1,532 days (more than 4 years). Significant repetitive activity which if effort involved was underestimated only slightly could lead to significant schedule growth.	Normal operational procedures proposed. Scope is straightforward and understood and this option has an overall vessel duration of *c* .141 days, campaign in one season. Offshore Execution Phase schedule is unlikely to slip beyond planned schedule plus contingencies applied.	This option has an overall vessel duration of *c.* 68 days, campaign in one season. Records of why adequate trenching depth was not achieved during original pipeline installation in this pipeline group is not available. Therefore there is uncertainty whether it may be difficult to improve the trench depth further where shallow trench currently exists. It is noted that the nearby Duart field pipelines (Group C) are in trenches of adequate depth indicating that adequate trenching depth should be achievable for Group D2 lines. It is also noted that an EPRD contractor would carry out a more detailed trench ability study before committing to this strategy.
			RATING	Lower Impact	Moderate Impact	Lower Impact	Moderate Impact
			Technical Complexity & Track Record	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Where pipelines / umbilicals are in shared trenches the umbilicals should be removed first.	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available.	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available.	Additional complexity in lowering methods is anticipated where pipelines/ umbilicals are in shared trenches. Jetting techniques will be adopted in these circumstances. It is noted that the Duart Pipelines (Group C) that cross over the Group D2 pipelines are fully rock covered and ultimately a common and wider project decision across both pipeline groups is required on how these are to be decommissioned as trenching would not be possible if the rock berms at the crossings are to be left in-situ.
			RATING	Lower Impact	Lower Impact	Lower Impact	Moderate Impact
			TECHNICAL: OVERALL RATING BASED ON AVERAGE	**Lower Impact**	**Moderate Impact**	**Lower Impact**	**Moderate Impact**
SAFETY	Risk During Project Execution		To Project Personnel	Shortest vessel duration of all options (*c.* 30 days) for single vessel and no vessel SIMOPS. Less crew interaction than Options 1c) as pipelines are loaded directly onto reel. Potential integrity risk when reeling as some pipelines were installed in the 1980's. However, it is considered mitigation for potential line failure can be achieved by procedure and by inspection and or testing the jumper spools which will be recovered before the pipelines. *Consider sensitivity analysis of Moderate Impact (Amber) for this option due to the large quantity of pipelines and umbilicals to be recovered (c. 90.9km)*	Long and multiple vessel campaigns anticipated (*c.* 1,532 days overall). High level vessel SIMOPs (>2 vessels for *c* .631 days). Significant and repetitive materials handling on deck (*c.* 90.9km of pipeline returned to deck in cut up sections. Also potential for chemical release from umbilical when umbilicals are recovered to deck. (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery). *Consider sensitivity analysis of Higher Impact (Red) for this option due to the significant durations (> 4 years) and multiple campaings anticipated.*	Relatively short duration campaign (*c* .141 days) for single vessel. Minimal materials handling as application of rock cover is reasonably automatic with minimal deck crew intervention required.	Relatively short duration campaign (*c* .68 days) for single vessel. Minimal and routine equipment handling (launching and recovery of trenching and burying equipment and ROV) for deck crew.
			RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
			To Those on Land	Management of materials returned onshore will be at licenced yards. Rated as Moderate Impact (Amber) due to the quantity of materials returned onshore for dismantling (*c.* 77.5km / *c* .4,454te) compared to other options. Most deconstruct work in yard is remote from personnel and carried out using appropriate equipment. Potential for chemical release from recovered umbilicals when unreeled and cut into sections at the yard (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery).	Management of materials returned onshore will be at licenced yards. Rated as Moderate Impact (Amber) due to the quantity of materials returned onshore for dismantling (*c* .77.5km / *c* .4,454te) compared to other options. Extended offshore campaign duration (>4yrs) will cause extended onshore activity to match back load schedule of materials. Most deconstruct work in yard is remote from personnel and carried out using appropriate equipment. Potential for chemical release from recovered umbilicals when cut into smaller sections at the yard (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery).	No materials returned onshore for dismantling, therefore no risk. Initial supply of rock materials to the quayside is routine and not considered a risk specific to this project.	No materials returned onshore for dismantling, therefore no risk. Mobilisation and demobilisation of trenching and burying equipment is routine and not considered risk specific to this project.
			RATING	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
			To Other Users of the Sea	Relative to normal operations there is minimal increased risk to other sea users given that the campaign is a relatively short duration, with a single vessel in the field at any one time. Minimum vessel transits to and from shore (mob and demob).	More vessels and significantly longer campaign duration (c.1,532 days) than other options and working over a 99.9km stretch of pipeline. Work in the area extending to > 4 years, with at least 28 vessel transits to and from shore.	Relative to normal operations there is minimal increased risk to other sea users given that the campaign is a relatively short duration, with a single vessel in the field at any one time. Few vessel transits to and from shore.	Relative to normal operations there is minimal increased risk to other sea users given that the campaign is a relatively short duration, with a single vessel in the field at any one time. Few vessel transits to and from shore.
			RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
			Residual (Long Term) Risk To Other Users of the Sea	No residual risk as option will leave a safe seabed.	No residual risk as option will leave a safe seabed.	Application of rock cover across the pipelines and umbilicals in this group will be installed to be over trawlable, rating recognises potential for new rock berms to become unstable over time and create a snag hazard. The close proximity of pipelines to each other may mean wide rock berms across multiple lines - or potentially less than 50m gap between adjacent and parallel rock berms. It is noted that pipelines / umbilicals are laid in trenches and therefore the application of rock into these trenches will mean that the profile of the rock berms above mean seabed level will not be as great as if they were surface laid pipelines.	No increased risk compared to existing operating condition, where trenching and burying has been successful as leaves a safe seabed. It is noted that the Duart Pipelines (Group C) that cross over the Group D2 pipelines are fully rock covered and, if left in-situ, could introduce a future snagging hazard if the berms become unstable.
			RATING	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
			SAFETY: OVERALL RATING BASED ON AVERAGE	**Lower Impact**	**Moderate Impact**	**Lower Impact**	**Lower Impact**

Rating Workbook - Tartan Group D2.xlsx

Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL <0.6m

ENVIRONMENTAL

One 12" dia. and three 8" dia. rigid pipelines with a combined length of 51.8km plus two umbilicals with a combined length of 25.7km make up this pipeline group.
All lines are located in shallow trenches (some in shared trenches) with an average depth of lowering of between 0.37 and 0.45m and depth of cover of between 0.24 and 0.37 to top of pipe.
97.1% (75.25km) of the combined pipeline/ umbilcal length does not meet the burial criteria and is considered exposed. The 2.9% (2.25km) of the line that meets the burial criteria is spread intermittently along the lengths of the pipelines/ umbilical and are numerous and very short lengths.
It is therefore considered that remediate in-situ options, where the significant majority of the line needs to be remediated, with only short and intermittent sections at numerus points along the pipelines/ umbilicals do not need remediated, would not be efficient nor technically feasible in terms of rock dumping or trenching activities.
Therefore during this evaluation it is assumed the Remediate In-situ Options (Options 2a and 2b)) are to be carried out on the whole length of the pipelines and umbilicals. (77.5km)

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:	
	Sub Criteria/ / Sub Options	a)	c)	a)	b)
		REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED
ENVIRONMENTAL	**Impact of Decommissioning Operations Offshore** *(includes emissions to air, discharges to sea and underwater noise)*	Given the relatively short duration of the activities associated with this option (*c* .30 days), the magnitude of effect of the emissions associated with the offshore campaign is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant environmental impact. Sources of underwater noise will include the presence of vessels and the noise associated with reverse reeling. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Taking account of the length of the vessel campaigns associated with the different decommissioning options: *c.* 1,532 days for Option 1c) and between 30 and 141 days for the remaining options, the magnitude of effect of the emissions associated with Option 1c) is considered significantly greater than the effects associated with the other options. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with cutting activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c.* 141 days which includes days for subsequent post-decommissioning surveys), the magnitude of effect is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the line ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Sources of underwater noise will include the presence of vessels and the noise associated with rock dumping activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c* .68 days which includes days for subsequent post-decommissioning surveys), the magnitude of effect is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the line ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Sources of underwater noise will include the presence of vessels and the noise associated with trench and burial activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.
	RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term *(includes disturbance to the cuttings piles)*	Due lack of depth of sediment cover, it may be possible to reverse reel pipelines without deburial first, by pulling lines through the light sediment cover. Disturbance to the seabed during recovery is therefore considered to be minimal and is not considered a significant impact for this option.	Due lack of depth of sediment cover, it may be possible to debury only at cut locations and pull sections of lines through the light sediment cover during recovery. Disturbance to the seabed during recovery is therefore considered to be minimal and is not considered a significant impact for this option.	This option is recognised to result in short term localised disturbance during rock placement. The footprint of this short term disturbance will extend the full length of pipelines and umbilicals within the group (*c* .77.5km) and is therefore considered a Moderate Impact (Amber) .	This option is recognised to result in short term localised disturbance during the trenching and burying activities. The footprint of this short term disturbance will extend the full length of pipelines and umbilicals within the group (*c* .77.5km) and is therefore considered a Moderate Impact (Amber).
	RATING	Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
	Change of Habitat - Long Term	No additional material to be introduced to the seabed to support this option. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of Option 1a) on the existing habitat is not considered significant.	No additional material to be introduced to the seabed to support this option. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of Option 1c) on the existing habitat is not considered significant.	Sediments across the Tartan Development Area are considered to represent three main habitats: circalittoral fine mud (EUNIS A5.36), circalittoral sandy mud (EUNIS A5.35) and deep circalittoral mixed sediment (EUNIS A5.45). In addition, the majority of the Tartan Development Area, is considered to meet the criteria for the OSPAR listed threatened and/or declining habitat 'Sea pen and burrowing megafauna communities' as well as the UK Habitat Feature of Conservation Importance and UKBAP habitat 'mud habitats in deep water'. This options requires *c* .534,094te of new rock materials added to the exposed pipeline and umbilical sections. Given the habitat types and volume of rock required, the long term impact of rock dumping the full length of lines in this group is considered High (Red).	No additional material introduced to support decommissioning activities. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of Option 2b) on the existing habitat is not considered significant.
	RATING	Lower Impact	Lower Impact	Higher Impact	Lower Impact
	Waste Processing *(i.e. processing of returned materials and use of landfill)*	Application of this option would result in *c* .4,454te of pipeline/ umbilical returned onshore to be processed, with potentially *c* .105te to landfill (e.g. plastics and trapped chemicals from the umbilicals).	Application of this option would result in *c* .4,454te of pipeline/ umbilical returned onshore to be processed, with potentially *c* .105te to landfill (e.g. plastics and trapped chemicals from the umbilicals).	No materials returned onshore.	No materials returned onshore.
	RATING	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
	ENVIRONMENTAL: OVERALL RATING BASED ON AVERAGE	**Lower Impact**	**Moderate Impact**	**Higher Impact**	**Lower Impact**

Rating Workbook - Tartan Group D2.xlsx

Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL <0.6m

SOCIETAL & ECONOMIC RISK

One 12" dia. and three 8" dia. rigid pipelines with a combined length of 51.8km plus two umbilicals with a combined length of 25.7km make up this pipeline group.
All lines are located in shallow trenches (some in shared trenches) with an average depth of lowering of between 0.37 and 0.45m and depth of cover of between 0.24 and 0.37 to top of pipe.
97.1% (75.25km) of the combined pipeline/ umbilcal length does not meet the burial criteria and is considered exposed. The 2.9% (2.25km) of the line that meets the burial criteria is spread intermittently along the lengths of the pipelines/ umbilical and are numerous and very short lengths.
It is therefore considered that remediate in-situ options, where the significant majority of the line needs to be remediated, with only short and intermittent sections at numerus points along the pipelines/ umbilicals do not need remediated, would not be efficient nor technically feasible in terms of rock dumping or trenching activities.
Therefore during this evaluation it is assumed the Remediate In-situ Options (Options 2a) and 2b)) are to be carried out on the whole length of the pipelines and umbilicals. (77.5km)

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:	
	Sub Criteria/ / Sub Options	a)	c)	a)	b)
		REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED
SOCIETAL	Impact on Commercial Fisheries	Option results in a safe seabed and should not therefore impact commercial fisheries.	Option results in a safe seabed and should not therefore impact commercial fisheries.	Rock cover to be installed would be laid in line with industry standards and fishing industry requirements, though the close proximity of the lines could mean that the rock berms could be <50m apart (noting SFF preference is for rock berms to be a minimum of 50 m apart as allows trawl gear to right itself should it get turned going over a berm). Also, It is possible that rock berms could become unstable over time such that bottom trawl gear could not be used along the length of the rock berms (c. 77.5km of pipelines and umbilicals) the industry could self-impose exclusions zones along the line lengths to prevent snagging and potential loss of gear. However, it is recognised that as the lines are laid in trenches the application of rock into these trenches will mean that the profile of the rock berms above mean seabed level will not be as great as if they were surface laid pipelines.	Option results in a safe seabed as there would be no exposed line lengths remaining and therefore no anticipated impact on commercial fisheries.
	RATING	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
	Socio-economic Impact on Communities and Amenities	Although significant volumes of materials would be returned onshore (when compared to the two remediate in-situ options where no materials are returned) the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	Although significant volumes of materials would be returned onshore (when compared to the two remediate in-situ options where no materials are returned) the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	SOCIETAL: OVERALL RATING - BASED ON AVERAGE	**Lower Impact**	**Lower Impact**	**Moderate Impact**	**Lower Impact**
ECONOMIC RISK	Cost for Decommissioning/ Removal activities	Estimated at £4.25M which is the lowest cost option.	Estimated at £70.22M which is 1,652% of lowest cost option, **£65.97M more than lowest cost option.**	Estimated at £11.18M which is 263% of lowest cost option, **£6.93M more than lowest cost option.** Although significantly more than lowest cost option, has been rated as Moderate Impact (Amber) to differentiate from cost of Option 1c). *Consider sensitivity analysis of Higher Impact (Red) for this option due to the estimate being significantly more than the lowest cost option.*	Estimated at £4.87M which is 115% of lowest cost option. *Consider sensitivity analysis of Moderate Impact (Amber) for this option due to technical uncertainties of being able to achieve the trench depth to enable required burial depth, this could lead to additional passes and therefore additional cost.*
	RATING	Lower Impact	Higher Impact	Moderate Impact	Lower Impact
	Cost for long term monitoring / Remediation activities	Minimal potential ongoing cost liability as all pipelines removed. Post project assessment survey only.	Minimal potential ongoing cost liability as all pipelines removed. Post project assessment survey only.	Once lines are rock covered, they will continue to be monitored over time to assess stability of the rock berms. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities (e.g. re-profile unstable rock berms).	Existing lines already trenched but not with adequate burial depth once trenching and burial activity is complete potential for remedial work post project is low as newly buried lines are unlikely to unbury. However continued monitoring of the lines is necessary to prove the predicted behaviour over time. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion.
	RATING	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
	ECONOMIC RISK: OVERALL RATING BASED ON AVERAGE	**Lower Impact**	**Higher Impact**	**Moderate Impact**	**Lower Impact**

Rating Workbook - Tartan Group D2.xlsx

Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL <0.6m

VISUAL RATING SUMMARY - HEATMAP

One 12" dia. and three 8" dia. rigid pipelines with a combined length of 51.8km plus two umbilicals with a combined length of 25.7km make up this pipeline group.
All lines are located in shallow trenches (some in shared trenches) with an average depth of lowering of between 0.37 and 0.45m and depth of cover of between 0.24 and 0.37 to top of pipe.
97.1% (75.25km) of the combined pipeline/ umbilcal length does not meet the burial criteria and is considered exposed. The 2.9% (2.25km) of the line that meets the burial criteria is spread intermittently along the lengths of the pipelines/ umbilical and are numerous and very short lengths.
It is therefore considered that remediate in-situ options, where the significant majority of the line needs to be remediated, with only short and intermittent sections at numerus points along the pipelines/ umbilicals do not need remediated, would not be efficient nor technically feasible in terms of rock dumping or trenching activities.
Therefore during this evaluation it is assumed the Remediate In-situ Options (Options 2a) and 2b)) are to be carried out on the whole length of the pipelines and umbilicals. (77.5km)

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:	
	Sub Criteria/ / Sub Options		a)	c)	a)	b)
			REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Lower Impact	Moderate Impact	Lower Impact	Moderate Impact
	Technical Complexity & Track Record		Lower Impact	Lower Impact	Lower Impact	Moderate Impact
SAFETY	Risk During Project Execution	To Project Personnel	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
		To Those on Land	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Lower Impact	Moderate Impact	Lower Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term		Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
	Loss of Habitat - Long Term		Lower Impact	Lower Impact	Higher Impact	Lower Impact
	Waste Processing		Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Lower Impact	Moderate Impact	Lower Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different
ECONOMIC RISK	Cost for Decommissioning/ Removal activities		Lower Impact	Higher Impact	Moderate Impact	Lower Impact
	Cost for long term monitoring / Remediation activities		Lower Impact	Lower Impact	Moderate Impact	Lower Impact
	OVERALL RATING		Lower Impact	Higher Impact	Moderate Impact	Lower Impact
	OVERALL RANKING		1st	4th	3rd	2nd
	Rating Count		Red =0	Red =1	Red = 1	Red = 0
			Amber =2	Amber =6	Amber = 5	Amber = 3
			Green =11	Green =6	Green = 7	Green = 10
	COMMENTS		Option 1a) is ranked 1st being evaluated with only two Moderate Impact (Amber) sub-criteria and should therefore be declared as the "most preferred option" in the Decommissioning Programme (DP). Option 2b) is ranked 2nd being evaluated with only three Moderate Impact (Amber) sub-criteria, however Option 2b) is rated only marginally worse than Option 1a) and should be considered to be carried forward to the C&P tendering phase to enable the EPRD contractors the input to the preferred option from an economic and overall campaign strategy taking account of other pipeline groups in the field. This will also allow the EPRD contractor to carry out a more detailed trench ability study before committing to this strategy. Options1c) and 2a) should be discounted at this stage and not considered further.			

Rating Workbook - Tartan Group D2.xlsx

Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL <0.6m

One 12" dia. and three 8" dia. rigid pipelines with a combined length of 51.8km plus two umbilicals with a combined length of 25.7km make up this pipeline group.
All lines are located in shallow trenches (some in shared trenches) with an average depth of lowering of between 0.37 and 0.45m and depth of cover of between 0.24 and 0.37 to top of pipe.
97.1% (75.25km) of the combined pipeline/ umbilcal length does not meet the burial criteria and is considered exposed. The 2.9% (2.25km) of the line that meets the burial criteria is spread intermittently along the lengths of the pipelines/ umbilical and are numerous and very short lengths.
It is therefore considered that remediate in-situ options, where the significant majority of the line needs to be remediated, with only short and intermittent sections at numerus points along the pipelines/ umbilicals do not need remediated, would not be efficient nor technically feasible in terms of rock dumping or trenching activities.
Therefore during this evaluation it is assumed the Remediate In-situ Options (Options 2a) and 2b)) are to be carried out on the whole length of the pipelines and umbilicals. (77.5km)

NARRATIVE SUMMARY:
Sub-criteria ratings have been averaged by main criteria.

Red / italic text in the cells below highlights the main areas of influence in a combined rating evaluation poorer than Low Impact (Green).

SUMMARY

Decommissioning Options	1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:	
	a)	c)	a)	b)
Sub Criteria/ Sub Options	REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED
TECHNICAL FEASIBILITY	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Technical complexity is not significantly different from other options. Relatively short overall vessel duration. Scope is straightforward and understood and unlikely to slip beyond planned schedule plus contingencies applied.	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Technical complexity is not significantly different from other options. *However, vessel durations (c.1,532 days: more than 4 years) are significantly greater than those for the remaining options* *There is also significant repetitive activity which if the effort involved was underestimated only slightly could lead to significant schedule growth .*	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Technical complexity is not significantly different from other options. Relatively short overall vessel duration. Scope is straightforward and understood and unlikely to slip beyond planned schedule plus contingencies applied.	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Relatively short overall vessel duration. *There is uncertainty on whether it may be difficult to improve the trench depth further at the exposure locations, since the original installation is at relatively shallow trench depth with no record available of why a deeper trench was not achieved.* It is noted that an EPRD contractor would carry out a more detailed trench ability study before committing to this strategy. *Also, additional complexity anticipated in lowering the pipelines and umbilicals that share a common trench, jetting techniques will be necessary.*
AVERAGE RATING THIS CRITERION	Lower Impact	Moderate Impact	Lower Impact	Moderate Impact
SAFETY	Short duration campaign for single vessel and minimal vessel transits to and from shore. Less deck crew interaction than Options 1c) as pipelines are loaded directly onto a reel. Potential integrity risk when reeling as some pipelines to be recovered were installed in the 1980's, but potential line failure can be mitigated by procedure and by inspection and or testing of the jumper spools which will be recovered before the pipelines. More materials returned onshore than Options 2a) and 2b), but to licensed yards with yard personnel remote from deconstruct activity as can executed using appropriate equipment. Potential for chemical release from recovered umbilicals when unreeled and cut into sections at the yard (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery). No residual risk as option will leave a safe seabed.	*Long and multiple vessel campaigns with long vessel SIMOPs periods and many vessel transits to and from shore for over 4 years.* *Significant and repetitive materials handling on deck with potential of dropped objects and chemical release from umbilical cores (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery).* More materials returned onshore than Options 2a) and 2b), *with an extended offshore campaign duration (>4yrs) resulting in extended onshore activity to match back load schedule of materials.* Materials processing will be at licensed yards with yard personnel remote from deconstruct work as executed using appropriate equipment. *Potential for chemical release from recovered umbilicals when cut into sections at the yard (e.g. where blocked cores may have resulted in inadequate cleaning and flushing prior to recovery).* No residual risk as option will leave a safe seabed.	Short duration campaign for single vessel and minimal vessel transits to and from shore. Minimal materials handling for deck crew as application of rock cover is reasonably automatic with minimal deck crew intervention required. No materials returned onshore for dismantling. No increased risk to other vessels than currently under normal operations. Rated as Moderate Impact (Amber) for residual risk to other users of the sea, taking account of the significant quantity of new rock cover being introduced, however recognising that the new rock is laid in existing trenches, meaning the rock profile above mean seabed level will be less than with surface laid pipelines.	Short duration campaign for single vessel and minimal vessel transits to and from shore. Minimal and routine equipment handling (launching and recovery of trenching equipment and ROV) for deck crew. No materials returned onshore for dismantling. No increased risk to other vessels than currently under normal operations. No residual risk as option will leave a safe seabed. Although, it is noted that the Duart Pipelines (Group C) that cross over the Group D2 pipelines are fully rock covered and, if left in-situ, could introduce a future snagging hazard if the berms become unstable.
AVERAGE RATING THIS CRITERION	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
ENVIRONMENTAL	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the emissions associated with the offshore campaign is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Due to lack of depth of sediment cover, it may be possible to reverse reel pipelines without deburial first, by pulling lines through the light sediment cover. Disturbance to the seabed during recovery is therefore considered to be minimal and is not considered a significant impact No additional material are to be introduced to the seabed to support this option. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact on the existing habitat is not considered significant. Rated as Moderate Impact (Amber) for waste processing, taking account of the *c .*4,454te of pipeline/ umbilical returned onshore to be processed, with potentially c.105te to landfill (plastics and trapped chemicals from the umbilicals).	*Taking account of the length of the vessel campaigns associated with this option: c.1,532 days compared to the other options, the impact of emissions associated with this option is considered significantly greater than those associated with the other options.* As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Due lack of depth of sediment cover, it may be possible to debury only at cut locations and pull sections of lines through the light sediment cover during recovery. Disturbance to the seabed during recovery is therefore considered to be minimal and is not considered a significant impact for this option. No additional material to be introduced to the seabed to support this option. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact on the existing habitat is not considered significant. *c.4,454te of pipeline/ umbilical returned onshore to be processed, with potentially c.105te to landfill (plastics and trapped chemicals from the umbilicals).*	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the emissions associated with the offshore campaign is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. *This option is recognised to result in short term localised disturbance during rock placement. The footprint of this short term disturbance will extend the full length of pipelines and umbilicals within the group (c.90.9km).* *This option requires the addition of c.534,094te of new rock materials along the full length of the pipelines and umbilicals. Given the habitat types and volume of rock required, the long term impact of rock dumping the full length of lines in this group is considered Higher Impact (Red).* No materials returned onshore.	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the emissions associated with the offshore campaign is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Rated as Moderate Impact (Amber) for seabed disturbance as this option is recognised to result in short term localised disturbance during trenching. The footprint of this short term disturbance is full length of pipelines (c.90.9km). No additional material to be introduced to the seabed to support this option. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact on the existing habitat is not considered significant. No materials returned onshore.
AVERAGE RATING THIS CRITERION	Lower Impact	Moderate Impact	Higher Impact	Lower Impact
SOCIETAL	Option results in a safe seabed and should not therefore impact commercial fisheries. Although more materials would be returned onshore (when compared to the two remediate in-situ options where no materials are returned) the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	Option results in a safe seabed and should not therefore impact commercial fisheries. Although more materials would be returned onshore (when compared to the two remediate in-situ options where no materials are returned) the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	*Although the rock cover would be laid in line with industry standards and fishing industry requirements, the close proximity of the lines to each other could mean that the rock berms could be <50m apart (noting SFF preference is for rock berms to be a minimum of 50 m apart as allows trawl gear to right itself should it get turned going over a berm).* *Also, It is possible that rock berms could become unstable over time such that bottom trawl gear could not be used along the length of the rock berms (c. 90.9km of pipelines and umbilicals) the industry could self-impose exclusions zones along the line lengths to prevent snagging and potential loss of gear.* *However, the rating of only Moderate Impact (Amber) recognises that as the lines are laid in trenches and the application of rock into these trenches will mean that the profile of the rock berms above mean seabed level will not be as great as if they were surface laid pipelines.* No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	Option results in a safe seabed as there would be no exposed line lengths remaining and therefore no anticipated impact on commercial fisheries. No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.
AVERAGE RATING THIS CRITERION	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
ECONOMIC RISK	Estimated at £4.25M which is the lowest cost option. Minimal potential ongoing cost liability as all pipelines removed. Post project assessment survey only.	*Estimated at £70.22M which is 1,652% of lowest cost option,* ***£65.97M more than lowest cost option.*** Minimal potential ongoing cost liability as all pipelines removed. Post project assessment survey only.	*Estimated at £11.18M which is 263% of lowest cost option,* ***£6.93M more than lowest cost option.*** *Although significantly more than lowest cost option, has been rated as Moderate Impact (Amber) to differentiate from cost of Option 1c).* *More potential for ongoing cost liability than other options as there will be at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion and potential for some remediation activities (e.g. re-profile unstable rock berms).*	Estimated at £4.87M which is115% of lowest cost option. Once trenching and burial activity is complete potential for remedial work post project is low as newly buried lines are unlikely to unbury. However continued monitoring of the lines is necessary to prove the predicted behaviour over time. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion.
AVERAGE RATING THIS CRITERION	Lower Impact	Higher Impact	Moderate Impact	Lower Impact
OVERALL RATING	**Lower Impact**	**Higher Impact**	**Higher Impact**	**Lower Impact**
OVERALL RANKING	**1st**	**4th**	**3rd**	**2nd**
COMMENTS	When average ratings by Main Criteria only are considered, the rankings of each option does not change compared to the original R/A/G evaluation, however the overall rating for option 2a) changes from Moderate Impact (Amber) to Higher Impact (Red). Therefore the recommendations concluded for the original evaluation remain in place.			

Rating Workbook - Tartan Group D2.xlsx

Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL <0.6m

VISUAL RATING SUMMARY:

Sensitivity Analysis 1 - Specific Sub-Criteria

One 12" dia. and three 8" dia. rigid pipelines with a combined length of 51.8km plus two umbilicals with a combined length of 25.7km make up this pipeline group.
All lines are located in shallow trenches (some in shared trenches) with an average depth of lowering of between 0.37 and 0.45m and depth of cover of between 0.24 and 0.37 to top of pipe.
97.1% (75.25km) of the combined pipeline/ umbilcal length does not meet the burial criteria and is considered exposed. The 2.9% (2.25km) of the line that meets the burial criteria is spread intermittently along the lengths of the pipelines/ umbilical and are numerous and very short lengths.
It is therefore considered that remediate in-situ options, where the significant majority of the line needs to be remediated, with only short and intermittent sections at numerus points along the pipelines/ umbilicals do not need remediated, would not be efficient nor technically feasible in terms of rock dumping or trenching activities.
Therefore during this evaluation it is assumed the Remediate In-situ Options (Options 2a) and 2b)) are to be carried out on the whole length of the pipelines and umbilicals. (77.5km)

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:	
	Sub Criteria/ / Sub Options		a)	c)	a)	b)
			REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Lower Impact	Moderate Impact	Lower Impact	Moderate Impact
	Technical Complexity & Track Record		Lower Impact	Lower Impact	Lower Impact	Moderate Impact
SAFETY	Risk During Project Execution	To Project Personnel	Moderate Impact	Higher Impact	Lower Impact	Lower Impact
		To Those on Land	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Lower Impact	Moderate Impact	Lower Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term		Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
	Loss of Habitat - Long Term		Lower Impact	Lower Impact	Higher Impact	Lower Impact
	Waste Processing		Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Lower Impact	Moderate Impact	Lower Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different
ECONOMIC RISK	Cost for Decommissioning/ Removal activities		Lower Impact	Higher Impact	Higher Impact	Moderate Impact
	Cost for long term monitoring / Remediation activities		Lower Impact	Lower Impact	Moderate Impact	Lower Impact
	OVERALL RATING		Lower Impact	Higher Impact	Moderate Impact	Lower Impact
	OVERALL RANKING		1st	4th	3rd	2nd
	Rating Count		Red =0 Amber =3 Green =10	Red =2 Amber =5 Green =6	Red = 2 Amber = 4 Green = 7	Red = 0 Amber = 4 Green = 9
	COMMENTS		The rankings do not change as a result of this Sensitivity Analysis. Option 1a) remains ranked 1st and should therefore be declared as the "most preferred option" in the DP. Option 2b) remains ranked 2nd and marginally worse than Option 1a) and should be considered to be carried forward to the C&P tendering phase to enable the EPRD contractors the input to the preferred option from an economic and overall campaign strategy taking account of other pipeline groups in the field. This will also allow the EPRD contractor to carry out a more detailed trench ability study before committing to Option 2b). Options1c) and 2a) should be discounted at this stage and not considered further.		

Rating changed from Low Impact (Green) to Moderate Impact (Amber).
Basis of sensitivity analysis is due to the large quantity of pipelines and umbilicals to be recovered (c. 90.9km)

Rating changed from Moderate Impact (Amber to Higher Impact (Red).
Basis of sensitivity analysis is due to the large quantity of pipelines and umbilicals to be recovered (c. 90.9km)

Rating changed from Moderate Impact (Amber to Higher Impact (Red).
Basis of sensitivity analysis is due to the estimate being significantly more (263%) than the lowest cost option.

Rating changed from Low Impact (Green) to Moderate Impact (Amber).
Basis of sensitivity analysis is due to technical uncertainties of being able to achieve the trench depth to enable required burial depth, this could lead to additional passes and therefore additional cost.

Rating Workbook - Tartan Group D2.xlsx

Rigid Pipelines and Umbilicals, Trenched and Shallow Covered, DOL <0.6m

One 12" dia. and three 8" dia. rigid pipelines with a combined length of 51.8km plus two umbilicals with a combined length of 25.7km make up this pipeline group.
All lines are located in shallow trenches (some in shared trenches) with an average depth of lowering of between 0.37 and 0.45m and depth of cover of between 0.24 and 0.37 to top of pipe.
97.1% (75.25km) of the combined pipeline/ umbilcal length does not meet the burial criteria and is considered exposed. The 2.9% (2.25km) of the line that meets the burial criteria is spread intermittently along the lengths of the pipelines/ umbilical and are numerous and very short lengths.
It is therefore considered that remediate in-situ options, where the significant majority of the line needs to be remediated, with only short and intermittent sections at numerus points along the pipelines/ umbilicals do not need remediated, would not be efficient nor technically feasible in terms of rock dumping or trenching activities.
Therefore during this evaluation it is assumed the Remediate In-situ Options (Options 2a) and 2b)) are to be carried out on the whole length of the pipelines and umbilicals. (77.5km)

VISUAL RATING SUMMARY:

Sensitivity Analysis 2 - Economic Risk Discounted

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:		2. REMEDIATE IN-SITU WITH:	
	Sub Criteria/ / Sub Options		a)	c)	a)	b)
			REVERSE REELING	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Lower Impact	Moderate Impact	Lower Impact	Moderate Impact
	Technical Complexity & Track Record		Lower Impact	Lower Impact	Lower Impact	Moderate Impact
SAFETY	Risk During Project Execution	To Project Personnel	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
		To Those on Land	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Lower Impact	Moderate Impact	Lower Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term		Lower Impact	Lower Impact	Moderate Impact	Moderate Impact
	Loss of Habitat - Long Term		Lower Impact	Lower Impact	Higher Impact	Lower Impact
	Waste Processing		Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Lower Impact	Moderate Impact	Lower Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different
OVERALL RATING			Lower Impact	Moderate Impact	Moderate Impact	Lower Impact
OVERALL RANKING			1st	3rd	4th	2nd
Rating Count			Red =0	Red =0	Red = 1	Red = 0
			Amber =2	Amber =6	Amber = 3	Amber = 3
			Green =9	Green =5	Green = 7	Green = 8
COMMENTS	Sensitivity Analysis 2 with Economic Risk Evaluation results discounted does not change the recommended most preferred option which remains Option 1a). Therefore the recommendations concluded for the original evaluation remain in place for this sensitivity analysis. It is worth noting that Option 1c) improves slightly by discounting Economic Risk and becomes 3rd best option, with Option 2a) being relegated to 4th. However both Options 1c) and 2a) remain rated sufficiently worse than Option 1a) that they may be discounted and not considered further in the CA report or in the DP.					

Rating Workbook - Tartan Group E.xlsx

Flexible Pipeline and Umbilical, Surface Laid and Rock Covered

One 6" ID Flexible Pipeline and one Umbilical, both 4.5km long. Both fully rock covered to average DOC 0.51m TOP, exposures at pipeline ends only.

TECHNICAL & SAFETY

Assessment Criteria			Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
				a)	a)	b)	c)
			Sub Criteria/ / Sub Options	REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY			Risk of Major Project Failure	Normal operational procedures proposed. Scope is straightforward and understood. Short vessel campaign (*c* .18 days). Existing rock cover will required to be displaced before recovery of the lines. However, during the displacement profiling / spreading of the rock will occur to maintain overtrawlability. Offshore Execution Phase schedule is unlikely to slip beyond planned schedule plus contingencies applied. Risk of project failure is low and considered to be not significantly different from other options.	Normal operational procedures proposed. Scope is straightforward and understood. Short vessel campaign (*c.* 23 days). Additional rock will be applied to exposures at pipeline ends which will extend existing rock profile by *c.* 500 m. Offshore Execution Phase schedule is unlikely to slip beyond planned schedule plus contingencies applied. Risk of project failure is low and considered to be not significantly different from other options.	Normal operational procedures proposed. Scope is straightforward and understood. Short vessel campaign (*c.* 20 days). Trenching device can trench to within 1m of rock berm, reprofiling the end of existing rock berm will be required to achieve cover for the final 1m of pipeline. Offshore Execution Phase schedule is unlikely to slip beyond planned schedule plus contingencies applied. Risk of project failure is low and considered to be not significantly different from other options.	Normal operational procedures proposed. Scope is straightforward and understood. Short vessel campaign (*c* .29 days). Cutting equipment can cut to within 1m of rock berm, reprofiling the end of existing rock berm will be required to achieve cover for the final 1m of pipeline. Offshore Execution Phase schedule is unlikely to slip beyond planned schedule plus contingencies applied. Risk of project failure is low and considered to be not significantly different from other options.
			RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
			Technical Complexity & Track Record	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical complexity not considered significantly different from other options.	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical complexity not considered significantly different from other options.	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical complexity not considered significantly different from other options.	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical complexity not considered significantly different from other options.
			RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
			TECHNICAL: OVERALL RATING BASED ON AVERAGE	**Not Significantly Different**	**Not Significantly Different**	**Not Significantly Different**	**Not Significantly Different**
SAFETY	Risk During Project Execution		To Project Personnel	Shortest vessel duration of all options (*c.* 18 days) for single vessel and no vessel SIMOPS. Deck crew interaction/ deck handling is low since pipelines and umbilicals are loaded directly onto reel. Risks are not considered to be significantly different from other options.	Short duration campaign (*c.* 23 days) for single vessel. No Minimal materials handling as application of rock cover is reasonably automatic with minimal deck crew intervention required. Risks are not considered to be significantly different from other options.	Short duration campaign (*c* .20 days) for single vessel. Minimal and routine equipment handling (launching and recovery of trenching equipment and ROV) for deck crew. Risks are not considered to be significantly different from other options.	Short duration campaign (*c.* 29 days) for single vessel. Although materials are recovered to the vessel, it is a relatively small quantity (*c* .520m / *c.* 20te) and pipelines are not concrete coated, therefore no risk from spalling concrete when handling. Risks are not considered to be significantly different from other options.
			RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
			To Those on Land	Management of materials returned onshore will be at licenced yards. Quantity of materials returned onshore for dismantling is *c* .9km / *c* .348te. Most deconstruct work in yard is remote from personnel and carried out using appropriate equipment. Umbilical has served a WI system and contains no chemicals only hydraulic oil, although release of hydraulic oil is still classified as a chemical release, the occupational risk to yard personnel from such an event is considered low. *Consider sensitivity analysis of Moderate Impact (Amber) for this option with other options Low Impact (Green) based on comparative quantity of materials returned onshore.*	No materials returned onshore for dismantling, therefore no risk. Initial supply of rock materials to the quayside is routine and not considered a risk specific to this project.	No materials returned onshore for dismantling, therefore no risk. Mobilisation and demobilisation of trenching equipment is routine and not considered risk specific to this project.	Management of materials returned onshore will be at licenced yards. Negligible quantity of materials returned onshore for dismantling (*c.* 520m / *c.* 20te).
			RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
			To Other Users of the Sea	Relative to normal operations there is minimal increased risk to other sea users given that the campaign is relatively short (*c* .18 days) duration, single vessel in field at any time and few vessel transits. Risks to other sea users are not considered to be significantly different from other options.	Relative to normal operations there is minimal increased risk to other sea users given that the campaign is relatively short (*c.* 23 days) duration, single vessel in field at any time and few vessel transits. Risks to other sea users are not considered to be significantly different from other options.	Relative to normal operations there is minimal increased risk to other sea users given that the campaign is relatively short (*c* .20 days) duration, single vessel in field at any time and few vessel transits. Risks to other sea users are not considered to be significantly different from other options.	Relative to normal operations there is minimal increased risk to other sea users given that the campaign is relatively short (*c* .29 days) duration, single vessel in field at any time and few vessel transits. Risks to other sea users are not considered to be significantly different from other options.
			RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
			Residual (Long Term) Risk To Other Users of the Sea	The existing rock berm profile will be improved from an over trawl ability perspective when displaced / spread to recover the lines. The rock sizes specification of existing berm should mean that the trawl gear could fish over the disturbed rock. The residual risk to other users is therefore considered low.	The existing rock berm and additional *c.* 520m of new rock berm added in this option is designed to be over trawlable, however, rating recognises potential for rock berms to become unstable over time and create a snag hazard.	The existing berm is 1m high, although it is designed to be over trawlable, however, rating recognises potential for rock berm to become unstable over time and create a snag hazard. Existing exposed ends are trenched and buried with this option.	Existing berm is 1m high, although these are designed to be over trawlable, however, rating recognises potential for rock berm to become unstable over time and create a snag hazard. Existing exposed ends are cut and removed with this option.
			RATING	Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
			SAFETY: OVERALL RATING BASED ON AVERAGE	**Lower Impact**	**Moderate Impact**	**Moderate Impact**	**Moderate Impact**

Rating Workbook - Tartan Group E.xlsx

Flexible Pipeline and Umbilical, Surface Laid and Rock Covered

One 6" ID Flexible Pipeline and one Umbilical, both 4.5km long. Both fully rock covered to average DOC 0.51m TOP, exposures at pipeline ends only.

ENVIRONMENTAL

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options	a)	a)	b)	c)
		REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
ENVIRONMENTAL	**Impact of Decommissioning Operations Offshore** *(includes emissions to air, discharges to sea and underwater noise)*	Given the relatively short duration of the activities associated with this option (*c.* 18 days), the magnitude of effect of the emissions associated with the offshore campaign is not considered significantly different from the other options. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with reverse reeling. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c.* 23 days), the magnitude of effect of the emissions associated with the offshore campaign is not considered significantly different from the other options. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with the application of rock cover. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c.* 20 days), the magnitude of effect of the emissions associated with the offshore campaign is not considered significantly different from the other options. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with trench and burial activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c.* 29 days), the magnitude of effect of the emissions associated with the offshore campaign is not considered significantly different from the other options. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with cutting pipelines. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Seabed Disturbance- Short Term *(includes disturbance to the cuttings piles)*	Although rock displaced to recover pipelines with this option it can be achieved in a controlled manner and seabed disturbance is not significant. Seabed Disturbance is not significantly different from other options.	The majority of the lines remain undisturbed below the existing rock berm. It is recognised there will be short term localised disturbance during rock placement at exposed pipeline ends. The footprint of this short term disturbance is small (*c.* 520m). Seabed Disturbance is not significantly different from other options.	The majority of the lines remain undisturbed below the existing rock berm. It is recognised there will be short term localised disturbance during trenching at exposed pipeline ends. The footprint of this short term disturbance is small (*c* .520m). Seabed Disturbance is not significantly different from other options.	The majority of the lines remain undisturbed below the existing rock berm. It is anticipated that cutting will be carried out using hydraulic shears and therefore seabed disturbance will be minimal and only local to already exposed ends of pipelines. Seabed Disturbance is not significantly different from other options.
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Change of Habitat - Long Term	No additional material introduced to seabed to support decommissioning activities. Any potential impact to the sediment and associated ecology from relocation during deburial is expected to be barely detectable. Long term change of habitat is not considered significantly different from other options.	A minor extension to the existing rock profile at each pipeline end only, *c.* 520m and *c.* 2,820te of new rock cover. Long term change of habitat is not considered significantly different from other options.	No additional material introduced to seabed to support decommissioning activities. Any potential impact to the sediment and associated ecology from relocation during trenching and burying of the exposed ends is expected to be barely detectable. Long term change of habitat is not considered significantly different from other options.	No additional material introduced to seabed to support decommissioning activities. Any potential impact to the sediment and associated ecology from relocation during recovery of the exposed ends is expected to be barely detectable. Long term change of habitat is not considered significantly different from other options.
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Waste Processing *(i.e. processing of returned materials and use of landfill)*	Application of this option would result in c.184te of materials returned onshore to be processed, with c.74te to landfill (plastics and trapped chemicals from the umbilicals). *Consider sensitivity analysis of Low Impact (Green) for based on fact that quantity of materials returned onshore whilst greater than other options is relatively small in the wider scale from a waste processing perspective.*	No materials returned onshore.	No materials returned onshore.	Application of this option would result in *c* .20te with potentially *c* .4te to landfill (plastics and trapped chemicals from the umbilicals). Rated as Lower Impact (Green) due to small volumes of material that would be recovered.
	RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	ENVIRONMENTAL: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**

Rating Workbook - Tartan Group E.xlsx

Flexible Pipeline and Umbilical, Surface Laid and Rock Covered

One 6" ID Flexible Pipeline and one Umbilical, both 4.5km long. Both fully rock covered to average DOC 0.51m TOP, exposures at pipeline ends only.

SOCIETAL & ECONOMIC RISK

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options	a)	a)	b)	c)
		REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
SOCIETAL	Impact on Commercial Fisheries	The existing rock berm profile will be improved from an over trawl ability perspective when displaced / spread to recover the lines whilst footprint is expected to remain similar to other options. The rock sizes specification of existing berm should mean that the trawl gear could fish over the disturbed rock. . Impact on commercial fisheries is not considered significantly different from other options.	Infrastructure footprint remains very similar for all options: this option will involve extending existing rock berm by *c.* 520m. Impact on commercial fisheries is not considered significantly different from other options.	Infrastructure footprint remains very similar for all options: this option will involve trenching and burying the exposed ends (*c* .520m). Existing rock berm remains. Impact on commercial fisheries is not considered significantly different from other options.	Infrastructure footprint remains very similar for all options: this option will involve cutting and removing the exposed ends (*c.* 520m). Existing rock berm remains. Impact on commercial fisheries is not considered significantly different from other options.
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Socio-economic Impact on Communities and Amenities	Although more materials would be returned onshore (when compared to the remediate in-situ options) the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	Small quantity of materials would be returned onshore that are not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	SOCIETAL: OVERALL RATING - BASED ON AVERAGE	**Not Significantly Different**	**Not Significantly Different**	**Not Significantly Different**	**Not Significantly Different**
ECONOMIC RISK	Cost for Decommissioning/ Removal activities	Estimated at £1.52M which is109% of lowest cost option.	Estimated at £1.68M which is 121% of lowest cost option.	Estimated at £1.39M which is the lowest cost option.	Estimated at £1.82M which is 130% of lowest cost option.
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Cost for long term monitoring / Remediation activities	Minimal potential ongoing cost liability as pipelines removed. Post project assessment survey only.	Existing lines already enclosed in a rock berm. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities (e.g. re-profile unstable rock berm)	Existing lines already enclosed in a rock berm. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities (e.g. re-profile unstable rock berm)	Existing lines already enclosed in a rock berm. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities (e.g. re-profile unstable rock berm)
	RATING	Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
	ECONOMIC RISK: OVERALL RATING BASED ON AVERAGE	**Lower Impact**	**Moderate Impact**	**Moderate Impact**	**Moderate Impact**

Rating Workbook - Tartan Group E.xlsx

Flexible Pipeline and Umbilical, Surface Laid and Rock Covered

VISUAL RATING SUMMARY - HEATMAP

One 6" ID Flexible Pipeline and one Umbilical, both 4.5km long. Both fully rock covered to average DOC 0.51m TOP, exposures at pipeline ends only.

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options		a)	a)	b)	c)
			REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Not significantly different	Not significantly different	Not significantly different	Not significantly different
		To Those on Land	Not significantly different	Not significantly different	Not significantly different	Not significantly different
		To Other Users of the Sea	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Seabed Disturbance- Short Term		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Change of Habitat - Long Term		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Waste Processing		Moderate Impact	Lower Impact	Lower Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different
ECONOMIC RISK	Cost for Decommissioning/ Removal activities		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Cost for long term monitoring / Remediation activities		Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
	OVERALL RATING		Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
	OVERALL RANKING		1st	2nd=	2nd=	2nd=
	Rating Count		Red =0	Red = 0	Red = 0	Red = 0
			Amber =1	Amber = 2	Amber = 2	Amber = 2
			Green =2	Green = 1	Green = 1	Green = 1
	COMMENTS		Although 1a) is ranked marginally better than options 2a) , 2b) and 2c), all four options not significantly different. Therefore, the outcome for other pipeline groups may determine the decommissioning strategy for this pipelines group. i.e. it may be more efficient to adopt a common decommissioning strategy across a number of pipelines groups in the field.			

Rating Workbook - Tartan Group E.xlsx

Flexible Pipeline and Umbilical, Surface Laid and Rock Covered

NARRATIVE SUMMARY:
Sub-criteria ratings have been averaged by main criteria

Red / italic text in cells below highlights the main areas of influence in a combined rating evaluation poorer than Low Impact (Green).

One 6″ ID Flexible Pipeline and one Umbilical, both 4.5km long. Both fully rock covered to average DOC 0.51m TOP, exposures at pipeline ends only.

SUMMARY

Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
Sub Criteria/ / Sub Options	a)	a)	b)	c)
	REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Technical complexity is not significantly different from other options. Relatively short offshore execution phase and schedule is unlikely to slip beyond planned schedule plus contingencies applied. Existing rock cover will require to be displaced before recovery of the lines. However, during the displacement profiling / spreading of the rock will occur to maintain overtrawlability.	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Technical complexity is not significantly different from other options. Relatively short offshore execution phase and schedule is unlikely to slip beyond planned schedule plus contingencies applied. Additional rock will be applied to exposures at pipeline ends which will extend existing rock profile by *c.* 500m.	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Technical complexity is not significantly different from other options. Relatively short offshore execution phase and schedule is unlikely to slip beyond planned schedule plus contingencies applied. Trenching device can trench to within 1m of rock berm, reprofiling the end of existing rock berm will be required to achieve cover for the final 1m of pipeline.	Straightforward operation using established technology and working methods and with an experienced contractor pool available. Technical complexity is not significantly different from other options. Relatively short offshore execution phase and schedule is unlikely to slip beyond planned schedule plus contingencies applied. Cutting equipment can cut to within 1m of rock berm, reprofiling the end of existing rock berm will be required to achieve cover for the final 1m of pipeline.
AVERAGE RATING THIS CRITERION	Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different
SAFETY	Short duration campaign (c.18 days) for single vessel with few vessel transits to and from shore. Deck crew interaction with materials is low since pipelines and umbilicals are loaded directly onto reel. Quantity of materials returned onshore is more than other options but not significant quantities. Management of materials returned onshore will be at licenced yards. Most deconstruct work in yard is remote from personnel and carried out using appropriate equipment, with low risk of chemical release risk from umbilicals. No increased risk to other vessels than currently under normal operations. The existing rock berm profile will be improved from an overtrawlability perspective when displaced / spread to recover the lines.	Short duration campaign (c.23 days) for single vessel with few vessel transits to and from shore. Minimal materials handling as application of rock cover is reasonably automatic with minimal deck crew intervention required. No materials returned onshore for dismantling. No increased risk to other vessels than currently under normal operations. *Pipelines are left in-situ below existing 1m high rock berm, although these are designed to be over trawlable, they could become unstable overtime and become a snagging risk.* Only small addition of rock to be added at the end of existing berms *c* .520m and *c* .2,820te in total with this option.	Short duration campaign (c.20 days) for single vessel with few vessel transits to and from shore. Minimal and routine equipment handling (launching and recovery of trenching equipment and ROV) for deck crew. No materials returned onshore for dismantling. No increased risk to other vessels than currently under normal operations. *Pipelines are left in-situ below existing 1m high rock berm, although these are designed to be over trawlable, they could become unstable overtime and become a snagging risk.* Existing exposed ends are trenched and buried with this option.	Short duration campaign (c.29 days) for single vessel with few vessel transits to and from shore. Negligible quantities of materials are recovered, with low risk of chemical release risk from umbilicals. Management of materials returned onshore will be at licenced yards. No increased risk to other vessels than currently under normal operations. *Pipelines are left in-situ below existing 1m high rock berm, although these are designed to be over trawlable, they could become unstable overtime and become a snagging risk.* Existing exposed ends are cut and removed with this option.
AVERAGE RATING THIS CRITERION	Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
ENVIRONMENTAL	Given the short duration of the activities associated with this option the impact of the atmospheric emissions associated with the vessels is not considered significant. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Although rock is displaced to recover pipelines with this option it can be achieved in a controlled manner and seabed disturbance is not significant. No additional material introduced to seabed to support decommissioning activities. Any potential impact to the sediment and associated ecology from relocation during deburial is expected to be barely detectable. Long term change of habitat is not considered significantly different from other options. *Comparatively more materials returned onshore for processing than with other options. c.184te with c.74te to landfill.*	Given the short duration of the activities associated with this option the impact of the atmospheric emissions associated with the vessels is not considered significant. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. The majority of the lines remain undisturbed below the existing rock berm. It is recognised there will be short term localised seabed disturbance during rock placement at exposed pipeline ends. The footprint of this short term disturbance is small (*c* .520m). A minor extension to the existing rock profile at each pipeline end only, c.520m and *c* .2,820te of new rock cover. Long term change of habitat is not considered significantly different from other options. No materials returned onshore.	Given the short duration of the activities associated with this option the impact of the atmospheric emissions associated with the vessels is not considered significant. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. The majority of the lines remain undisturbed below the existing rock berm. It is recognised there will be short term localised disturbance during trenching at exposed pipeline ends. The footprint of this short term disturbance is small (*c* .520m). No additional material introduced to seabed, any potential impact to the sediment and associated ecology from relocation during trenching and burying of the exposed ends is expected to be barely detectable. Long term change of habitat is not considered significantly different from other options. No materials returned onshore.	Given the short duration of the activities associated with this option the impact of the atmospheric emissions associated with the vessels is not considered significant. As the lines will be flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. The majority of the lines remain undisturbed below the existing rock berm. It is anticipated that cutting will be carried out using hydraulic shears and therefore seabed disturbance will be minimal and only local to already exposed ends of pipelines (*c* .520m). No additional material introduced to seabed, any potential impact to the sediment and associated ecology from relocation during recovery of the exposed ends is expected to be barely detectable. Long term change of habitat is not considered significantly different from other options. Small quantity of materials returned onshore, *c.* 20te with *c.* 4te to landfill.
AVERAGE RATING THIS CRITERION	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
SOCIETAL	The existing rock berm profile will be improved from an overtrawlability perspective when displaced / spread to recover the lines whilst the footprint is expected to remain similar to other options. Impact on commercial fisheries is not considered significantly different from other options. Although more materials would be returned onshore (when compared to the remediate in-situ options) the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	Infrastructure footprint remains very similar for all options: this option will involve extending existing rock berm by only *c* .520m. Impact on commercial fisheries is not considered significantly different from other options. No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	Infrastructure footprint remains very similar for all options: this option will involve trenching and burying the exposed ends (*c* .520m). Existing rock berm remains. Impact on commercial fisheries is not considered significantly different from other options. No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	Infrastructure footprint remains very similar for all options: this option will involve cutting and removing the exposed ends (c.520m). Existing rock berm remains. Impact on commercial fisheries is not considered significantly different from other options. Small quantity of materials would be returned onshore that are not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.
AVERAGE RATING THIS CRITERION	Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different
ECONOMIC RISK	Estimated at £1.52M which is109% of lowest cost option. Minimal potential ongoing cost liability as pipelines removed. Post project assessment survey only.	Estimated at £1.68M which is 121% of lowest cost option. *Existing lines already enclosed in a rock berm will be left in place plus additional c.520m of new rock applied at exposed ends. Therefore, potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion, with potential for some future remediation activities (e.g. re-profile of an unstable rock berm).*	Estimated at £1.39M which is the lowest cost option. *Existing lines already enclosed in a rock berm will be left in place. Therefore, potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion, with potential for some future remediation activities (e.g. re-profile of an unstable rock berm).*	Estimated at £1.82M which is 130% of lowest cost option. *Existing lines already enclosed in a rock berm will be left in place. Therefore, potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion, with potential for some future remediation activities (e.g. re-profile of an unstable rock berm).*
AVERAGE RATING THIS CRITERION	Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
OVERALL RATING	Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
OVERALL RANKING	**1st**	**2nd=**	**2nd=**	**2nd=**
COMMENTS	When average ratings by Main Criteria only are considered, the rankings of each option does not change compared to the original R/A/G evaluation. Therefore, the recommendations concluded for the original evaluation remain in place.			

Rating Workbook - Tartan Group E.xlsx

Flexible Pipeline and Umbilical, Surface Laid and Rock Covered

One 6" ID Flexible Pipeline and one Umbilical, both 4.5km long. Both fully rock covered to average DOC 0.51m TOP, exposures at pipeline ends only.

VISUAL RATING SUMMARY: Sensitivity Analysis 1 - Specific Sub-Criteria

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options		a)	a)	b)	c)
			REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Not significantly different	Not significantly different	Not significantly different	Not significantly different
		To Those on Land	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Seabed Disturbance- Short Term		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Change of Habitat - Long Term		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Waste Processing		Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different
SOCIETAL	Impact on Commercial Fisheries		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different
ECONOMIC RISK	Cost for Decommissioning/ Removal activities		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Cost for long term monitoring / Remediation activities		Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
OVERALL RATING			Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
OVERALL RANKING			1st	2nd=	2nd=	2nd=
Rating Count			Red =0 Amber =1 Green =2	Red = 0 Amber = 2 Green = 1	Red = 0 Amber = 2 Green = 1	Red = 0 Amber = 2 Green = 1
COMMENTS	The changes in ratings in this Sensitivity Analysis are associated with the significance, or not, of the quantity of materials returned onshore for Option 1a). Both rating changes counteract each other and therefore the results and recommendations from the original R/A/G evaluation remain the same. Although 1a) is ranked marginally better than options 2a) , 2b) and 2c), all four options not significantly different. Therefore, the outcome for other pipeline groups may determine the decommissioning strategy for this pipelines group. i.e. it may be more efficient to adopt a common decommissioning strategy across a number of pipelines groups in the field.					

Rating changed from "not significantly different". To Moderate Impact (Amber) with other options becoming Low Impact (Green).
Basis of sensitivity analysis is that Option 1a) has comparatively more materials returned onshore to be handled than all other options

Rating changed from Moderate Impact (Amber) to Low Impact (Green) which results in all options for this sub-criterion becoming "not significantly different".
Basis of sensitivity analysis is that whilst Option 1a) has comparatively more materials returned onshore than other options it is relatively small quantity in the wider scale from a waste processing perspective.

Rating Workbook - Tartan Group E.xlsx

Flexible Pipeline and Umbilical, Surface Laid and Rock Covered

VISUAL RATING SUMMARY: Sensitivity Analysis 2 - Economic Risk Discounted

One 6" ID Flexible Pipeline and one Umbilical, both 4.5km long. Both fully rock covered to average DOC 0.51m TOP, exposures at pipeline ends only.

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options		a)	a)	b)	c)
			REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Not significantly different	Not significantly different	Not significantly different	Not significantly different
		To Those on Land	Not significantly different	Not significantly different	Not significantly different	Not significantly different
		To Other Users of the Sea	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Moderate Impact	Moderate Impact	Moderate Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Seabed Disturbance- Short Term		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Change of Habitat - Long Term		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Waste Processing		Moderate Impact	Lower Impact	Lower Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different
OVERALL RATING			Moderate Impact	Moderate Impact	Moderate Impact	Moderate Impact
OVERALL RANKING			1st=	1st=	1st=	1st=
Rating Count			Red =0	Red = 0	Red = 0	Red = 0
			Amber =1	Amber = 1	Amber = 1	Amber = 1
			Green =1	Green = 1	Green = 1	Green = 1
COMMENTS	Sensitivity Analysis 2 with Economic Risk Evaluation results discounted, results in all four options being ranked equally (first equal) as each option has one Moderate Impact (Amber) and one Low Impact (Green). This reinforces the recommendation under the original R/A/G evaluation results that it may be more efficient to adopt a common decommissioning strategy across a number of pipelines groups in the field, incorporating this group.					

Rating Workbook - Tartan Group F.xlsx

Rigid Trunk Pipeline, Concrete Coated and Shallow Trenched and Partially Covered

The remaining section of PL18, the 24" Oil Export Line x 11km (KP15.602 to KP26.56). KP15.602 being the point where the pipeline transitions into the shallow trench. With an average DOC of 0.44m and with mid line exposures of 1.48km approximately with some exposures currently covered with mattresses and concrete blocks

TECHNICAL & SAFETY

Assessment Criteria			Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:			3. LEAVE IN-SITU
				c)	a)	b)	c)	
			Sub Criteria/ / Sub Options	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED	AND MONITOR
TECHNICAL FEASIBILITY			Risk of Major Project Failure	Straightforward operation, however vessel durations offshore (*c* .223 days in total) are significantly greater than the other options: with vessel durations for remaining options ranging between *c.* 15 days and *c.* 37 days. Significant repetitive activity which if effort involved was underestimated only slightly could lead to significant schedule growth. Also, uncertainty exists on the integrity of the 24" Oil export line which has lost between 60% and 70% of its wall thickness overtime in some areas. This could result in further delays in lifting sections of the line if failures occur during the operation.	Relatively short exposures (*c.* .1.49km) to be remediated with single rock dump vessel onstation for *c.* 24 days. Normal operational procedures proposed. Scope is straightforward and understood. Offshore Execution Phase schedule is unlikely to slip beyond planned schedule plus contingencies applied.	Relatively short exposures (*c.* 1.49km) to be remediated with single trenching vessel onstation for *c.* 20 days. Normal operational procedures proposed. However, records of why adequate trenching depth, similar to Group A, was not achieved during original pipeline installation in these areas are not available. Therefore, there is uncertainty whether or not it may be difficult to improve the trench depth further at these exposures. It is noted that an EPRD contractor would carry out a more detailed trench ability study before committing to this strategy such that the Offshore Execution Phase schedule is unlikely to slip beyond planned schedule plus contingencies applied. However option is rated Moderate Impact (Amber) due to uncertainties around reaching required trenching depth. *Consider sensitivity analysis of High Impact (Red) for this option due to this uncertainty in being able to achieve adequate trench depth at exposures.*	Relatively short exposures (c.1.49km) to be remediated with single rock dump vessel onstation for c.37 days. Normal operational procedures proposed. Scope is straightforward and understood. Offshore Execution Phase schedule is unlikely to slip beyond planned schedule plus contingencies applied.	Scope involves post decommissioning vessel surveys only.
			RATING	Moderate Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
			Technical Complexity & Track Record	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical complexity not considered significantly different from other options. *Consider sensitivity analysis of Moderate Impact (Amber) for this option as aged concrete coating is in poor condition and may result in more complex recovery methods.*	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical complexity not considered significantly different from other options.	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical complexity not considered significantly different from other options.	Uses established technology and working methods designed for this field of operation. Large experienced contractor pool available. Technical complexity not considered significantly different from other options.	Scope involves vessel / ROV surveys only. A large experienced contractor pool executes this type activity annually in the North Sea.
			RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
			TECHNICAL: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Lower Impact**	**Moderate Impact**	**Lower Impact**	**Lower Impact**
SAFETY	Risk During Project Execution		To Project Personnel	Long and multiple vessel campaigns anticipated (*c.* 223 days overall). Vessel SIMOPs (>2 vessels for *c.* 76 days). Significant and repetitive materials handling on deck *(c.* 11km/ *c.* 5,233te of pipeline returned to deck in cut up sections) with potential of dropped objects from spalling of aged concrete coating. Sections of the pipeline run parallel to and close proximity to 3rd party pipelines which may remain live during execution. It is expected that lifting methods adopted for the pipeline sections will mitigate risk of dropped objects on adjacent line pipelines. *Consider sensitivity analysis of Higher Impact (Red) for this option due to the comparatively larger quantity of materials to be handled by the deck crew and over a longer duration compared to Option 2c).*	Short duration campaign (*c.* 24 days) for single vessel. Minimal materials handling as application of rock cover is reasonably automatic with minimal deck crew intervention required.	Short duration campaign (*c* .20 days) for single vessel. Minimal and routine equipment handling (launching and recovery of trenching equipment and ROV) for deck crew.	Short duration campaign (*c* .37 days) for single vessel. Some repetitive materials handling on deck with potential of dropped objects from spalling of aged concrete coating. However much less handling than Option 1c) with only *c.* 1.48km/ *c.* 710te of pipeline returned to deck. Sections of the pipeline run parallel to and close proximity to 3rd party pipelines which may remain live during execution. It is expected that lifting methods adopted for the pipeline sections will mitigate risk of dropped objects on adjacent line pipelines. Noted there is a likelihood of concreted coating damage from trawling on exposed sections being recovered.	Short duration and repeated survey campaigns using a single vessel, estimated to be c.15 days total across three surveys. Minimal and routine equipment handling (launching and recovery of survey equipment and ROV) for deck crew.
			RATING	Moderate Impact	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
			To Those on Land	Management of materials returned onshore will be at licenced yards. Significant quantity of materials returned onshore (*c* .10.96km/ *c.* 5,233te) to be managed with potential of dropped objects from spalling of aged concrete coating. However, most deconstruct work in the yard is remote from personnel and carried out using appropriate equipment. *Consider sensitivity analysis of Higher Impact (RED) for this option, as there is comparatively larger quantities of materials to be handled compared to Option 2c) and over a prolonged period.*	No materials returned onshore for dismantling, therefore no risk. Initial supply of Rock materials to the quayside is routine and not considered a risk specific to this project.	No materials returned onshore for dismantling, therefore no risk. Mobilisation and demobilisation of trenching equipment is routine and not considered risk specific to this project.	Management of materials returned onshore will be at licenced yards. Only small quantity of materials returned onshore (*c.* 1.48km/ *c.* 710te) to be managed with potential of dropped objects from spalling of aged concrete coating. However, most deconstruct work in the yard is remote from personnel and carried out using appropriate equipment. *Consider sensitivity analysis of Low Impact (Green) for this option as there is comparatively much less materials to be handled compared to Option 1c) and over a much shorter period.*	No materials returned onshore for dismantling, therefore no risk. Mobilisation and demobilisation of survey equipment is routine and not considered risk specific to this project.
			RATING	Moderate Impact	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
			To Other Users of the Sea	More vessels and much longer campaign duration (*c* .233 days) than other options and working over a 11km stretch of pipeline. More vessel transits (*c.* 10) to and from onshore to unload recovered pipeline sections. However, risk to other users of the sea can be mitigated.	No increased risk to other vessels than currently under normal operations. Campaign is relatively short duration, single vessel in field. Minimum vessel transits to and from shore (mob and demob).	No increased risk to other vessels than currently under normal operations. Campaign is relatively short duration, single vessel in field. Minimum vessel transits to and from shore (mob and demob).	No increased risk to other vessels than currently under normal operations. Campaign is relatively short duration, single vessel in field. Minimum vessel transits to and from shore (mob and demob).	No increased risk to other vessels than currently under normal operations. Single survey vessel only for short duration (repeated surveys over a number of years)
			RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
			Residual (Long Term) Risk To Other Users of the Sea	No residual risk as option will leave a safe seabed.	Additional rock berms introduced at exposed sections *(c* 1.48km/ *c* .22,396te) will be installed to be over trawlable, rating recognises potential for new rock berms to become unstable over time and create a snag hazard. No rock berms exist on this pipeline at present.	No increased risk compared to existing operating condition, existing trenched and buried section remains over trawlable and exposed sections will be trenched and buried to become over trawlable and thus leave a safe seabed.	No increased risk compared to existing operating condition, existing trenched section remains over trawlable and exposed sections will be removed at cut ends buried or rock covered within trench to leave a clean seabed.	Increased risk from exposed sections of pipeline decommissioned in-situ, with no mitigation introduced to prevent snagging from over trawling. Exposed pipeline sections may deteriorate overtime leading to increased snagging risk, although noted that pipeline exposures are in open trench with top of pipe below mean seabed level.
			RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Higher Impact
			SAFETY: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**	**Moderate Impact**

Rating Workbook - Tartan Group F.xlsx

Rigid Trunk Pipeline, Concrete Coated and Shallow Trenched and Partially Covered

The remaining section of PL18, the 24" Oil Export Line x 11km (KP15.602 to KP26.56). KP15.602 being the point where the pipeline transitions into the shallow trench. With an average DOC of 0.44m and with mid line exposures of 1.48km approximately with some exposures currently covered with mattresses and concrete blocks

ENVIRONMENTAL

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:			3. LEAVE IN-SITU
	Sub Criteria/ / Sub Options	c)	a)	b)	c)	
		CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED	AND MONITOR
ENVIRONMENTAL	**Impact of Decommissioning Operations Offshore** *(includes emissions to air, discharges to sea and underwater noise)*	Taking account of the length of vessel campaigns associated with this option (*c* .223 days) compared to the relatively short durations of the other options, the magnitude of effect of the emissions associated with Option 1c) is considered significantly greater than the effects associated with the other options. As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with cutting activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c.* 24 days), the magnitude of effect is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the pipeline ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Sources of underwater noise will include the presence of vessels and the noise associated with rock dumping activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c.* 20 days), the magnitude of effect is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the pipeline ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Sources of underwater noise will include the presence of vessels and the noise associated with trench and burial activities. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c* .20 days, the magnitude of effect is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the pipeline ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Sources of underwater noise will include the presence of vessels and the noise associated with cutting pipelines. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.	Given the relatively short duration of the activities associated with this option (*c.* 15 days, the magnitude of effect is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the pipeline ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Sources of underwater noise will include the presence of vessels during the post - decommissioning surveys. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area.
	RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term *(includes disturbance to the cuttings piles)*	Full length of pipeline to be deburied before removal (*c.* 11km), although noted that depth of sediment cover is not significant by comparison to the pipelines under Group A. Also noted that Tartan A cuttings piles remains unaffected (all options) due to cut locations/ boundary limit of the pipeline and the cuttings pile.	This option is recognised to result in short term localised disturbance during rock placement. The footprint of this short term disturbance (*c* .1.48km of pipeline) is less than the footprint of disturbance associated with Option 1c), however it is still rated Moderate Impact (Amber).	This option is recognised to result in short term localised disturbance during trenching and burying. The footprint of this short term disturbance (*c.* 1.48km of pipeline) is less than the footprint of disturbance associated with Option 1c), however it is still rated Moderate Impact (Amber).	The sections of line to be recovered (*c* .1.48km of pipeline) are exposed and it is expected that cutting will be carried out using a hydraulic shears. The footprint of seabed to be disturbed is therefore considered less than the area to be disturbed for Options 1c, 2a and 2b.	No seabed disturbance associated with this option, visual surveys of pipelines only.
	RATING	Moderate Impact	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term	No additional material to be introduced to the seabed to support decommissioning activities. It is possible that some spalling of the concrete coating may result in small pieces of concrete falling from the pipeline during recovery, however impacts on the ecosystem are not expected to be significant given that there are naturally occurring rocks/boulders in the area that are likely be inhabited by ecosystems similar to those that would settle on any small bits of concrete that may drop off and are not recovered. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of Option 1c) on the existing habitat is not considered significant.	Sediments across the Tartan Development Area are considered to represent three main habitats: circalittoral fine mud (EUNIS A5.36), circalittoral sandy mud (EUNIS A5.35) and deep circalittoral mixed sediment (EUNIS A5.45). In addition, the majority of the Tartan Development Area, is considered to meet the criteria for the OSPAR listed threatened and/or declining habitat 'Sea pen and burrowing megafauna communities' as well as the UK Habitat Feature of Conservation Importance and UKBAP habitat 'mud habitats in deep water'. This option requires the addition of *c* .22,396te of new rock cover to be added to the exposed pipelines. Given the habitat types and volume of rock required, the long term impact of rock dumping is considered Moderate Impact (Amber).	No additional material to be introduced to the seabed to support this option. In addition no pieces of concrete expected to be left on the seabed (as described for Option 1c). Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of Option 2b) on the existing habitat is not considered significant.	No additional material to be introduced to the seabed to support decommissioning activities. It is possible that some spalling of the concrete coating may result in small pieces of concrete falling from the pipelines during recovery of the exposed sections, however impacts on the ecosystem are not expected to be significant given that there are naturally occurring rocks/boulders in the area that are likely be inhabited by ecosystems similar or those that would settle on any small pieces of concrete that may drop off and are not recovered. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed. Therefore, the long term impact of Option 2c) on the existing habitat is not considered significant.	Habitat will not be disturbed for this option, therefore no long term habitat change impacts
	RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Waste Processing *(i.e. processing of returned materials and use of landfill)*	Application of this option would result in *c.* 5,233te of the pipeline is returned onshore to be processed, with potentially *c.* 1,334te to landfill (note the CA workshop assumed that the concrete coating on the pipelines is of poor quality and assumes a worst case whereby it will go to landfill). *Consider sensitivity analysis of Low Impact (Green) for this option if circumstances allow the concrete coating to also be recycled.*	No materials returned onshore.	No materials returned onshore.	Application of this option would result in *c* .710te of the pipeline is returned onshore to be processed, with potentially *c.* 295te to landfill (note the CA workshop assumed that the concrete coating on the pipelines is of poor quality and assumes a worst case whereby it will go to landfill). *Consider sensitivity analysis of Low Impact (Green) for this option if circumstances allow the concrete coating to also be recycled.*	No materials returned onshore.
	RATING	Moderate Impact	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
	ENVIRONMENTAL: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Moderate Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**

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Rigid Trunk Pipeline, Concrete Coated and Shallow Trenched and Partially Covered

The remaining section of PL18, the 24" Oil Export Line x 11km (KP15.602 to KP26.56). KP15.602 being the point where the pipeline transitions into the shallow trench. With an average DOC of 0.44m and with mid line exposures of 1.48km approximately with some exposures currently covered with mattresses and concrete blocks

SOCIETAL & ECONOMIC RISK

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:			3. LEAVE IN-SITU
	Sub Criteria/ / Sub Options	c)	a)	b)	c)	
		CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED	AND MONITOR
SOCIETAL	Impact on Commercial Fisheries	Option results in a safe seabed and therefore no anticipated impact on commercial fisheries.	Rock cover to be installed would be laid in line with industry standards and fishing industry requirements. Therefore, it should be possible for fishing gear to fish in the area. If the rock berm did become unstable over time such that bottom trawl gear could not be used in the area, given the length of rock berms (*c.* 1.48km of pipelines) the area of seabed impacted is considered ot have a Moderate Impact (Amber) when compared to the other options. *Consider sensitivity analysis of Low Impact (Green) for this option since the rock cover will be installed in existing open trenches, with less rock profile above mean seabed level than with surface laid pipelines.*	Option results in a safe seabed as there would be no exposed line lengths remaining and therefore no anticipated impact on commercial fisheries.	Option results in a safe seabed as there would be no exposed line lengths remaining and therefore no anticipated impact on commercial fisheries.	Option leaves multiple and short exposed sections that may deteriorate overtime which could become snagging hazards leading to lost nets/income or self-imposed exclusion zones by fishermen. Rated High (Red) impact due to potential length of exposures (*c.* 1.48km in total). *Consider sensitivity analysis of Moderate Impact (Amber) as noted that the pipeline exposures are left un-remediated are in an open trench with top of pipe below mean seabed level, and less of a snag hazard.*
	RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Higher Impact
	Socio-economic Impact on Communities and Amenities	Although more materials returned onshore when compared to the other options, the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities.	No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	Negligible quantity of materials returned such that impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant. In addition, no new onshore jobs anticipated.	No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	SOCIETAL: OVERALL RATING - BASED ON AVERAGE	**Lower Impact**	**Moderate Impact**	**Lower Impact**	**Lower Impact**	**Higher Impact**
ECONOMIC RISK	Cost for Decommissioning/ Removal activities	Estimated at £9.62M which is 941% of lowest cost option.	Estimated at £1.76M which is172% of lowest cost option.	Estimated at £1.39M which is 136% of lowest cost option.	Estimated at £2.41M which is 235% of lowest cost option.	Estimated at £1.02M which is the lowest cost option.
	RATING	Higher Impact	Moderate Impact	Lower Impact	Moderate Impact	Lower Impact
	Cost for long term monitoring / Remediation activities	Minimal potential ongoing cost liability as pipeline is removed. Post project assessment survey only.	Existing line is already buried and will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities (e.g. re-profile unstable rock berms)	Existing line is already buried and will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Less potential for remedial work than Option 2a) post project as newly buried sections of line unlikely to unbury.	Existing line is already buried and will continue to be monitored. Potential for at least 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Less potential for remedial work post project than Option 2a) post project as exposed sections of line have been removed.	Existing line is already buried and will continue to be monitored. Potential for more than 3 periodic monitoring surveys and over a much more prolonged period to review behaviour of site post project completion as sections of line are left exposed. Also more potential for remedial work than other options post project as exposed sections of line remaining in the open trench will deteriorate and become an increased snag hazard.
	RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Higher Impact
	ECONOMIC RISK: OVERALL RATING BASED ON AVERAGE	**Higher Impact**	**Moderate Impact**	**Lower Impact**	**Moderate Impact**	**Higher Impact**

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Rigid Trunk Pipeline, Concrete Coated and Shallow Trenched and Partially Covered

The remaining section of PL18, the 24" Oil Export Line x 11km (KP15.602 to KP26.56). KP15.602 being the point where the pipeline transitions into the shallow trench. With an average DOC of 0.44m and with mid line exposures of 1.48km approximately with some exposures currently covered with mattresses and concrete blocks

VISUAL RATING SUMMARY - HEATMAP

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:			3. LEAVE IN-SITU
	Sub Criteria/ / Sub Options		c)	a)	b)	c)	
			CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED	AND MONITOR
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Moderate Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Moderate Impact	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
		To Those on Land	Moderate Impact	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
		To Other Users of the Sea	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Higher Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term		Moderate Impact	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Waste Processing		Moderate Impact	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Higher Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
ECONOMIC RISK	Cost for Decommissioning/ Removal activities		Higher Impact	Moderate Impact	Lower Impact	Moderate Impact	Lower Impact
	Cost for long term monitoring / Remediation activities		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Higher Impact
OVERALL RATING			Higher Impact	Lower Impact	Lower Impact	Lower Impact	Higher Impact
OVERALL RANKING			4th	3rd	1st	2nd	5th
Rating Count			Red =1 Amber =7 Green =4	Red = 0 Amber = 6 Green = 6	Red = 0 Amber = 2 Green = 10	Red = 0 Amber = 4 Green = 8	Red =3 Amber =0 Green =9
COMMENTS			Option 2b) is ranked as the most preferred option and should be identified as such in the CA report and in the Decommissioning Programme (DP). Although it the ability to achieve the required trench depth at current pipeline exposed sections remains a technical uncertainty which should be reviewed and resolved during C&P phase of the project. (see Technical and Safety Worksheet). Option 2c) is only rated marginally worse than option 2b), by two additional Moderate Impact (Amber) due to the fact Option 2c) recovers a small quantity of materials to the vessel deck and Option 2b does not and is rated more poorly on safety risk during materials handling and Environmental impact in waste processing. It also is estimated to cost c.£1.0M more than option 2b). Option 2a) is rated more poorly than option 2a), having four more additional Moderate Impact (Amber) ratings, on the sub-criteria Residual (Long Term) Risk to Other Users, most of the Environmental Sub-criteria and on both estimated cost and potential ongoing cost, in all cases this is because Option 2a) introduces a fairly large number of small new rock berms to the seabed. Since Options 2b) and 2c) are rated only marginally different, it is recommended that both options are carried forward to the C&P tendering phase to enable the EPRD contractors the input to the preferred option from an economic and overall campaign strategy taking account of other pipeline groups in the field. This will also allow the EPRD contractor to carry out a more detailed trench ability study before committing to Option 2b). It is recommended that Option 1c) and Option 3 are discounted at this stage and not considered further. Based on Sensitivity Analysis 2 - Option 2a) should be reinstated and also be considered during the C&P tendering phase to enable the EPRD contractors the input to the preferred option from an economic and overall campaign strategy.			

Rating Workbook - Tartan Group F.xlsx

Rigid Trunk Pipeline, Concrete Coated and Shallow Trenched and Partially Covered

The remaining section of PL18, the 24" Oil Export Line x 11km (KP15.602 to KP26.56). KP15.602 being the point where the pipeline transitions into the shallow trench. With an average DOC of 0.44m and with mid line exposures of 1.48km approximately with some exposures currently covered with mattresses and concrete blocks

NARRATIVE SUMMARY:

Sub-criteria ratings have been averaged by main criteria

Red / italic text in cells below highlights the main areas of influence in a combined rating evaluation poorer than Low Impact (Green).

SUMMARY

Decommissioning Options		2. REMEDIATE IN-SITU WITH:			3. LEAVE IN-SITU
Sub Criteria/ / Sub Options	c)	a)	b)	c)	
	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED	AND MONITOR
TECHNICAL FEASIBILITY	Straightforward operation using established technology, working methods and with experienced contractor pool available. *However ,vessel durations offshore are significantly greater than other options and involves significant repetitive activity which if the effort involved was underestimated only slightly could lead to significant schedule growth.* *Also, uncertainty exists on the integrity of the 24" Oil export line which has lost between 60% and 70% of its wall thickness overtime in some areas. This could result in further delays in lifting sections of the line if failures occur during the operation.*	Straightforward operation using established technology, working methods and with experienced contractor pool available. Relatively short exposures (*c.* 1.49km) to be remediated. Scope is straightforward and understood and unlikely to slip beyond planned schedule plus contingencies applied.	Straightforward operation using established technology, working methods and with experienced contractor pool available. Relatively short exposures (*c* .1.49km) to be remediated *Records of why adequate trench depth was not achieved at exposures during original pipeline is not available. Therefore, uncertainty remains as to whether it may be difficult to improve the trench depth further at these exposures.* It is noted that an EPRD contractor would carry out a more detailed trench ability study before committing to this strategy.	Straightforward operation using established technology, working methods and with experienced contractor pool available. Only Short exposures (*c.* 1.49km) to be remediated Scope is straightforward and understood and unlikely to slip beyond planned schedule plus contingencies applied.	Scope involves vessel / ROV surveys only. A large experienced contractor pool executes this type activity annually in the North Sea. Scope is straightforward and understood and unlikely to slip beyond planned schedule plus contingencies applied.
AVERAGE RATING THIS CRITERION	Moderate Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
SAFETY	*Long and multiple vessel campaigns with long vessel SIMOPs periods and many vessel transits to and from shore.* However risk to other users of the sea can be mitigated. *Significant and repetitive materials handling on deck with potential of dropped objects with potential of spalling of concrete coating.* *Significant more materials returned onshore to be managed than other options,* but to licensed yards with personnel remote from deconstruct work as executed using appropriate equipment. No residual risk as option will leave a safe seabed.	Short duration campaign for single vessel and minimal vessel transits to and from shore. Minimal materials and routine equipment handling on deck. No materials returned onshore. No increased risk to other users of the sea than currently under normal operations. Additional rock berms at exposed sections will be installed to be over trawlable, however could become unstable over time and create a future long term snag hazard.	Short duration campaign for single vessel and minimal vessel transits to and from shore. Routine equipment handling on deck. No materials returned onshore. No increased risk to other users of the sea than currently under normal operations. No increased residual (long term) risk compared to existing operating condition, existing trenched and buried section remains over trawlable and exposed sections will be trenched and buried to become over trawlable and thus leave a safe seabed.	Short duration campaign for single vessel and minimal vessel transits to and from shore. Minimal materials or routine equipment handling on deck. Minimal materials returned onshore but with potential of dropped objects with potential of spalling of concrete coating. No increased risk to other users of the sea than currently under normal operations. No increased Residual (long term) risk compared to existing operating condition, existing trenched and buried section remains over trawlable and exposed sections will be removed with cut ends buried or rock covered within trench to leave a safe seabed.	Short duration and repeated survey campaigns and for single vessel only. Minimal and routine equipment handling (launching and recovery of survey equipment and ROV) for deck crew. No materials returned onshore. No increased risk to other users of the sea than currently under normal operations. *Some residual risk from exposed sections of pipeline decommissioned in-situ, with no mitigation introduced to prevent snagging from over trawling. Exposed sections of pipelines may deteriorate overtime leading to increased snagging risk.*
AVERAGE RATING THIS CRITERION	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Moderate Impact
ENVIRONMENTAL	*Taking account of the length of vessel campaigns, the subsequent magnitude of effect of the emissions associated with Option 1c) is considered significantly greater than the effects associated with the other options.* As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the line during recovery are not expected to have a significant impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. *There is short-term seabed disturbance along full length of the pipeline as it will be deburied before removals, considered to be greater than for the other options,* although noted that depth of sediment cover is not significant by comparison to the pipelines under Group A. No additional material introduced to seabed to support decommissioning activities. However, it is possible that some spalling of the concrete coating may result in small pieces of concrete falling from the pipelines during recovery, however impacts on the ecosystem are not expected to be significant *Potentially c.1,334te of concrete to landfill.*	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the vessel emissions is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the pipeline ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. *Some short term localised seabed disturbance during rock placement, the footprint of this short term disturbance (c.1.49km of pipeline) is less than the footprint of disturbance associated with Option 1c), however it is still rated Moderate Impact (Amber).* *This option requires the addition of c.22,396te of new rock cover to be added to the exposed pipelines. Given the habitat types and volume of rock required, the long term impact of rock dumping on change of habitat is considered Moderate Impact (Amber).* No materials returned onshore for processing.	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the vessel emissions is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the pipeline ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Some short term localised disturbance during trenching, the footprint of this short term disturbance (c.1.48km of pipeline) is less than the footprint of disturbance associated with Option 1c), however it is still rated Moderate Impact (Amber) for seabed disturbance for this option. No additional material introduced to seabed to support decommissioning activities. No materials returned onshore for processing.	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the vessel emissions is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the pipeline ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. The sections of line to be recovered are exposed and it is expected that cutting will be carried out using a hydraulic shears. The footprint of seabed to be disturbed is therefore considered significantly less than the area to be disturbed for Option 1c). No additional material introduced to seabed to support decommissioning activities. Rated as Low Impact for waste processing as only very small quantity of materials returned onshore.	Given the relatively short duration of the activities associated with this option, the magnitude of effect of the vessel emissions associated with this option is considered significantly less than for Option 1c). As the lines will be flushed and cleaned to reduce hydrocarbon contents to as low as reasonable practicable, any discharges from the lines (during severance of the pipeline ends from other infrastructure and overtime as the line degrades) are not expected to have a significant environmental impact. Underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. No seabed disturbance associated with this option, visual surveys of pipelines only. No additional material introduced to seabed to support decommissioning activities. No materials returned onshore.
AVERAGE RATING THIS CRITERION	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
SOCIETAL	Option results in a safe seabed and therefore not anticipated to impact on commercial fisheries. Although more materials returned onshore when compared to the other options, the quantity is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities..	Rock cover to be installed would be laid in line with industry standards and fishing industry requirements. Therefore, it should be possible for fishing gear to fish in the area. *If the rock berm did become unstable over time such that bottom trawl gear could not be used in the area, given the length of rock berms (c.1.49km of pipelines) the area of seabed impacted is considered to have a Moderate Impact (Amber) when compared to the other options.* No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	Option results in a clear seabed and should not therefore impact commercial fisheries. No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	Option results in a clear seabed and should not therefore impact commercial fisheries. Negligible quantity of materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.	*Option leaves exposed sections that could become snagging hazards leading to lost nets/income or self-imposed exclusion zones by fishermen. Rated only Moderate Impact (Amber) due to relatively short exposure lengths,* although noted that pipeline exposures are in open trench with top of pipe below mean seabed level. No materials returned, such that no new onshore jobs anticipated. Similarly, no impact on communities and amenities.
AVERAGE RATING THIS CRITERION	Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Higher Impact
ECONOMIC RISK	*Estimated at £9.62M which is 941% of lowest cost option.* Minimal potential ongoing cost liability as all pipelines removed.	*Estimated at £1.76M which is 172% of lowest cost option.* *Existing line already buried will continue to be monitored.* *Potential for some remediation activities (e.g. re-profile unstable rock berms).*	Estimated at £1.39M which is 136% of lowest cost option. Existing line already buried will continue to be monitored. Less potential for remedial work than option 2a) post project as newly buried sections of line unlikely to unbury.	*Estimated at £2.41M which is 235% of lowest cost option.* Existing line already buried will continue to be monitored. Less potential for remedial work than Option 2a) post project as exposed sections of line have been removed.	Estimated at £1.02M which is the lowest cost option. Existing line already buried will continue to be monitored. *Potential for more than 3 periodic monitoring surveys and over a much more prolonged period.* *More potential for remedial work post project as exposed sections of line remaining on the seabed deteriorate and become an increased snag hazard.*
AVERAGE RATING THIS CRITERION	Higher Impact	Moderate Impact	Lower Impact	Moderate Impact	Higher Impact
OVERALL RATING	Higher Impact	Moderate Impact	Lower Impact	Lower Impact	Moderate Impact
OVERALL RANKING	**5th**	**3rd**	**1st=**	**1st=**	**4th**
COMMENTS	When average ratings by Main Criteria only are considered, Options 2b) and 2c) are ranked first equal, with average ratings across most main criteria being Low Impact (Green) and with One rated Moderate Impact (Amber). This reinforces the proposal to carry forward options 2b) and 2c) to the C&P tendering phase to enable the EPRD contractors the input to the preferred option from an economic and overall campaign strategy. This will also allow the EPRD contractor to carry out a more detailed trench ability study before committing to Option 2b). It is recommended that Option 1c) and Option 3 are discounted at this stage and not considered further. Based on Sensitivity Analysis 2 - Option 2a) should be reinstated and also be considered during the C&P tendering phase to enable the EPRD contractors the input to the preferred option from an economic and overall campaign strategy.				

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Rigid Trunk Pipeline, Concrete Coated and Shallow Trenched and Partially Covered

The remaining section of PL18, the 24" Oil Export Line x 11km (KP15.602 to KP26.56). KP15.602 being the point where the pipeline transitions into the shallow trench. With an average DOC of 0.44m and with mid line exposures of 1.48km approximately with some exposures currently covered with mattresses and concrete blocks

VISUAL RATING SUMMARY: Sensitivity Analysis 1 - Specific Sub-Criteria

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:			3. LEAVE IN-SITU
	Sub Criteria/ / Sub Options		c)	a)	b)	c)	
			CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED	AND MONITOR
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Moderate Impact	Lower Impact	Higher Impact	Lower Impact	Lower Impact
	Technical Complexity & Track Record		Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
SAFETY	Risk During Project Execution	To Project Personnel	Higher Impact	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
		To Those on Land	Higher Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Higher Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term		Moderate Impact	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Waste Processing		Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Lower Impact	Lower Impact	Lower Impact	Moderate Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
ECONOMIC RISK	Cost for Decommissioning/ Removal activities		Higher Impact	Moderate Impact	Lower Impact	Moderate Impact	Lower Impact
	Cost for long term monitoring / Remediation activities		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Higher Impact
OVERALL RATING			Higher Impact	Lower Impact	Lower Impact	Lower Impact	Higher Impact
OVERALL RANKING			4th	3rd	2nd	1st	5th
Rating Count			Red =3 Amber =5 Green =4	Red = 0 Amber = 5 Green = 7	Red = 1 Amber = 1 Green = 10	Red = 0 Amber = 2 Green = 10	Red =2 Amber =1 Green =9
COMMENTS	Under this sensitivity analysis Option 2c) becomes ranked as the most preferred option mainly due to the change in rating of Risk of Major Project Failure of Option 2b) due to the uncertainty of ability to achieve the required trench depth at current pipeline exposed sections remains a technical uncertainty which should be reviewed and resolved during C&P phase of the project. (see Technical and Safety Worksheet). Option 2b) is only rated marginally worse than option 2c) and the fact that Option 2c) is estimated to cost c.£1.0M more than option 2b) must also be a consideration. Also Option 2b) remains the 1st ranked option for all other sensitivity analysis. It is therefore recommended option 2b) is retained as the most preferred option in the DP. Option 2a) is rated more poorly than options 2b), having four more additional Moderate Impact (Amber) ratings, on the sub-criteria Residual (Long Term) Risk to Other Users, most of the Environmental Sub-criteria and on both estimated cost and potential ongoing cost, in all cases this is because Option 2a) introduces a fairly large number of small new rock berms to the seabed. Since Options 2b) and 2c) are rated only marginally different, it is recommended that both options are carried forward to the C&P tendering phase to enable the EPRD contractors the input to the preferred option from an economic and overall campaign strategy taking account of other pipeline groups in the field. This will also allow the EPRD contractor to carry out a more detailed trench ability study before committing to Option 2b). It is recommended that Option 1c) and Option 3 are discounted at this stage and not considered further. Based on Sensitivity Analysis 2 - Option 2a) should be reinstated and also be considered during the C&P tendering phase to enable the EPRD contractors the input to the preferred option from an economic and overall campaign strategy.						

Rating changed from Not Significantly Different (from other Options) to Moderate Impact (Amber).
Basis of sensitivity analysis is that aged concrete coating is in poor condition and may result in more complex recovery methods, than initial evaluation assumes.
Change to Moderate Impact (Amber) for Option 1c) means that Options 2a), b) and c) and Option 3 revert to Low Impact (Green) for Technical Complexity

Rating changed from Moderate Impact (Amber) to Higher Impact (Red).
Basis of sensitivity analysis is due to the uncertainty in being able to achieve adequate trench depth at exposures.

Rating changed from Moderate Impact (Amber) to Higher Impact (Red).
Basis of sensitivity analysis is due to the comparatively larger quantity of materials to be handled by the deck crew and over a longer duration compared to Option 2c).

Rating changed from Moderate Impact (Amber) to Low Impact (Green).
Basis of sensitivity analysis is due there being comparatively much less materials to be handled compared to Option 1c) and over a much shorter period.

Rating changed from Moderate Impact (Amber) to Higher Impact (Red).
Basis of sensitivity analysis is due to the comparatively larger quantity of materials to be handled by personnel at the yard and over a longer duration compared to Option 2c).

Rating changed from Moderate Impact (Amber) to Low Impact (Green) for both Options 1c) and 2c). Since other options are already rated Low Impact (Green) for Waste Processing, this results in all options being rated as Not Significantly Different.
Basis of sensitivity analysis for 1c) and 2c) is that the rating may be improved to Low Impact (Green) if circumstances allow the concrete coating to recycled.

Rating changed from Higher Impact (Red) to Moderate Impact (Amber).
Basis of sensitivity analysis is that the pipeline exposures are left un-remediated are in an open trench with top of pipe below mean seabed level, and less of a snag hazard.

Rating changed from Moderate Impact (Amber) to Low Impact (Green).
Basis of sensitivity analysis is that the new the rock cover will be installed in existing open trenches, with less rock profile above mean seabed level than with surface laid pipelines.

Rating Workbook - Tartan Group F.xlsx

Rigid Trunk Pipeline, Concrete Coated and Shallow Trenched and Partially Covered

The remaining section of PL18, the 24" Oil Export Line x 11km (KP15.602 to KP26.56). KP15.602 being the point where the pipeline transitions into the shallow trench. With an average DOC of 0.44m and with mid line exposures of 1.48km approximately with some exposures currently covered with mattresses and concrete blocks.

VISUAL RATING SUMMARY: Sensitivity Analysis 2 - Economic Risk Discounted

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:			3. LEAVE IN-SITU
	Sub Criteria/ / Sub Options		c)	a)	b)	c)	
			CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED	AND MONITOR
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Moderate Impact	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Moderate Impact	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
		To Those on Land	Moderate Impact	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
		To Other Users of the Sea	Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Higher Impact
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Moderate Impact	Lower Impact	Lower Impact	Lower Impact	Lower Impact
	Seabed Disturbance- Short Term		Moderate Impact	Moderate Impact	Moderate Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Waste Processing		Moderate Impact	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Moderate Impact	Lower Impact	Lower Impact	Higher Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different	Not significantly different
OVERALL RATING			Higher Impact	Lower Impact	Lower Impact	Lower Impact	Higher Impact
OVERALL RANKING			4th	3rd	1st	2nd	5th
Rating Count			Red =0 Amber =7 Green =3	Red = 0 Amber = 4 Green = 6	Red = 0 Amber = 2 Green = 8	Red = 0 Amber = 3 Green = 7	Red =2 Amber =0 Green =8
COMMENTS			Sensitivity Analysis 2 with Economic Risk Evaluation results discounted does not change the overall rankings compared to the original evaluation. Although when Economic Risk is omitted Option 2a) becomes only a marginally poorer performance than Option 2c) with only one more Moderate Impact (Amber) than Option 2c). Therefore, under this sensitivity analysis Option 2b) remains the most preferred option and should be identified as such in the CA report and in the Decommissioning Programme (DP). Although the ability to achieve the required trench depth at current pipeline exposed sections remains a technical uncertainty which should be reviewed and resolved during C&P phase of the project. (see Technical and Safety Worksheet). However, there is reason to consider carrying forward options 2a), 2b) and 2c) to the C&P tendering phase to enable the EPRD contractors the input to the preferred option from an economic and overall campaign strategy taking account of other pipeline groups in the field. This will also allow the EPRD contractor to carry out a more detailed trench ability study before committing to Option 2b). Under this sensitivity analysis It is recommended that Option 1c) and Option 3 are discounted at this stage and not considered further.			