MARATHON BRAE

Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick Combined Decommissioning Programmes

June 2017 Consultation Draft

Marathon Oil

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Terms and Abbreviations

ALARP	As Low As Reasonably Practicable
BTA	Buoyancy Tank Assemblies
CA	Comparative Assessment
CNR	Canadian Natural Resources
CoP	Cessation of Production
CTE	Coal Tar Epoxy
BEIS	Department of Business, Energy and Industrial Strategy
BEIS EMT	BEIS Environmental Management Team
BEIS ODU	BEIS Offshore Decommissioning Unit
DP	Decommissioning Programme
EIA	Environmental Impact Assessment
EL	Elevation
EPR	Ethylene Propylene Rubber
ES	Environmental Statement
FBE	Fusion Bonded Epoxy
FLTC	UK Fisheries Offshore Oil and Gas Legacy Trust Fund Ltd
FPAL	First Point Assessment Limited
GJ	Giga Joules
HLV	Heavy Lift Vessel
HSE OSDR	Health and Safety Executive Offshore Safety Directorate
JNCC	Joint Nature Conservation Committee
KP	Kilometre Point
LAT	Lowest Astronomical Tide
LLC	Limited Liability Corporation
MARPOL	International Convention for the Prevention of Pollution from Ships
MCAA	Marine & Coastal Access Act 2009
N/A	Not Applicable
NEBA	Net Environment Benefit Analysis
NORM	Naturally Occurring Radioactive Material
OGA	Oil and Gas Authority
OPEP	Oil Pollution Emergency Plan
OSPAR	Oslo Paris Convention
PiP	Pipe in Pipe
PL	Pipe Line (as in PL Number)
PLL	Potential Loss of Life
PMS	Power Management System
PWA	Pipeline Works Authorisation
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SAGE	Scottish Area Gas Evacuation (Gas export system)
SDU	Subsea Distribution Unit
SEPA	Scottish Environment Protection Agency
SLV	Single Lift Vessel
SSIV	Subsea Isolation Valve
SUTU	Subsea Umbilical Termination Unit
Te	Tonnes
UK	United Kingdom
UKCS	UK Continental Shelf
WGS84	World Geodetic System 1984
WHPS	Wellhead Protection Structure
WWF	World Wide Fund for Nature

1. Executive Summary

1.1 Combined Decommissioning Programmes

This document contains 4 decommissioning programmes for 14 installations and 64 pipelines.

As required by the Petroleum Act 1998, amended by the Energy Act 2008, this document contains the combined decommissioning programmes for the following facilities:

1. Brae Fields Section 29 Notices:
    - Brae Alpha platform including jacket/sub-structure.
    - Brae Bravo platform including jacket/sub-structure.
    - Brae Bravo flare jacket/sub-structure and bridge.
    - Central Brae subsea template.
    - Associated Pipelines, Flowlines Umbilicals and Power Management System cables.
2. West Brae and Sedgwick Subsea Manifold Section 29 Notices:
    - West Brae subsea wells, manifold and extension manifold.
    - Sedgwick wells.
    - Associated pipelines, flowlines and umbilicals.

The East Brae Platform topsides, jacket/sub-structure and Braemar subsea facilities are covered by a separate Decommissioning Programme [6].

1.2 Requirement for Decommissioning Programmes

1.2.1 Installations

In accordance with the Petroleum Act 1998, as amended, Marathon Oil UK LLC (Marathon Oil) as operator of the Brae Alpha and Brae Bravo platforms, and the Central Brae, West Brae and Sedgwick subsea installations, and on behalf of the Section 29 Notice Holders (see Table 1.2 and Table 1.3) is applying to the Department for Business, Energy and Industrial Strategy (BEIS) to obtain approval for decommissioning the installations detailed in Sections 2.1 and 2.2 of this document. (See also Section 8 – Partners' Letters of Support).

1.2.2 Pipelines

In accordance with the Petroleum Act 1998, as amended, Marathon Oil as operator of the Brae Area and on behalf of the Section 29 Notice Holders (see Table 1.5 and Table 1.6) is applying to BEIS to obtain approval for decommissioning the pipelines detailed in Sections 2.3 of this document. (See also Section 8 – Partners' Letters of Support).

In conjunction with public, stakeholder and regulatory consultation, the decommissioning programmes are submitted in compliance with national and international regulations and BEIS guidelines [1]. The schedule outlined in this document is for a 16 year decommissioning project plan due to begin in 2017 with platform based Plug and Abandonment activities on Brae Bravo.

1.3 Introduction

The Brae Alpha, Brae Bravo and Central Brae installations lie within UKCS Block 16/7a. The Brae Alpha and Brae Bravo platforms stand in 112m and 99m of water respectively, and the Central Brae subsea installation is in 105m of water. The West Brae subsea development is located in UKCS Blocks 16/7a and

16/6a, and the Sedgwick subsea installation is located entirely within UKCS Block 16/6a. The water depth at West Brae and Sedgwick is 107m. All the Brae facilities are approximately 270 km north-east of Aberdeen.

Brae Alpha and Brae Bravo have modular topsides and steel jackets/sub-structures. Brae Bravo has a second steel jacket/sub-structure supporting the flare. The flare structure is connected to the main platform by a steel bridge.

Brae Alpha started production in 1983 and Brae Bravo in 1988. The Central Brae subsea installation commenced production in 1989, and the West Brae and Sedgwick subsea installations both started production in 1997. The West Brae extension manifold and an additional well started production in 2015.

Marathon Oil has already extended the life of the Brae Field beyond initial projections. Production will become sub-economical in the short term. Other hydrocarbon opportunities have been evaluated and considered unviable, therefore the decision to cease production has been made.

A CoP (Cessation of Production) application for Brae Bravo was submitted in 2015 and approved by OGA in 2016. CoP of Brae Bravo is currently expected in 2018.

CoP of Brae Alpha, Central Brae, West Brae and Sedgwick will take place after Brae Bravo CoP, and CoP applications will be submitted for these facilities at the appropriate time.

The jackets/sub-structures of the Brae Alpha and Brae Bravo large steel platforms are subject to separate derogation application processes under OSPAR Decision 98/3. The Brae Bravo flare jacket/sub-structure will not form part of the application for derogation and will be removed in its entirety.

1.3.1 Scope of Decommissioning Programmes

The combined decommissioning programmes contained in this document cover the following facilities:

- The Brae Alpha and Brae Bravo platforms.
- The Central Brae, West Brae and Sedgwick subsea installations including the wellheads, and the flowlines and umbilicals that connect the subsea installations to the Brae Alpha and Brae Bravo platforms.
- The interconnecting pipelines between Brae Alpha and Brae Bravo, PL360 and PL361.
- The oil export pipeline to Forties Charlie, PL64.
- Pipeline PL896, the gas export pipeline to PL762 (SAGE) from the East Brae SSIV/Crossover structure.
- Pipeline PL894 between the East Brae SSIV/Crossover structure to the Brae Bravo Wye assembly.
- Pipeline PL895 between the East Brae SSIV/Crossover structure to the Brae Bravo platform.
- The East Brae SSIV/Crossover structure.
- The Power Management System (PMS) cable that connects Brae Alpha to Brae Bravo in its entirety.
- The PMS cables that connect Brae Alpha and Brae Bravo to the East Brae platform; from Brae Alpha and Brae Bravo to the East Brae safety zone.

This equipment is shown in Figure 1.2. Decommissioning of the third-party facilities connected to the Brae Area facilities is not covered by the combined decommissioning programmes described in this document. However, Marathon Oil will collaborate with the operators of third party facilities to maximise any potential efficiencies in decommissioning.

1.3.2 Decommissioning Programmes Outline

1. The Brae Alpha and Brae Bravo platform wells and the Central Brae, West Brae and Sedgwick subsea wells will be plugged and abandoned in accordance with Oil & Gas UK Guidelines [2].
2. All topsides process equipment, subsea installations, pipelines, flowlines and umbilicals, will be flushed and cleaned to an appropriate standard prior to decommissioning.
3. The Brae Alpha and Brae Bravo platform topside modules, and the Brae Bravo flare bridge and flare jacket/sub-structure, will be removed and returned to shore for reuse, recycling or disposal.
4. Subject to regulatory approval and derogation under OSPAR Decision 98/3, the Brae Alpha and Brae Bravo jackets/sub-structures will be removed to the top of the jacket/sub-structure footings. The portions of the jackets/sub-structures that are removed will be returned to shore for, recycling, or disposal. The Brae Alpha and Brae Bravo jacket/sub-structure footings will be left in place.
5. The drill cuttings piles within the Brae Alpha footings and the Brae Bravo footings will be left in place to degrade naturally.
6. If derogation for the jacket/sub-structures is granted, Marathon Oil proposes to maintain post-decommissioning safety zones around the Brae Alpha and Brae Bravo jacket/sub-structure footings, subject to consultation with authorities and stakeholders. The purpose of these 'post-decommissioning' safety zones is to mitigate the risk of fishing vessels inadvertently snagging their nets on the jacket/sub-structure footings. The post-decommissioning safety zones will be recorded on the FishSAFE system and on Admiralty charts to warn all mariners of the presence of subsea obstructions. The current safety zones at Central Brae, West Brae and Sedgwick will be removed once the equipment has been decommissioned. Applications for post-decommissioning safety zones will be made to the HSE.
7. The Central Brae template structure will be removed to shore for reuse, recycling or disposal. Exact scope and remediation requirements will be defined during detailed engineering.
8. Any parts of pipelines and umbilicals at Central Brae, West Brae and Sedgwick that are laid on the seabed, will be removed to shore or trenched in place. Parts of pipelines and umbilicals returned to shore will be reused, recycled, or disposed of appropriately.
9. The West Brae and Sedgwick wellheads and manifolds will be removed to shore for reuse, recycling, or appropriate disposal. The active wellheads at West Brae and Sedgwick have integrated protection structures that will be removed as part of P&A.
10. The Sedgwick SDU (Subsea Distribution Unit) and its protective structure will be removed to shore for reuse, recycling, or appropriate disposal.
11. Mattresses protecting West Brae and Sedgwick facilities and lines will be reused[1] to profile and stabilise features such as cut ends of pipelines located no more than 250m from the jacket/sub-structure footings at Brae Alpha and Brae Bravo, or recycled to remediate the seabed at the Central Brae template and West Brae manifold footprints. Reuse and recycling of the mattresses within the Brae Area minimises the overall use of resources for decommissioning by minimising the requirement to introduce new rock cover to the area including the associated energy required to quarry and transport the rock. Resources required to recover, recycle or dispose of mattresses onshore are also

[1] *The term 'reuse' is defined here to mean using the mattress to perform the same purpose as it is currently, but in a different location offshore. The reuse of a mattress avoids the use of a new mattress. If a mattress is to be recycled, it is to be used in a different role to that currently, for example to reduce the volume of rock cover needed to remediate any depressions left in the seabed following removal of other equipment. In this case the mattress may require remedial rock cover to limit risk to other sea users.*

reduced. Mattresses that cannot be reused or recycled offshore will be removed to shore for reuse, recycling or appropriate disposal.

12. Following decommissioning, Marathon Oil will undertake a seabed survey to identify and categorise oil and gas development-related debris. The survey will cover areas within 500m of the Brae Alpha and Bravo platforms and the Central Brae, West Brae and Sedgwick subsea installations, and within 200m of the pipelines, umbilicals and PMS cables, in accordance with BEIS guidelines [1]. Marathon Oil, in consultation with BEIS will develop a management and recovery plan to deal with any debris. Following implementation of the recovery plan, Marathon Oil will engage an independent organisation to conduct trawl sweeps (location and extent to be defined in consultation with relevant parties, including the fishing industry) to verify that the seabed is clear.
13. Following decommissioning, Marathon Oil will conduct a survey to confirm that the Brae Area is left as described in the decommissioning programmes.
14. Any facilities or parts of facilities that are left in place will be monitored according to a programme agreed with BEIS.

1.4 Overview of Installations/Pipelines Being Decommissioned

The overall layout of the Brae Area facilities, including Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick, is shown in Figure 1.2.

1.4.1 Installations

Table 1.1: Installations Being Decommissioned

Field(s)	Brae West Brae Sedgwick		**Production Type (Oil/Gas/Condensate)**	All fields are Oil/Gas/Condensate
Water Depths	Brae Alpha:	112m	**UKCS Block**	Brae Alpha: 16/7a
	Brae Bravo:	99m		Brae Bravo: 16/7a
	Central Brae:	105m		Central Brae: 16/7a
	West Brae:	107m		West Brae: 16/6a & 16/7a
	Sedgwick:	107m		Sedgwick: 16/6a

Surface Installations

Number	Type	Topside Weight (tonnes)		Sub-Structure Weight[2] (tonnes)	
2	Fixed Large Steel Jacket	Brae Alpha	30,200	Brae Alpha	20,000
		Brae Bravo	36,200	Brae Bravo	22,000

[2] *Recoverable steel weight including recoverable piles, but excluding grout, marine growth, and additional weight due to flooded members.*

Table 1.1: Installations Being Decommissioned				
1	Fixed Small Steel Jacket	Brae Bravo Flare (Included in Brae Bravo Topsides Weight)	Brae Bravo Flare	1,000

Table 1.1: Installations Being Decommissioned

Subsea Installations	
Number	**Type**
1	Template (Central Brae)
2	Manifolds (West Brae, West Brae Extension)
8	Integrated Wellhead Protection Structures (Seven West Brae wells and one Sedgwick well) All will be removed as part of P&A programme

Number of wells	
Platform	
Brae Alpha:	34
Brae Bravo:	28

Number of wells	
Subsea	
Central Brae:	8
West Brae:	8
Sedgwick:	2

Drill Cuttings Piles	
Number of Piles	**Total Estimated Volume (m^3)**
2	50,500

Distance to Median (km)	
Brae Alpha	3
Brae Bravo	4
Central Brae	15
West Brae	20
Sedgwick	22

Distance From Nearest UK Coastline (km)	
Brae Alpha	207
Brae Bravo	187
Central Brae	192
West Brae	182
Sedgwick	180

Table 1.2: Brae Alpha, Brae Bravo and Central Brae Section 29 Notice Holders		
Section 29 Notice Holders	**Registration Number**	**Equity Interest**
Marathon Oil U.K. LLC	FC009587	40.0%
TAQA Bratani Limited	5975475	41.7%
Centrica Resources Limited	2855151	8.0%
JX Nippon Exploration and Production (U.K.) Limited	3288689	6.3%
TAQA Bratani LNS Limited	6230540	4.0%
BP Exploration Operating Company Limited	305943	0.0%
ENI UKCS Limited	1019748	0.0%
Engie E&P UK Limited	3386464	0.0%
Marathon Oil North Sea (G.B.) Limited	981126	0.0%
Repsol Sinopec Resources UK Limited	825828	0.0%
Repsol Sinopec LNS Limited	2483161	0.0%

Table 1.3: West Brae and Sedgwick Section 29 Notice Holders		
Section 29 Notice Holders	**Registration Number**	**Equity Interest**
Marathon Oil U.K. LLC	FC009587	40.0%
TAQA Bratani Limited	5975475	41.7%
Centrica Resources Limited	2855151	8.0%
JX Nippon Exploration and Production (U.K.) Limited	3288689	6.3%
TAQA Bratani LNS Limited	6230540	4.0%
BP Exploration Operating Company Limited	305943	0.0%
Engie E&P UK Limited	3386464	0.0%
Marathon Oil North Sea (G.B.) Limited	981126	0.0%
Repsol Sinopec Resources UK Limited	825828	0.0%
Repsol Sinopec LNS Limited	2483161	0.0%

1.4.2 Pipelines

The pipelines covered by the Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick decommissioning programmes, and the relevant Section 29 notice holders are listed in Table 1.4, Table 1.5 and Table 1.6 respectively.

Table 1.4: Pipelines Being Decommissioned		
Number of Pipeline(s)/Umbilical(s)	**64**	See Table 2.3

The number of items listed in Table 1.4 includes pipelines, flowlines, umbilicals, and PMS cables.

Table 1.5: Brae Alpha and Brae Bravo Pipelines Section 29 Notice Holders

Pipelines[3]: PL64, PL360, PL361, PL634, PL635, PL636 (1 of 2 and 2 of 2), PL637, PL894, PL895, PL896 , PLU4188, PLU4189, PLU4190, PLU4203 and PLU4217

Section 29 Notice Holder(s)	Registration Number	Equity Interest
Marathon Oil U.K.LLC	FC009587	40.0%
TAQA Bratani Limited	5975475	41.7%
Centrica Resources Limited	2855151	8.0%
JX Nippon Exploration and Production (U.K.) Limited	3288689	6.3%
TAQA Bratani LNS Limited	6230540	4.0%
BP Exploration Operating Company Limited	305943	0.0%
ENI UKCS Limited	1019748	0.0%
Engie E&P UK Limited	3386464	0.0%
Marathon Oil North Sea (G.B.) Limited	981126	0.0%
Repsol Sinopec Resources UK Limited	825828	0.0%
Repsol Sinopec LNS Limited	2483161	0.0%

[3] *Not listed but included in this decommissioning programme are the three PMS cables which do not have a PL number. See Table 2.3*

Table 1.6: West Brae and Sedgwick Pipelines Section 29 Notice Holders

Pipelines: PL1441.1, PL1441.2, PL1441.3, PL1441.4, PL1441.5, PL1441.6, PL1442.1, PL1442.2, PL1442.4, PL1442.5, PL1442.6, PL1442.7, PL1442.8, PL1443.1, PL1443.3, PL1444.1, PL1445, PLU1446, PLU1446.12, PLU1446.13, PLU1446.14, PLU1446.15, PLU1446.16, PLU1446.17, PLU1446JV1, PL1447, PL1448, PLU3798, PLU3799, PLU3800, PLU3801, PLU3802, PL3806, PL3809, PLU3811, PLU3813, PLU4031, PLU4131, PLU4132, PLU4133, PLU4134, PLU4135, PLU4136, PLU4137 and PLU4138

Section 29 Notice Holder(s)	Registration Number	Equity Interest
Marathon Oil U.K. LLC	FC009587	40.0%
TAQA Bratani Limited	5975475	41.7%
Centrica Resources Limited	2855151	8.0%
JX Nippon Exploration and Production (U.K.) Limited	3288689	6.3%
TAQA Bratani LNS Limited	6230540	4.0%
BP Exploration Operating Company Limited	305943	0.0%
Engie E&P UK Limited	3386464	0.0%
Repsol Sinopec Resources UK Limited	825828	0.0%
Repsol Sinopec LNS Limited	2483161	0.0%

1.5 Summary of Proposed Decommissioning Programmes

The selected decommissioning options for the Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick facilities are shown in Table 1.7 below.

Table 1.7: Summary of Decommissioning Programmes

Selected Option	Reason for Selection	Proposed Decommissioning Solution
Topsides		
Complete removal for reuse, recycling or appropriate disposal.	Topside removal is mandatory. Marathon Oil will seek to optimise the benefits that accrue from removal of the topsides by maximising reuse and recycling.	Cleaned equipment refurbished for reuse where possible. Equipment that cannot be reused will be recycled or processed via appropriate disposal routes.
Jackets/Sub-Structures		
Remove the Brae Alpha and Brae Bravo platform jackets/sub-structures to the top of the footings. This option is subject to derogation under OSPAR Decision 98/3.	Marathon Oil conducted a comparative assessment (CA) to determine the preferred option for decommissioning the jackets/sub-structures based on a balance of safety, environmental, technical and socio-economic considerations.	The Brae Alpha and Brae Bravo jackets/sub-structures will be removed to the top of the footings (approximately 28m above seabed for Brae Alpha and 34m above seabed for Brae Bravo). The exact cut height will be determined following detailed engineering taking into account technical constraints (such as jacket design, cross bracing design and cutting technology), safety and environmental impacts. Recovered material will be returned to shore for recycling or disposal. Marathon Oil proposes to put in place post-decommissioning safety zones around the Brae Alpha and Brae Bravo footings to assist in preventing fishing vessels inadvertently snagging their nets on the jackets/sub-structure footings. The post-decommissioning safety zones will be recorded on the FishSAFE system and Admiralty charts to warn all mariners of the presence of subsea obstructions.

Table 1.7: Summary of Decommissioning Programmes

Selected Option	Reason for Selection	Proposed Decommissioning Solution
Complete removal of the Brae Bravo flare jacket/sub-structure.	To leave the seabed clear for other users and to meet OSPAR and BEIS regulatory requirements.	The Brae Bravo flare jacket/sub-structure will be recycled. Any material that cannot be recycled will be processed via appropriate disposal routes.
Subsea Installations		
Removal of the Central Brae Template and seabed remediation.	To leave the seabed unobstructed for other users and to meet OSPAR and BEIS regulatory requirements.	The Central Brae template will be recovered in one or more heavy lifts or in smaller pieces, using ROVs or divers. The template will be brought onshore for recycling or appropriate disposal. Exact scope and remediation requirements will be confirmed during detailed engineering.
Complete removal of the West Brae Manifold, the West Brae Extension Manifold, and the associated wellheads, xmas trees and integrated WHPSs.	To leave the seabed clear for other users and to meet OSPAR and BEIS regulatory requirements.	The West Brae facilities will be recovered as a single lift, or in pieces. This work will be conducted by ROVs, divers and construction vessels as appropriate. The facilities will be reused or recycled as far as is reasonably practicable. Any material that cannot be reused or recycled will be processed via appropriate disposal routes.
Complete removal of the Sedgwick SDU and the Sedgwick wellheads, xmas tree and integrated WHPS.	To leave the seabed clear for other users and to meet OSPAR and BEIS regulatory requirements.	The Sedgwick facilities will be recovered as a single lift, or in pieces. This work will be conducted by ROVs, divers and construction vessels as appropriate. The Sedgwick facilities will be reused or recycled as far as is reasonably practicable. Any material that cannot be reused or recycled will be processed via appropriate disposal routes.

Table 1.7: Summary of Decommissioning Programmes

Selected Option	Reason for Selection	Proposed Decommissioning Solution
Pipelines		
The oil export pipeline PL64 from Brae Alpha to Forties Charlie will be left in place on the seabed. At intervals along the pipeline route, sections of PL64 will be trenched in place to provide "gates" that allow clear transit for fishing gear.	The selected option provides a balance between risks to personnel performing decommissioning, risks to other users of the sea and overall consumption of resources.	PL64 will be left in place on the seabed. Sections of the line will be trenched to provide gates that allow clear access for fishing. The pipeline, and the transit gates will be marked on the FishSAFE system. The pipeline will be monitored in accordance with a programme to be agreed between Marathon Oil and BEIS.
The gas export pipeline PL896 from the East Brae SSIV/Crossover structure to the PL762 (SAGE Wye) will be left in place on the seabed. At intervals along the pipeline route, sections of PL896 will be trenched in place to provide "gates" that allow clear transit for fishing gear.	The selected option provides a balance between risks to personnel performing decommissioning, risks to other users of the sea and overall consumption of resources.	PL896 will be left in place on the seabed. Sections of the line will be trenched to provide gates that allow clear access for fishing. The pipeline, and the transit gates will be marked on the FishSAFE system. The pipeline will be monitored in accordance with a programme to be agreed between Marathon Oil and BEIS.
The majority of the length of the infield pipelines, PL360, PL361, PL894 and PL895, will be trenched in place. Pipelines inboard of the SSIV structures and no more than 250m [5] from the derogated jacket/sub-structure footings will be left in place.	The pipelines were subject to a CA process and risk assessment to identify the preferred decommissioning options. The preferred decommissioning option for the majority of the length of these pipelines is to trench in place. This minimises disturbance of the environment and the use of resources, and leaves the seabed in a condition that does not pose a hazard to other sea users.	The majority of the length of these pipelines will be trenched in place to a minimum depth of 0.6m. Any portions of the pipelines that are brought to shore will be sent for recycling or disposal as appropriate.
Flowlines, Umbilicals and Power Management System Cables and Associated Mattresses		
Those portions of flowlines, umbilicals and power management cables that are trenched or buried will be left in place. Surface-laid portions of flowlines, umbilicals and power management cables that are no more than 250m [5] from the footings, will be left in place. Any remaining portions of	Risk assessment has concluded that trenched and buried, and surface-laid flowlines, umbilicals and cables, that are no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term	Trenched and buried parts of the flowlines, umbilicals and power management cables will be left in place, as will the surface-laid portions no more than 250m [5] from the Brae Alpha and Brae Bravo footings. The other parts of these lines will be recovered using

Table 1.7: Summary of Decommissioning Programmes

Selected Option	Reason for Selection	Proposed Decommissioning Solution
flowlines, umbilicals and power management cables will be removed to shore for recycling or disposal. Mattresses that protect surface-laid flowlines, umbilicals and power management cables that are to be removed, will be reused to profile and stabilise features, such as cut ends of pipelines within 250m of the derogated jacket/sub-structure, or recycled to remediate the seabed at Central Brae or West Brae following the removal of subsea structures. Any surplus mattresses will be removed to shore for reuse, recycling or appropriate disposal.	snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving these portions in place avoids disturbing the drill cuttings piles and re-mobilising contaminants into the environment, reduces risks to personnel and reduces the use of resources. Surface-laid portions of flowlines, umbilicals and power management cables that are not trenched or buried, and are more than 250m [5] from the footings pose a potential hazard to fishermen, therefore these portions will be removed. Reuse and recycling of the mattresses within the Brae Area minimises the overall use of resources for decommissioning by minimising the requirement to introduce new rock cover to the area including the associated energy required to quarry and transport the rock. Resources required to recover, recycle or dispose of mattresses onshore are also reduced.	appropriate techniques, either Cut and Lift or reverse reeling. The portions of the flowlines, umbilicals and power management cables that are brought to shore will be sent for recycling or disposal as appropriate. Mattresses will be moved or recovered by ROVs or divers and recovery vessels, using appropriate tools and techniques.
Wells		
The Brae Alpha and Brae Bravo platform wells, and the Central Brae, West Brae, and Sedgwick subsea wells will be plugged and abandoned in accordance with Oil & Gas UK (O&G UK) Guidelines [2].	Plugging and abandoning the wells to defined O&G UK standards will leave the wells in a safe and secure condition. This will protect people and the environment and meet regulatory requirements.	Well equipment that is removed will be returned to shore for reuse, recycling, or disposal. Marathon Oil will submit the relevant Portal Environmental Tracking System (PETS) applications to support decommissioning works.

Table 1.7: Summary of Decommissioning Programmes

Selected Option	Reason for Selection	Proposed Decommissioning Solution
Drill Cuttings		
The drill cuttings piles at the bases of the Brae Alpha and Brae Bravo jackets/sub-structures will be left in place to degrade naturally.	Leaving the drill cuttings in place minimises the risks to personnel associated with recovering them, and the risk of re-suspending the drill cuttings in the water column. This option also minimises energy use, and the use of onshore disposal resources. The levels of contamination in the drill cuttings piles fall well below the OSPAR 2006/5 thresholds for oil leach rate and persistence.	The drill cuttings piles at the bases of the Brae Alpha and Brae Bravo jackets/sub-structures will be left in place to degrade naturally.
Interdependencies		
Leaving the lower portions of the Brae Alpha and Brae Bravo jackets/sub-structures in place will avoid disturbance of the drill cuttings piles. This minimises the risk of dispersing the drill cuttings more widely in the environment, and minimises the risks to personnel carrying out the decommissioning work.		

1.6 Field Locations Including Field Layouts and Adjacent Facilities

The locations of the Brae Area fields within the UKCS are shown in Figure 1.1. Figure 1.2 shows the Brae Area facilities layout in more detail. Figure 1.3 shows the proposed surface-laid post-decommissioning infrastructure as detailed within this document. Figure 1.4 shows the Brae Area and the adjacent facilities. The 'greyed out' facilities in Figure 1.2 do not form part of the combined decommissioning programmes described in this document.

Figure 1.1: Brae Area Field Locations within UKCS

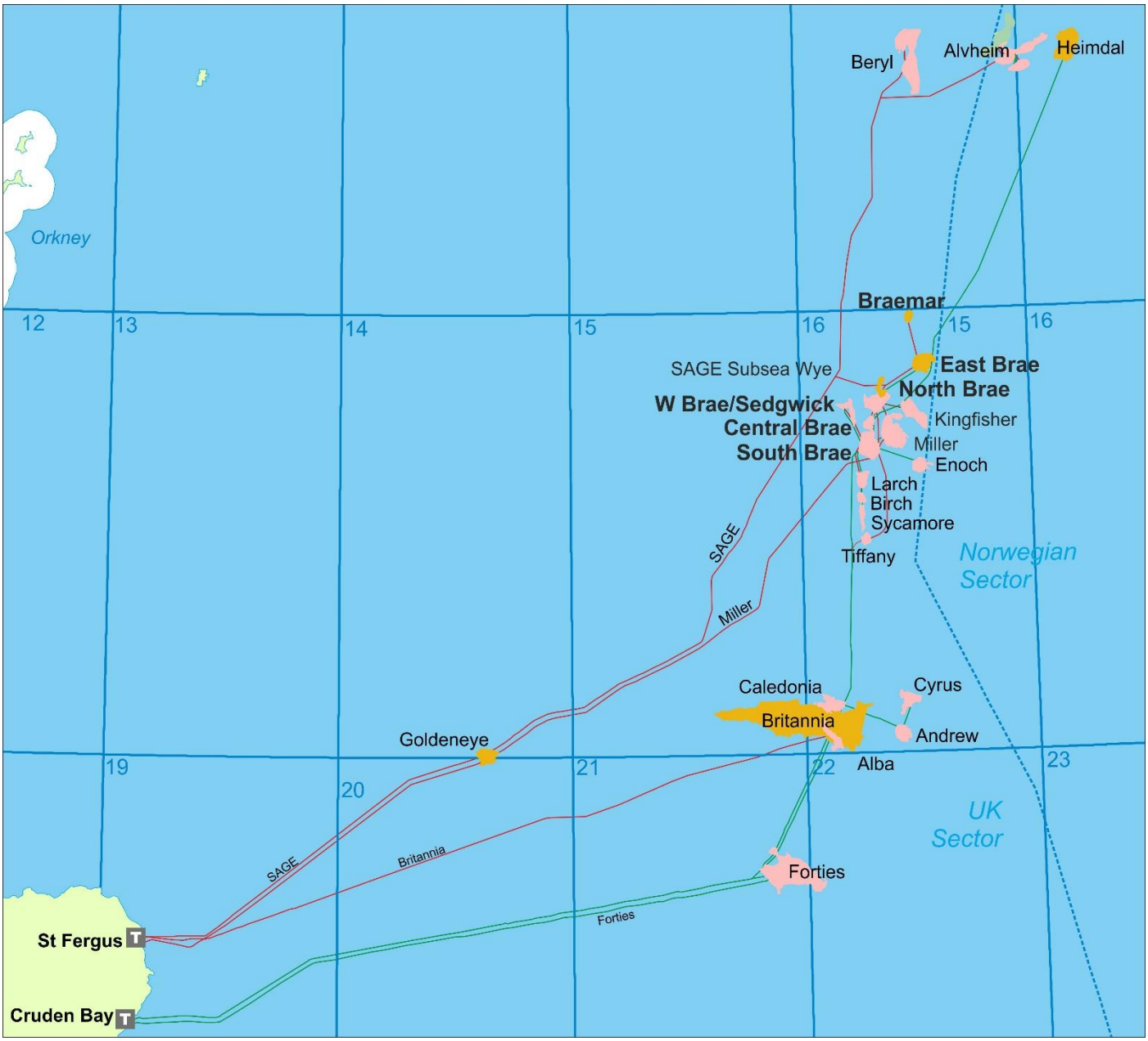
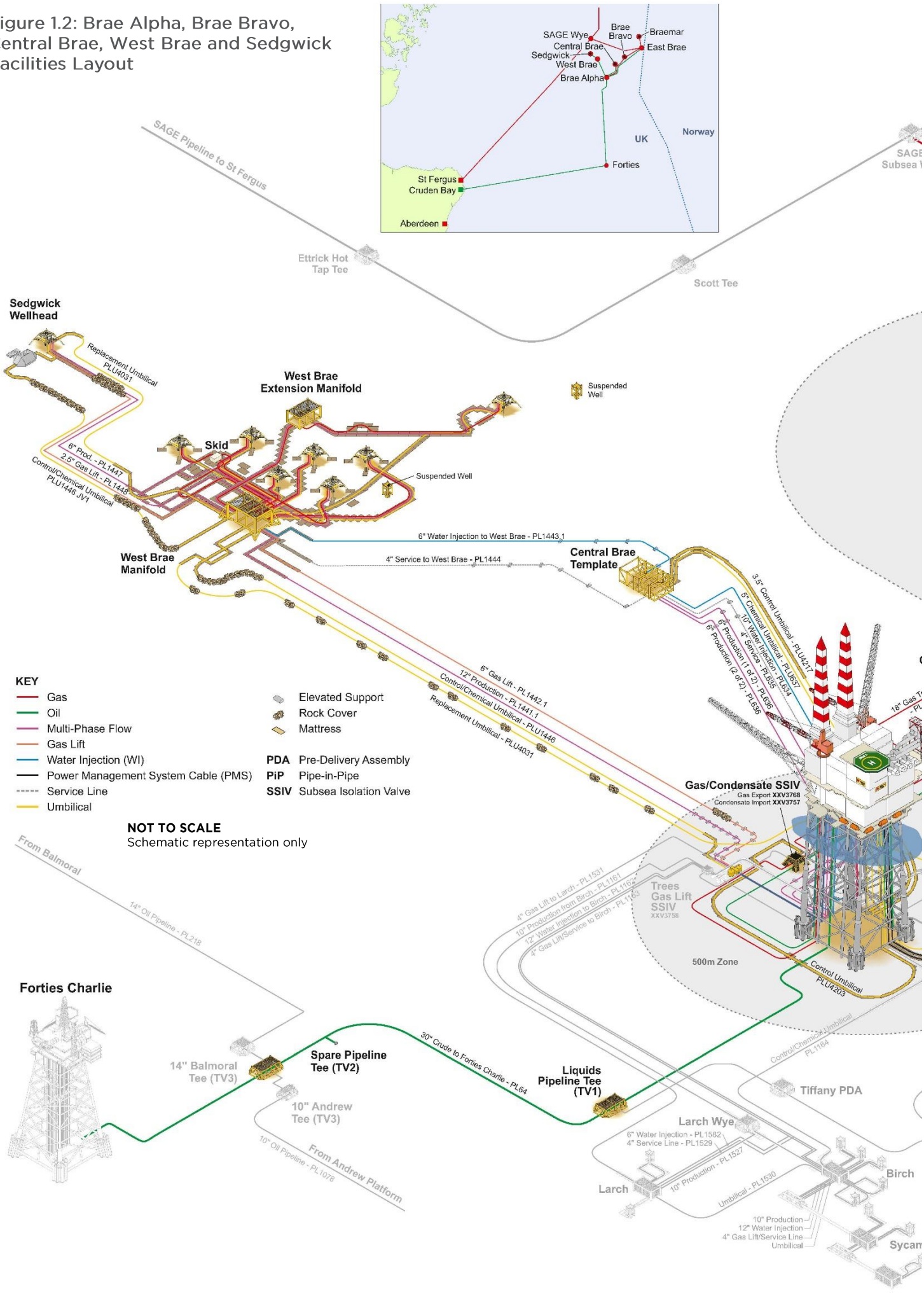


Figure 1.2: Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick Facilities Layout



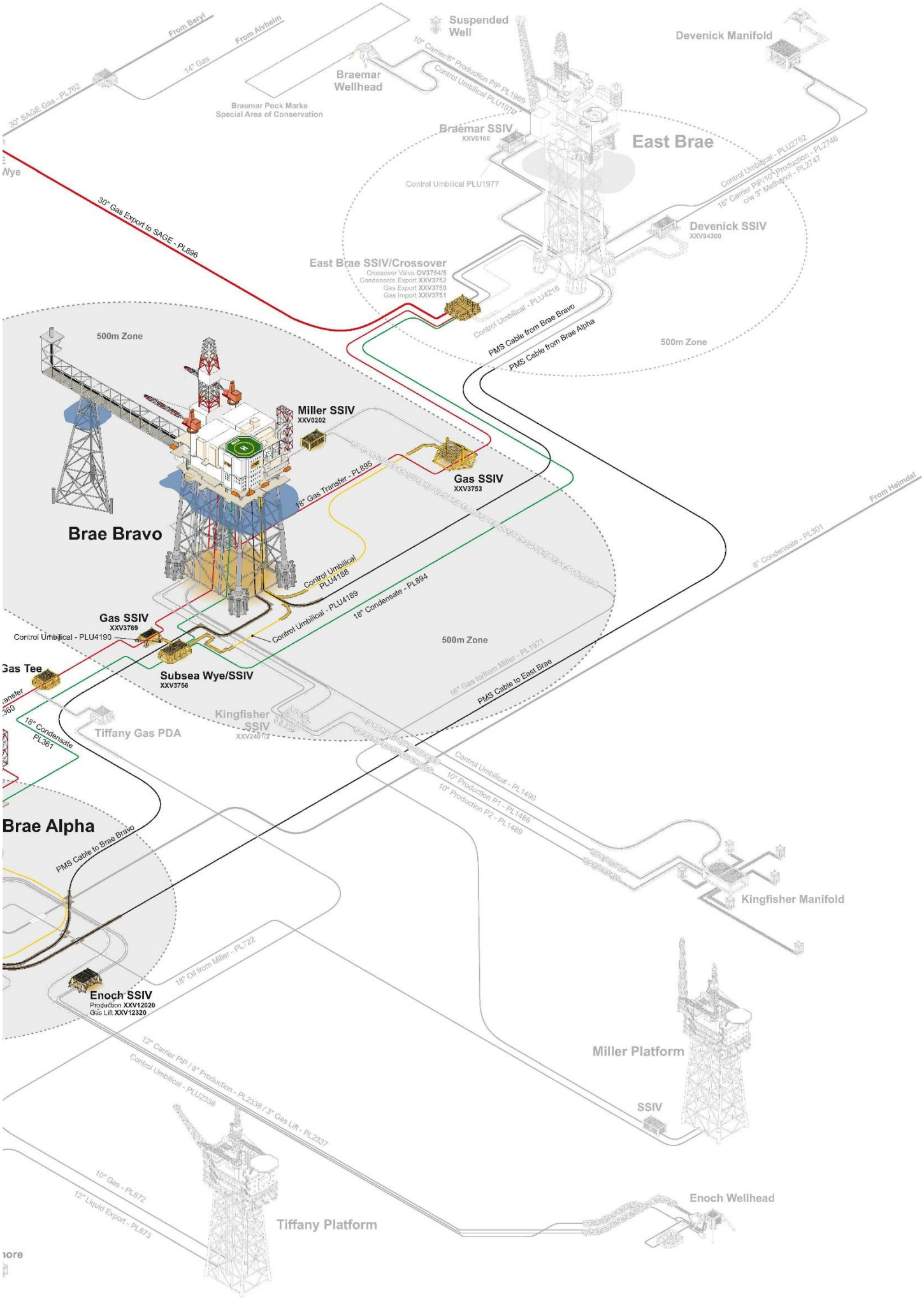
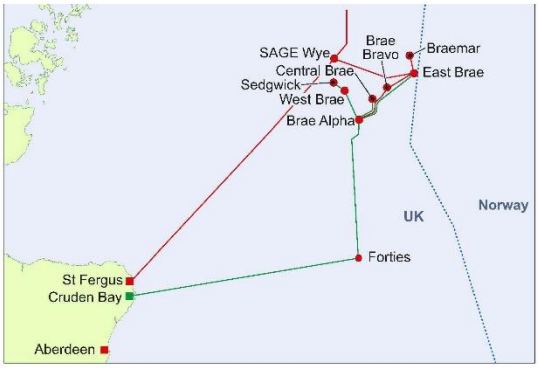
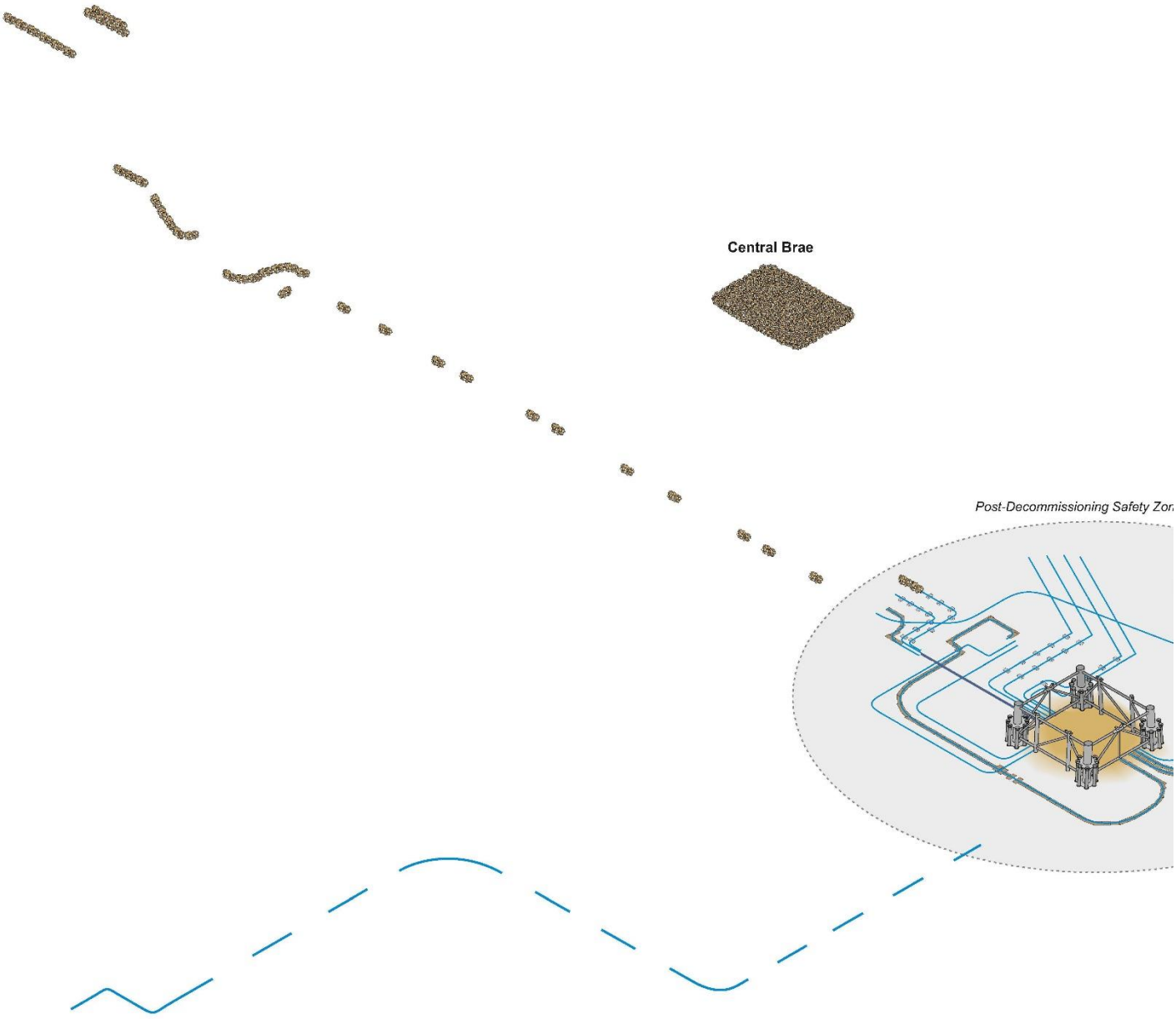
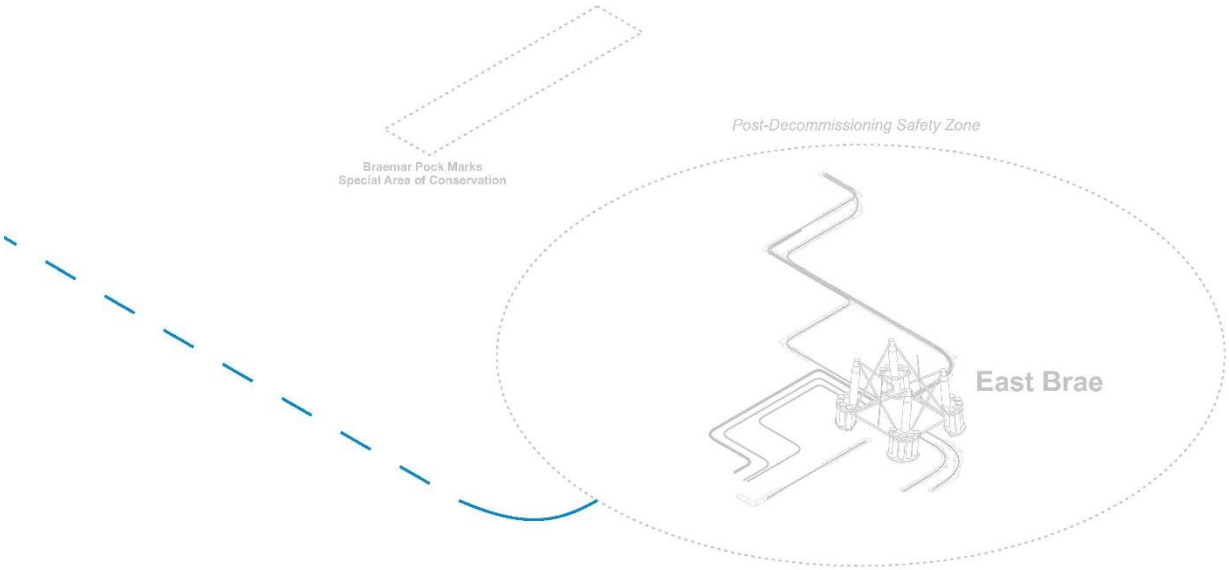
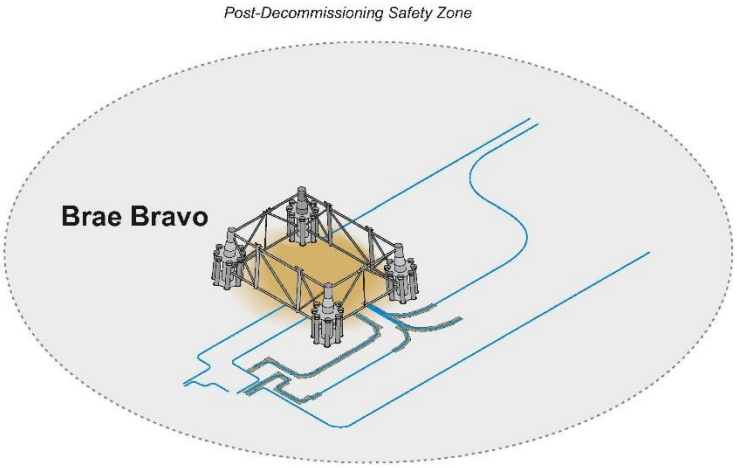

From Beryl
From Alvheim
14" Gas
30" SAGE Gas - PL762
Suspended Well
Braemar Wellhead
10" Carrier/6" Production PIP PL1969
Control Umbilical PLU1970
Braemar Pock Marks Special Area of Conservation
Devenick Manifold
Braemar SSIV
XXV0160
East Brae
Control Umbilical PLU1977
Control Umbilical - PLU2752
16" Carrier PIP/10" Production - PL2746
c/w 3" Methanol - PL2747
Devenick SSIV
XXV94300
Wye
30" Gas Export to SAGE - PL896
East Brae SSIV/Crossover
Crossover Valve OV3754/5
Condensate Export XXV3752
Gas Export XXV3750
Gas Import XXV3751
Control Umbilical - PLU4216
PMS Cable from Brae Bravo
PMS Cable from Brae Alpha
500m Zone
Miller SSIV
XXV0202
Gas SSIV
XXV3753
18" Gas Transfer - PL895
Brae Bravo
Control Umbilical PLU4188
18" Condensate - PL894
Control Umbilical - PLU4189
From Heimdal
8" Condensate - PL301
Gas SSIV
XXV3769
Control Umbilical - PLU4190
500m Zone
Gas Tee
Subsea Wye/SSIV
XXV3756
16" Gas to/from Miller - PL1971
PMS Cable to East Brae
Kingfisher SSIV
XXV24617
Tiffany Gas PDA
18" Condensate PL361
Control Umbilical - PL1490
10" Production P1 - PL1488
10" Production P2 - PL1489
Brae Alpha
PMS Cable to Brae Bravo
Kingfisher Manifold
18" Oil from Miller - PL722
Enoch SSIV
Production XXV12020
Gas Lift XXV12320
Miller Platform
SSIV
12" Carrier PIP / 8" Production - PL2336 / 3" Gas Lift - PL2337
Control Umbilical - PLU2338
10" Gas - PL872
12" Liquid Export - PL873
Tiffany Platform
Enoch Wellhead

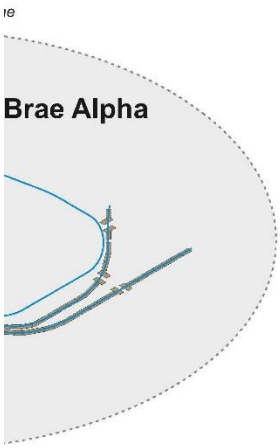
Figure 1.3: Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick Post-Decommissioning











KEY

Decommissioned Pipelines, left in situ

Elevated Support
Rock Cover
Mattress

NOT TO SCALE
Schematic representation only

The facilities adjacent to the Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick installations are listed in Table 1.8.

Table 1.8: Adjacent Facilities

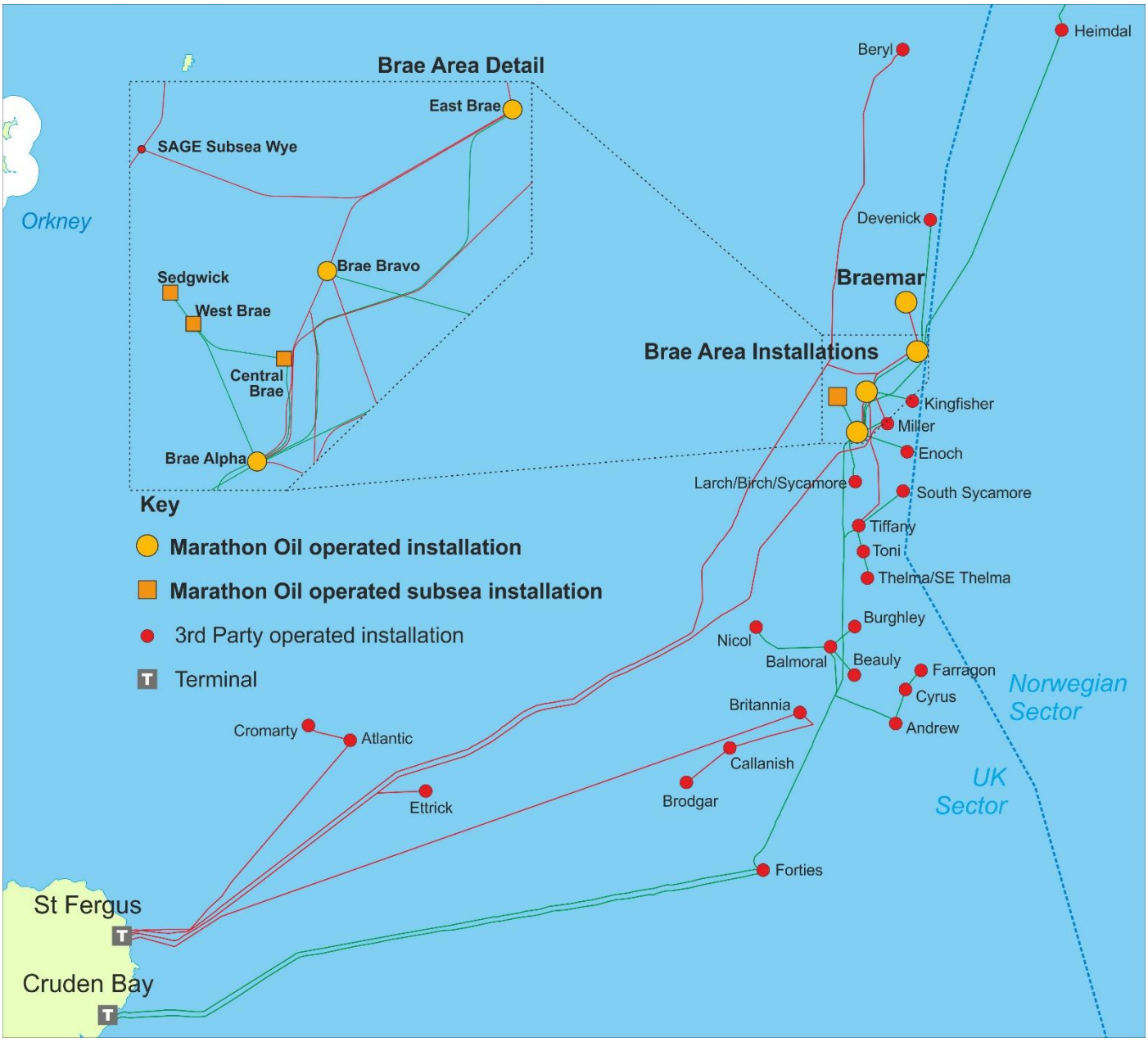
Owner	Name	Type	Distance/ Direction From Brae Alpha	Information	Status
Marathon Oil	East Brae	Platform	23km North-east	Connects to Brae Alpha and Brae Bravo via PMS cables and pipelines	Operational
BP	Miller	Platform	8km North-east	Redundant production platform	Being Decommissioned
BP	PL1971 Miller to Brae Bravo	16"Gas Pipeline	-	Redundant pipeline	Suspended
BP	PL722 Miller to Brae Alpha	18" Oil Pipeline	-	Redundant pipeline	Suspended
Repsol Sinopec	Enoch Wellhead	Subsea well	15km East-south-east	Subsea tie-back to Brae Alpha	Operational
Repsol Sinopec	PL2336 Enoch to Brae Alpha Flowline	8" Flowline in 12" carrier pipe	-	Pipeline	Operational
Repsol Sinopec	PL2337 Brae Alpha to Enoch Gas Lift Line	3" Flowline in 12" carrier pipe	-	Pipeline	Operational
Repsol Sinopec	PLU2338 Brae Alpha to Enoch Control Umbilical	Electro/ Hydraulic Control Umbilical	-	Pipeline	Operational
CNR	Tiffany	Platform	24km South	Production Platform	Operational
CNR	PL872 Tiffany to PL360 Gas Export Line	10" Gas Pipeline	-	Pipeline	Operational

Table 1.8: Adjacent Facilities

Owner	Name	Type	Distance/ Direction From Brae Alpha	Information	Status
CNR	PL873 Tiffany to PL64 Oil Export Line	12" Oil Pipeline	-	Pipeline	Operational
Centrica	Birch, Larch, Sycamore	Subsea manifolds and wellheads	10km South	Subsea Production Installation	Operational
Centrica	PL1161 Birch to Brae Alpha	10" Production Pipeline	-	Pipeline	Operational
Centrica	PL1162 Brae Alpha to Birch	12" Water Injection Line	-	Pipeline	Operational
Centrica	PL1531 Brae Alpha to Larch	4" Gas Lift Line	-	Pipeline	Operational
Centrica	PL1163 Brae Alpha to Birch	4" Gas Lift Line	-	Pipeline	Operational
Centrica	PL1529	4" Service Line	-	Pipeline	Operational
Centrica	PL1528 Larch WYE to Larch	6" Water Injection Line	-	Pipeline	Operational
Apache	PL762 SAGE	Pipeline	-	Connects to East Brae via PL896 and the SSIV/Crossover structure	Operational
Shell	Kingfisher	Subsea manifold and wells	15km North-east	Subsea Production Installation	Operational
TAQA	Devenick	Subsea template	56km North-north-east	Subsea Production Installation	Operational

Table 1.8: Adjacent Facilities	
Impacts of Decommissioning Proposals	
Marathon Oil has been, and will continue to be in contact with operators and owners of adjacent facilities. The adjacent facilities have no known impacts on the Brae Area decommissioning programmes. All third party facilities that tie-in to, or are supported by the Brae Area facilities, are engaged under normal commercial agreements and are part of the CoP application process to OGA.	

Figure 1.4: Brae Area Adjacent Facilities



1.7 Industrial Implications

Marathon Oil is developing the Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick, decommissioning contract and procurement strategy, on behalf of the Section 29 Notice Holders. Marathon Oil has, and will continue to:

1. Publish Brae Decommissioning project information, including the project schedule, on the Marathon Oil decommissioning website: www.marathonoil.com/braedecom.
2. Publish project information and contact details on the BEIS website.
3. Engage with the OGA and the decommissioning supply chain on issues relating to the Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick combined decommissioning programmes and schedule.
4. Use the FPAL database as the primary source for establishing tender lists for contracts and purchases with a value of £250,000 or more.

2. Description of Items to be Decommissioned

2.1 Installations: Surface Facilities – Topsides and Jackets/Sub-Structures

Key information regarding the Brae Alpha and Brae Bravo platform topsides and jackets/sub-structures is presented in Table 2.1.

Table 2.1: Surface Facilities Information

				Topsides/Facilities		Jacket/Sub-Structure			
Name	Type	Location		Dry Weight (tonnes)	Number of Modules	Weight[4] (tonnes)	Number of Legs	Number of Piles	Weight of Piles (tonnes)
Brae Alpha Platform	Fixed Steel Jacket/ sub-structure	WGS84 Decimal	58.692799°N 1.281446°E	30,200	25	20,000	8	36	3,050
		WGS84 Decimal Minute	58° 41.568'N 1° 16.888'E						
Brae Bravo Platform	Fixed Steel Jacket/ sub-structure	WGS84 Decimal	58.792540°N 1.3470857°E	36,200	28	22,000	8	32	3,340
		WGS84 Decimal Minute	58° 47.552'N 1° 20.825'E						
Brae Bravo Flare	Fixed Steel Jacket/ sub-structure	WGS84 Decimal	58.792540°N 1.3470857°E	Included in Brae Bravo Topsides		1,000	3	3	100
		WGS84 Decimal Minute	58° 47.552'N 1° 20.825'E						

[4] *Recoverable steel weight, including recoverable piles but excluding grout, marine growth, and additional weight due to flooded members*

2.2 Installations: Subsea Including Stabilisation Features

Key information regarding the Central Brae, West Brae and Sedgwick subsea installations is presented in Table 2.2.

Table 2.2: Subsea Installations and Stabilisation Features

Central Brae

Subsea Installations Including Stabilisation Features	Number	Size LxWxH (m) Weight (tonnes)	Location		Comments/Status
Wellheads	8		Within template structure		Six wells Integrated into template. 2 further wells within template structure.
Manifolds	0				
Central Brae Template Structure	1	35x20x11 660[5]	WGS84 Decimal	58.745833°N 1.311139°E	The Central Brae Template Structure is piled to the seabed. During completion of the Central Brae wells, cement spilled over onto the template.
			WGS84 Decimal Minute	58° 44.750'N 1° 18.668'E	
Protection Frames	0				
Concrete mattresses	0				
Grout bags	0				
Formwork	0				
Frond mats	0				
Rock placement	0				
Other	0				

[5] *Excludes pile weight and any overspill grout/cement*

Table 2.2: Subsea Installations and Stabilisation Features

West Brae

Subsea installations including Stabilisation Features	Number	Size LxWxH (m) Weight (tonnes)	Location		Comments/Status
Wellheads	7 active 1 suspended	7.6x7.6x4.4 40 each	WGS84 Decimal	58.763328°N 1.216114°E	Wellheads have integrated protection, rather than separate protection frames. Suspended well has no protection frame.
			WGS84 Decimal Minute	58° 45.800'N 1° 12.967'E	
West Brae Manifold	1	17.5x12.5x4.5 142	WGS84 Decimal	58.763328°N 1.216114°E	The West Brae manifold is piled to the seabed.
			WGS84 Decimal Minute	58° 45.800'N 1° 12.967'E	
West Brae Extension Manifold	1	12x6x5 110	WGS84 Decimal	58.763328°N 1.216114°E	The West Brae Extension manifold is piled to the seabed.
			WGS84 Decimal Minute	58° 45.800'N 1° 12.967'E	
Templates	0				
Protection Frames	0				
Concrete mattresses	24	5x3x0.15 168 total	WGS84 Decimal	58.763328°N 1.216114°E	Four mattresses at each wellhead, except W9 and suspended well
			WGS84 Decimal Minute	58° 45.800'N 1° 12.967'E	
Grout bags	0				
Formwork	0				
Frond mats	0				
Rock placement	0				
Other	0				

Table 2.2: Subsea Installations and Stabilisation Features

Sedgwick

Subsea installations including Stabilisation Features	Number	Size LxWxH (m) Weight (tonnes)	Location		Comments/Status
Wellheads	1 active 1 suspended	7.6x7.6x4.4 40 each	WGS84 Decimal	58.778778°N 1.192103°E	Active well has an integrated WHPS that will be removed as part of the P&A programme. Suspended exploration well – No Xmas tree or WHPS.
			WGS84 Decimal Minute	58° 46.727'N 1° 11.526'E	
Manifolds	0				
Templates	0				
Protection Frames	0				
Concrete mattresses	4	5x3x0.15 28 total	WGS84 Decimal	58.778778°N 1.192103°E	Four mattresses at well 16/06a-V01
			WGS84 Decimal Minute	58° 46.727'N 1° 11.526'E	
Grout bags	0				
Formwork	0				
Frond Mats	0				
Rock Placement	0				
Other	0				

2.3 Pipeline(s) Including Stabilisation Features

The Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick Combined Decommissioning Programmes cover the following pipelines, umbilicals and PMS cables:

- The oil export pipeline, PL64, from Brae Alpha to Forties Charlie.
- The gas export pipeline, PL896, from the East Brae SSIV/Crossover structure to PL762 (SAGE).
- The infield pipelines connecting Brae Alpha, Brae Bravo and the East Brae SSIV/Crossover structure, PL360, PL361, PL894 and PL895.
- The PMS cable connecting Brae Alpha to Brae Bravo.
- The PMS cables connecting Brae Alpha and Brae Bravo to the East Brae platform, except for those parts of the cables within the current East Brae safety zone.
- The umbilicals connecting the Brae Alpha and Brae Bravo to the SSIVs on the export and infield pipelines.
- The flowlines and umbilicals connecting Brae Alpha to Central Brae, West Brae and Sedgwick.
- The flowlines and umbilicals connecting the West Brae manifold to the West Brae Extension Manifold and Sedgwick.

These facilities are described in more detail in Table 2.3, and illustrated in Figure 1.2. Stabilisation features are listed in Table 2.4.

Table 2.3: Pipeline/Flowline/Umbilical Information

Description	Pipeline No. (as per PWA)	Nominal Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From-To	Burial Status	Status	Current Content
Brae Alpha to Forties Charlie Oil Export Includes: In-line structures TV1, TV2 and TV3	PL64	30	117.3	Steel, FBE, CTE and Concrete	Oil	Brae Alpha to Forties Charlie	Surface-laid	Operational	Hydrocarbon liquids
Brae Alpha to Brae Bravo Gas Transfer Includes SSIV Structure at Brae Alpha, SSIV Structure at Brae Bravo and Tiffany TEE	PL360	18	12.3	Steel, FBE, CTE and Concrete	Gas	Brae Alpha to Brae Bravo	Surface-laid	Operational	Hydrocarbon gas
Brae Bravo to Brae Alpha Condensate Export Includes SSIV Structures at Brae Alpha and Brae Bravo and lateral tie-in structure	PL361	18	12.7	Steel, FBE and Concrete	Condensate	Brae Bravo to Brae Alpha	Surface-laid	Operational	Hydrocarbon liquids

Table 2.3: Pipeline/Flowline/Umbilical Information

Description	Pipeline No. (as per PWA)	Nominal Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From-To	Burial Status	Status	Current Content
Brae Alpha to Central Brae Water Injection	PL634	10	7	Steel and FBE	Injection water	Brae Alpha to Central Brae	Part trenched, part surface-laid, part surface-laid and rock covered.	Suspended under IPR	Sea water
Central Brae Service Line	PL635	4	7	Steel and FBE	Chemical/ Gas	Brae Alpha to Central Brae	Part trenched, part surface-laid, part surface-laid and rock covered.	Operational	Chemicals or Hydrocarbon fluids
Central Brae to Brae Alpha Production Flowline (PL636 is made up of two parallel pipelines that follow the same route from Central Brae to Brae Alpha)	PL636 (1 of 2)	6	7	Stainless steel, polyurethane, Inconel	Reservoir Fluids	Central Brae to Brae Alpha	Predominantly trenched and rock covered.	Operational	Reservoir fluids

Table 2.3: Pipeline/Flowline/Umbilical Information

Description	Pipeline No. (as per PWA)	Nominal Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From-To	Burial Status	Status	Current Content
Central Brae to Brae Alpha Production Flowline (PL636 is made up of two parallel pipelines that follow the same route from Central Brae to Brae Alpha)	PL636 (2 of 2)	6	7	Stainless steel, polyurethane, Inconel	Reservoir Fluids	Central Brae to Brae Alpha	Predominantly trenched and rock covered.	Operational	Reservoir fluids
Central Brae Chemical Injection Umbilical	PL637	5	7	Chemical lines, and structural layers of polymer and steel wire	Chemical	Brae Alpha to Central Brae	Part trenched, part surface-laid, part surface-laid and rock covered, part surface-laid and mattress protected.	Operational	Chemicals
East Brae to Brae Bravo WYE Assembly, condensate transfer Includes Lateral Tie-in Structure and WYE/SSIV Structure	PL894	18	15	Steel, FBE, CTE and Concrete	Condensate	Brae Bravo to East Brae	Surface-laid	Operational	Hydrocarbon liquids

Table 2.3: Pipeline/Flowline/Umbilical Information

Description	Pipeline No. (as per PWA)	Nominal Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From-To	Burial Status	Status	Current Content
Brae Bravo to East Brae Gas Transfer Includes East Brae SSIV/Crossover Structure and Brae Bravo SSIV	PL895	18	15	Steel, FBE, CTE and Concrete	Gas	Brae Bravo to East Brae	Surface-laid	Operational	Hydrocarbon gas
East Brae SSIV/Crossover Structure to pipeline PL762 (SAGE)	PL896	30	23	Steel, FBE and Concrete	Gas	East Brae SSIV Crossover Structure to SAGE Subsea Wye (on PL762)	Surface-laid	Operational	Hydrocarbon gas
West Brae Manifold to Brae Alpha Production Flowline	PL1441.1	12	9.02	Stainless steel and 3 layer polypropylene	Crude Oil Produced Water	West Brae Extension Manifold to Brae Alpha	Part trenched, part surface-laid, part surface-laid and mattress protected	Operational	Crude Oil Produced Water
W8z to West Brae Manifold Production Jumper	PL1441.2	7.75	0.035	Layers of polymer and steel wire	Crude Oil Produced Water	W8z to West Brae Manifold	Surface-laid mattress protected	Operational	Crude Oil Produced Water
W12y to West Brae Manifold Production Jumper	PL1441.3	7.75	0.035	Layers of polymer and steel wire	Crude Oil Produced Water	W12y to West Brae Manifold	Surface-laid mattress protected	Operational	Crude Oil Produced Water

Table 2.3: Pipeline/Flowline/Umbilical Information

Description	Pipeline No. (as per PWA)	Nominal Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From-To	Burial Status	Status	Current Content
W3 to West Brae Manifold Production Jumper	PL1441.4	7.75	0.035	Layers of polymer and steel wire	Crude Oil Produced Water	W3 to West Brae Manifold	Surface-laid mattress protected	Operational	Crude Oil Produced Water
W7z/W10y to West Brae Manifold Production Jumper	PL1441.5	7.75	0.142	Layers of polymer and steel wire	Crude Oil Produced Water	W7z/W10y to West Brae Manifold	Surface-laid mattress protected	Operational	Crude Oil Produced Water
W9x to West Brae Manifold Production Jumper	PL1441.6	7.75	0.035	Layers of polymer and steel wire	Crude Oil Produced Water	W9x to West Brae Manifold	Surface-laid mattress protected	Operational	Crude Oil Produced Water
Brae Alpha to West Brae Manifold Gas Lift Flowline. Includes TEE structure	PL1442.1	6	9.02	Steel and 3 layer polypropylene	Hydrocarbon Lift Gas	Brae Alpha to West Brae	Part trenched, part surface-laid, part surface-laid and mattress protected	Operational	Hydrocarbon Lift Gas
West Brae Manifold to W7z/W10y Gas Lift Jumper	PL1442.2	5.27	0.14	Layers of polymer and steel wire	Hydrocarbon Lift Gas	West Brae Manifold to W7z/W10y	Surface-laid mattress protected	Operational	Hydrocarbon Lift Gas
West Brae Manifold to W9x Gas Lift Jumper	PL1442.4	5.27	0.06	Layers of polymer and steel wire	Hydrocarbon Lift Gas	West Brae Manifold to W9x	Surface-laid mattress protected	Operational	Hydrocarbon Lift Gas

Table 2.3: Pipeline/Flowline/Umbilical Information

Description	Pipeline No. (as per PWA)	Nominal Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From-To	Burial Status	Status	Current Content
West Brae Manifold to W10y Gas Lift Jumper	PL1442.5	5.27	0.035	Layers of polymer and steel wire	Hydrocarbon Lift Gas (this line is disconnected at the well)	West Brae Manifold to W10y	Surface-laid mattress protected	Suspended	Seawater
West Brae Manifold to W3 Gas Lift Jumper	PL1442.6	5.27	0.027	Layers of polymer and steel wire	Hydrocarbon Lift Gas	West Brae Manifold to W3	Surface-laid mattress protected	Operational	Hydrocarbon Lift Gas
West Brae Manifold to W12y Gas Lift Jumper	PL1442.7	5.27	0.11	Layers of polymer and steel wire	Hydrocarbon Lift Gas	West Brae Manifold to W12y	Surface-laid mattress protected	Operational	Hydrocarbon Lift Gas
West Brae Manifold to W8z Gas Lift Jumper	PL1442.8	5.27	0.035	Layers of polymer and steel wire	Hydrocarbon Lift Gas	West Brae Manifold to W8z	Surface-laid mattress protected	Operational	Hydrocarbon Lift Gas
Central Brae to West Brae Water Injection Flowline	PL1443.1	6	6.2	Steel and 3 layer polypropylene	Injection water	Central Brae to West Brae	Part trenched, part surface-laid, part surface-laid and mattress protected	Operational	Inhibited Water/ Seawater
West Brae manifold to W10y Water Injection Jumper	PL1443.3	8.81	0.06	Layers of polymer and steel wire	Injection water	West Brae manifold to W10y	Surface-laid mattress protected	Operational	Seawater

Table 2.3: Pipeline/Flowline/Umbilical Information

Description	Pipeline No. (as per PWA)	Nominal Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From-To	Burial Status	Status	Current Content
Central Brae to West Brae Service Flowline	PL1444.1	4	6.2	Steel and 3 layer polypropylene	Water and chemicals	Central Brae to West Brae	Part trenched, part surface-laid, part surface-laid and mattress protected	Operational	Water and chemicals
Brae Alpha to base of West Brae Production Riser Gas Lift Flowline	PL1445	3	0.16	22% Cr Duplex	Hydrocarbon Lift Gas	Brae Alpha topsides to Brae Alpha West Brae Production Riser Base	Not buried	Not operational	Seawater
Brae Alpha to West Brae Chemical/Control Umbilical	PLU1446	4	8.73	Chemical lines, and structural layers of polymer and steel wire	Chemicals	Brae Alpha to West Brae	Part trenched, part surface-laid and mattress protected, part surface-laid and rock covered	Operational	Chemicals

Table 2.3: Pipeline/Flowline/Umbilical Information

Description	Pipeline No. (as per PWA)	Nominal Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From-To	Burial Status	Status	Current Content
West Brae Manifold to W8z Chemical/Control Umbilical	PLU1446.12	0.5	0.035	Chemical lines, and structural layers of polymer and steel wire	Chemicals	West Brae manifold to W8z	Part trenched, part surface-laid and mattress protected, part surface-laid and rock covered	Operational	Chemicals
West Brae Manifold to W12y Chemical/Control Umbilical	PLU1446.13	0.5	0.035	Chemical lines, and structural layers of polymer and steel wire	Chemicals	West Brae manifold to W12y	Part trenched, part surface-laid and mattress protected, part surface-laid and rock covered	Operational	Chemicals
West Brae Manifold to W3 Chemical/Control Umbilical	PLU1446.14	0.5	0.035	Chemical lines, and structural layers of polymer and steel wire	Chemicals	West Brae manifold to W3	Part trenched, part surface-laid and mattress protected, part surface-laid and rock covered	Operational	Chemicals

Table 2.3: Pipeline/Flowline/Umbilical Information

Description	Pipeline No. (as per PWA)	Nominal Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From-To	Burial Status	Status	Current Content
West Brae Manifold to W8z Chemical/Control Umbilical	PLU1446.15	0.5	0.035	Chemical lines, and structural layers of polymer and steel wire	Chemicals	West Brae manifold to W8z	Part trenched, part surface-laid and mattress protected, part surface-laid and rock covered	Operational	Chemicals
West Brae Manifold to W12y Chemical/Control Umbilical	PLU1446.16	0.5	0.035	Chemical lines, and structural layers of polymer and steel wire	Chemicals	West Brae manifold to W12y	Part trenched, part surface-laid and mattress protected, part surface-laid and rock covered	Operational	Chemicals
West Brae Manifold to W3 Chemical/Control Umbilical	PLU1446.17	0.5	0.035	Chemical lines, and structural layers of polymer and steel wire	Chemicals	West Brae manifold to W3	Part trenched, part surface-laid and mattress protected, part surface-laid and rock covered	Operational	Chemicals

Table 2.3: Pipeline/Flowline/Umbilical Information

Description	Pipeline No. (as per PWA)	Nominal Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From-To	Burial Status	Status	Current Content
West Brae Manifold to Sedgwick Chemical/Control Umbilical	PLU1446JV1	0.75	2.3	Chemical lines, and structural layers of polymer and steel wire	Chemicals	West Brae manifold to Sedgwick	Part trenched, part surface-laid and mattress protected, part surface-laid and rock covered	Operational	Chemicals
Sedgwick to West Brae Manifold Flowline	PL1447	6	2.3	Stainless steel and 3 layer polypropylene	Crude oil and produced water	Sedgwick to West Brae	Part trenched, part surface-laid and mattress protected, part surface-laid mattress protected and rock covered	Operational	Crude oil and produced water
West Brae to Sedgwick Gas Lift Flowline	PL1448	2	2.3	Steel and 3 layer polypropylene	Gas	West Brae to Sedgwick	Part trenched with spot rock cover, part surface-laid and mattress protected, part surface-laid and rock covered	Operational	Hydrocarbon Gas

Table 2.3: Pipeline/Flowline/Umbilical Information

Description	Pipeline No. (as per PWA)	Nominal Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From-To	Burial Status	Status	Current Content
West Brae Manifold to W9x Chemical Jumper	PLU3798	¾ hose and ½ hose	0.035	Chemical lines, and structural layers of polymer and steel wire	Chemicals	West Brae Manifold to W9x	Surface-laid mattress protected	Suspended	Chemicals
West Brae Manifold to W7z Chemical Jumper	PLU3799	¾ hose and ½ hose	0.035	Chemical lines, and structural layers of polymer and steel wire	Chemicals	West Brae Manifold to W7z	Surface-laid mattress protected	Suspended	Chemicals
West Brae Manifold to W9x Chemical Jumper	PLU3800	¾ hose and ½ hose	0.035	Chemical lines, and structural layers of polymer and steel wire	Chemicals	West Brae Manifold to W9x	Surface-laid mattress protected	Operational	Chemicals
West Brae Manifold to W10y Chemical Jumper	PLU3801	¾ hose and ½ hose	0.04	Chemical lines, and structural layers of polymer and steel wire	Chemicals	West Brae Manifold to W10y	Surface-laid mattress protected	Operational	Chemicals
West Brae Manifold to W10y Chemical Jumper	PLU3802	¾ hose and ½ hose	0.04	Chemical lines, and structural layers of polymer and steel wire	Chemicals	West Brae Manifold to W10y	Surface-laid mattress protected	Suspended	Chemicals
W11 to West Brae Extension Manifold Production Jumper	PL3806	7.95	0.162	Layers of polymer and steel wire	Crude oil and produced water	W11 to West Brae Extension Manifold	Surface-laid mattress protected	Operational	Crude oil and produced water

Table 2.3: Pipeline/Flowline/Umbilical Information

Description	Pipeline No. (as per PWA)	Nominal Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From-To	Burial Status	Status	Current Content
West Brae Extension Manifold to W11 Gas Lift Jumper	PL3809	5.83	0.162	Layers of polymer and steel wire	Hydrocarbon Lift Gas	West Brae Extension Manifold to W11	Surface-laid mattress protected	Operational	Hydrocarbon Lift Gas
West Brae Manifold to W7z Chemical Jumper	PLU3811	¾ hose and ½ hose	0.058	Layers of polymer and steel wire	Chemicals	West Brae Manifold to W7z	Surface-laid mattress protected	Operational	Chemicals
West Brae Manifold to W11 Chemical Jumper	PLU3813	¾ hose and ½ hose	0.2	Layers of polymer and steel wire	Chemicals	West Brae Manifold to W11	Surface-laid mattress protected	Operational	Chemicals
Brae Alpha to West Brae Manifold and Sedgwick Electrical Umbilical	PLU4031	2.8	9.653	Electrical quads and steel wire armour	Power and signal	Brae Alpha to West Brae	Trenched and partially rock covered	Operational	-
West Brae Manifold to W7 Electrical Flying Lead	PLU4131	1	0.058	Copper conductor, steel wire armour, insulation	Electric Power	West Brae Manifold to W7	Surface-laid mattress protected	Operational	-
West Brae Manifold to W7 Electrical Flying Lead	PLU4132	1	0.072	Copper conductor, steel wire armour, insulation	Electric Power	West Brae Manifold to W7	Surface-laid mattress protected	Operational	-

Table 2.3: Pipeline/Flowline/Umbilical Information

Description	Pipeline No. (as per PWA)	Nominal Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From-To	Burial Status	Status	Current Content
West Brae Manifold to W8 Electrical Flying Lead	PLU4133	1	0.060	Copper conductor, steel wire armour, insulation	Electric Power	West Brae Manifold to W8	Surface-laid mattress protected	Operational	-
West Brae Manifold to W8 Electrical Flying Lead	PLU4134	1	0.072	Copper conductor, steel wire armour, insulation	Electric Power	West Brae Manifold to W8	Surface-laid mattress protected	Operational	-
West Brae Manifold to W9 Electrical Flying Lead	PLU4135	1	0.086	Copper conductor, steel wire armour, insulation	Electric Power	West Brae Manifold to W9	Surface-laid mattress protected	Operational	-
West Brae Manifold to W9 Electrical Flying Lead	PLU4136	1	0.102	Copper conductor, steel wire armour, insulation	Electric Power	West Brae Manifold to W9	Surface-laid mattress protected	Operational	-
West Brae Manifold to W12 Electrical Flying Lead	PLU4137	1	0.040	Copper conductor, steel wire armour, insulation	Electric Power	West Brae Manifold to W12	Surface-laid mattress protected	Operational	-
West Brae Manifold to W12 Electrical Flying Lead	PLU4138	1	0.072	Copper conductor, steel wire armour, insulation	Electric Power	West Brae Manifold to W12	Surface-laid mattress protected	Operational	-

Table 2.3: Pipeline/Flowline/Umbilical Information

Description	Pipeline No. (as per PWA)	Nominal Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From-To	Burial Status	Status	Current Content
Brae Bravo PL895 SSIV Control Umbilical	PLU4188	2	0.5	Hydraulic lines, electrical lines and structural layers of polymer and steel wire	Hydraulic fluids/ Electrical connections	Brae Bravo to PL895 SSIV	Surface-laid mattress protected	Operational	Hydraulic fluids/ Electrical connections
Brae Bravo Subsea Wye/SSIV Control Umbilical	PLU4189	2	0.35	Hydraulic lines, electrical lines and structural layers of polymer and steel wire	Hydraulic fluids/ Electrical connections	Brae Bravo to Subsea Wye/SSIV	Surface-laid mattress protected	Operational	Hydraulic fluids/ Electrical connections
Brae Bravo PL360 Gas SSIV Control Umbilical	PLU4190	2	0.045	Hydraulic lines, electrical lines and structural layers of polymer and steel wire	Hydraulic fluids/ Electrical connections	Brae Bravo to PL360 SSIV	Surface-laid mattress protected	Operational	Hydraulic fluids/ Electrical connections
Brae Alpha PL360/PL361 SSIV Control Umbilical	PLU4203	2	0.6	Hydraulic lines, electrical lines and structural layers of polymer and steel wire	Hydraulic fluids/ Electrical connections	Brae Alpha to PL360/PL361 SSIV	Surface-laid mattress protected	Operational	Hydraulic fluids/ Electrical connections

Table 2.3: Pipeline/Flowline/Umbilical Information

Description	Pipeline No. (as per PWA)	Nominal Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From-To	Burial Status	Status	Current Content
Central Brae Control Umbilical	PLU4217	3.5	7	Hydraulic lines, electrical lines and structural layers of polymer and steel wire	Hydraulic fluids/ Electrical connections	Brae Alpha to Central Brae	Part trenched, part surface-laid, part surface-laid and rock covered, part surface-laid and mattress protected.	Operational	Hydraulic fluids/ Electrical connections
PMS Cable Brae Alpha to Brae Bravo	-	5.3	13	Copper conductor, fibre optic, steel wire armour, EPR insulation	Electrical Power	Brae Alpha to Brae Bravo	Part trenched, part surface-laid with mattress protection	Operational	-
PMS Cable Brae Alpha to East Brae	-	5.3	28.5	Copper conductor, fibre optic, steel wire armour, EPR insulation	Electrical Power	Brae Alpha to East Brae	Part trenched, part surface-laid with mattress protection	Operational	-
PMS Cable Brae Bravo to East Brae	-	5.3	14.5	Copper conductor, fibre optic, steel wire armour, EPR insulation	Electrical Power	Brae Bravo to East Brae	Part trenched, part surface-laid with mattress protection	Operational	-

Table 2.4: Subsea Pipeline Stabilisation Features

Stabilisation Feature	Approximate Number	Weight (tonne)	Location(s)	Exposed/Buried/Condition
Concrete Mattresses	18	126	On PL64 1 Mattress at KP 73.035 to KP 73.042 17 Mattresses between KP 73.518 to KP 73.607	15 Mattresses exposed and in good condition. 2 Mattresses (KP 73.035 to KP 73.042 & KP 73.538 to KP 73.543) exposed and in partially torn condition. 1 Mattress (KP 73.604 to KP 73.607) partially buried and in good condition
Concrete Mattresses	3	21	On PL360 3 Mattresses between KP 0.234 and KP 0.273	3 Mattresses exposed and in good condition
Concrete Mattresses	4	28	On PL361 2 Mattresses between KP 0.337 to KP 0.346 2 Mattresses between KP 9.812 to KP 9.817	1 Mattress predominantly buried in good condition (KP 0.337 to KP 0.341) 1 Mattress predominantly buried in partially torn condition (KP 0.341 to KP 0.346) 2 Mattresses exposed in good condition, laid overlapping (KP 9.812 to KP 9.817)
Concrete Mattresses	96	672	Brae Alpha umbilical PLU4203 to PL3601/PL361 SSIV	15 mattresses partially buried by sediment. 35 mattresses partially buried by drill cuttings. 46 mattresses exposed and in good condition.
Concrete Mattresses	11	77	Brae Bravo umbilical PLU4189 to Subsea WYE	11 Mattresses partially buried by sediment.
Concrete Mattresses	5	35	Umbilical PLU4190 Subsea WYE to PL360 SSIV	5 Mattresses partially buried by sediment.

Table 2.4: Subsea Pipeline Stabilisation Features

Stabilisation Feature	Approximate Number	Weight (tonne)	Location(s)	Exposed/Buried/Condition
Concrete Mattresses	2	14	On umbilical PL637 adjacent to Brae Alpha 2 Mattresses between KP 0.002 to KP 0.015	1 Mattress predominantly buried in good condition (KP 0.002 to KP 0.008) 1 Mattress exposed in good condition (KP 0.008 to KP 0.015)
Concrete Mattresses	7	49	On umbilical PL637 adjacent to Central Brae structure 7 Mattresses between KP 6.759 to KP 6.850	1 Mattress partially buried in good condition (KP 6.759 to KP 6.771) 3 Mattresses exposed in good condition (KP 6.771 to KP 6.817) 3 Mattresses predominantly buried (KP 6.817 to KP 6.850) Note: In this area, the mattresses are made up of hexagonal sections and measure 12m each in length. (In this area, the mattresses are 12m long and are made up of hexagonal blocks).
Concrete Mattresses	8	56	On control umbilical PLU4217 adjacent to Brae Alpha sub-structure	4 mattresses partially buried by drill cuttings. 4 mattresses exposed.
Concrete Mattresses	33	231	On control umbilical PLU4217 adjacent to Central Brae structure	3 Mattresses buried. 30 mattresses exposed.
Concrete Mattresses	6	42	On PL894 lateral tie-in structure 6 Mattresses between KP 8.134 to KP 8.140	6 Mattresses exposed in good condition (KP 8.134 to KP 8.140)

Table 2.4: Subsea Pipeline Stabilisation Features

Stabilisation Feature	Approximate Number	Weight (tonne)	Location(s)	Exposed/Buried/Condition
Concrete Mattresses	8	56	Brae Bravo umbilical PLU4188 to PL895 SSIV	5 mattresses buried at SSIV structure. 3 mattresses partially buried adjacent to Brae Bravo Substructure
Concrete Mattresses	33	231	On PL1441.1 11 Mattresses between KP 0.000 to KP 0.298 22 Mattresses between KP 8.642 to KP 8.781	14 Mattresses exposed in good condition (KP 0.014 to KP 0.016, KP 0.040 to KP 0.042, KP 0.140 to KP 0.142, KP 0.165 to KP 0.167, KP 0.183 to KP 0.186, KP 0.218 to KP 0.220, KP 8.730 to KP 8.776) 15 Mattresses partially buried in good condition (KP 0.118 to KP 0.120, KP 8.646 to KP 8.730) 4 Mattresses predominantly buried in good condition (KP 0.062 to KP 0.065, KP 0.090 to KP 0.093, KP 0.121 to KP 0.124, KP 0.238 to KP 0.240)
Concrete Mattresses	50	350	On PL1442.1 6 Mattresses between KP 0.007 to KP 0.162 24 Mattresses between KP 6.681 to KP 6.816 20 Mattresses between KP 8.687 to KP 8.781	12 Mattresses exposed in good condition (KP 0.038 to KP 0.131, KP 6.749 to KP 6.751) 28 Mattresses partially buried in good condition (KP 0.160 to KP 0.162, KP 6.694 to KP 6.705, KP 6.717 to KP 6.749, KP 6.751 to KP 6.803, KP 8.704 to KP 8.754, KP 8.752 to KP 8.781) 10 Mattresses predominantly buried in good condition (KP 0.007 to KP 0.013, KP 6.681 to KP 6.694, KP 6.705 to KP 6.717, KP 6.803 to KP 6.816, KP 8.687 to KP 8.704)

Table 2.4: Subsea Pipeline Stabilisation Features

Stabilisation Feature	Approximate Number	Weight (tonne)	Location(s)	Exposed/Buried/Condition
Concrete Mattresses	21	147	On PL1443.1 4 Mattresses between KP 0.005 to KP 0.082 17 Mattresses between KP 6.067 to 6.141	12 Mattresses exposed in good condition (KP 0.005 to KP 0.082, KP 6.087 to KP 6.104, KP 6.127 to KP 6.141) 7 Mattresses partially buried in good condition (KP 6.075 to KP 6.087, KP 6.104 to KP 6.127) 2 Mattresses predominantly buried in good condition (KP 6.067 to KP 6.075)
Concrete Mattresses	24	168	On PL1444.1 6 Mattresses between KP -0.075 to KP 0.046 18 Mattresses between KP 5.996 to KP 6.084	14 Mattresses exposed in good condition (KP -0.075 to KP 0.046, KP 6.013 to KP 6.049, KP 6.075 to KP 6.083) 8 Mattresses partially buried in good condition (KP 6.008 to KP 6.013, KP 6.049 to KP 6.075, KP 6.083 to KP 6.084) 2 Mattresses predominantly buried in good condition (KP 5.996 to KP 6.008)
Concrete Mattresses	46	322	On PLU1446 24 Mattresses between KP 0.007 to KP 0.149 22 Mattresses between KP 8.728 to KP 8.840	20 Mattresses exposed in good condition (KP 8.739 to KP 8.840) 3 Mattresses partially buried in good condition (KP 0.007 to KP 0.024) 20 Mattresses predominantly buried in good condition (KP 0.026 to KP 0.149) 1 Mattress predominantly buried and torn (KP 0.024 to KP 0.026) 2 Mattresses predominantly rock covered in good condition (KP 8.728 to KP 8.739)

Table 2.4: Subsea Pipeline Stabilisation Features

Stabilisation Feature	Approximate Number	Weight (tonne)	Location(s)	Exposed/Buried/Condition
Concrete Mattresses	25	175	On PLU1446JV1: 12 Mattresses between KP 0.005 to KP 0.067 13 Mattresses between KP 2.250 to KP 2.317	15 Mattresses exposed in good condition (KP 0.005 to KP 0.007, KP 0.025 to KP 0.037, KP 0.049 to KP 0.061, KP 2.270 to KP 2.307, KP 2.308 to KP 2.317) 7 Mattresses partially buried in good condition (KP 0.007 to KP 0.025, KP 5 to KP 0.049, KP 2.257 to KP 2.270) 3 Mattresses partially rock covered in good condition (KP 0.061 to KP 0.067, KP 2.250 to KP 2.257)
Concrete Mattresses	14	98	Umbilical SDU Foundation at Sedgwick	14 Mattresses buried
Concrete Mattresses	52	364	On PL1447: 26 Mattresses between KP 0.002 to KP 0.104 26 Mattresses between KP 2.067 to KP 2.224	24 Mattresses exposed in good condition (KP 0.002 to KP 0.017, KP 0.026 to KP 0.047, KP 2.128 to KP 2.187) 15 Mattresses partially buried in good condition (KP 0.017 to KP 0.032, KP 0.038 to KP 0.075, KP 2.095 to KP 2.100, KP 2.125 to KP 2.128, KP 2.187, KP 2.224) 12 Mattresses predominantly buried in good condition (KP 0.075 to KP 0.104, KP 2.074 to KP 2.095, KP 2.100 to KP 2.125) 1 Mattress predominantly buried with rock cover in good condition (KP 2.067 to KP 2.074)

Table 2.4: Subsea Pipeline Stabilisation Features

Stabilisation Feature	Approximate Number	Weight (tonne)	Location(s)	Exposed/Buried/Condition
Concrete Mattresses	32	224	On PL1448: 12 Mattresses between KP 0.002 to KP 0.066 20 Mattresses between KP 2.100 to KP 2.245	11 Mattresses exposed in good condition (KP 0.002 to KP 0.012, KP 0.0244 to KP 0.033, KP 0.041 to KP 0.048, KP 2.102 to KP 2.120, KP 2.157 to KP 2.166) 18 Mattresses partially buried in good condition (KP 0.012 to KP 0.024, KP 0.033 to KP 0.041, KP 2.102 to KP 2.103, KP 2.120 to KP 2.158, KP 2.166 to KP 2.245) 2 Mattresses predominantly buried in good condition (KP 0.048 to KP 0.066) 1 Mattress predominantly buried with rock cover in good condition (KP 2.100 to KP 2.102)
Concrete Mattresses	45	315	On PL4031	45 Mattresses exposed in good condition
Concrete Mattresses	118	826	On Brae Alpha to Brae Bravo PMS cable 68 Mattresses between KP 0.009 to KP 0.289 4 Mattresses between KP 2.016 to KP 2.034 6 Mattresses between KP 6.206 to KP 6.236 6 Mattresses between KP 7.176 to KP 7.207 1 Mattress between KP 9.906 to KP 9.909 33 Mattresses between KP 12.222 to KP 12.437	55 Mattresses exposed in good condition (KP 0.065 to KP 0.069, KP 0.080 to KP 0.250, KP 2.016 to KP 2.034, KP 9.906 to 9.909, KP 12.371 to KP 12.377, KP 12.414 to KP 12.422) 15 Mattresses partially buried in good condition (KP 0.018 to KP 0.028, KP 0.061 to KP 0.075, KP 0.250 to KP 0.284, KP 12.325 to KP 12.330, KP 12.360 to KP 12.369) 48 Mattresses predominantly buried in good condition (KP 0.009 to KP 0.018, KP 0.028 to KP 0.061, KP 0.075 to KP 0.080, KP 0.284 to KP 0.289, KP 6.206 to KP 6.236, KP 7.176 to KP 7.207, KP 12.222 to KP 12.325, KP 12.330 to KP 12.360, KP 12.369 to KP 12.373, KP 12.373 to KP 12.414, KP 12.422 to KP 12.437)

Table 2.4: Subsea Pipeline Stabilisation Features

Stabilisation Feature	Approximate Number	Weight (tonne)	Location(s)	Exposed/Buried/Condition
Concrete Mattresses	31	217	On Brae Alpha to East Brae PMS cable: 17 Mattresses between KP 0.015 to KP 0.159 7 Mattresses between KP 4.586 to KP 4.634 1 Mattress between KP 6.273 to KP 6.279 5 Mattresses between KP 9.699 to KP 9.724 1 Mattress between KP 21.825 to KP 21.830	2 Mattresses exposed in good condition (KP 0.082 to KP 0.088) 10 Mattresses partially buried in good condition (KP 0.067 to KP 0.069, KP 4.608 to KP 4.629, KP 9.699 to KP 9.724) 18 Mattresses predominantly buried in good condition (KP 0.015 to KP 0.076, KP 0.076 to KP 0.086, KP 0.086 to KP 0.159, KP 4.586 to KP 4.608, KP 4.629 to KP 4.634) 1 Mattress completely buried (KP 6.273 to KP 6.279)
Concrete Mattresses	30	210	On Brae Bravo to East Brae PMS cable 16 Mattresses between KP 0.004 to KP 0.076 6 Mattresses between KP 3.511 to KP 3.546 1 Mattress between KP 7.434 to KP 7.439 7 Mattresses between KP 7.630 to KP 7.794	1 Mattress exposed and broken. (KP 3.511 to KP 3.516) 7 Mattresses partially buried in good condition (KP 0.004 to KP 0.007, KP 3.516 to KP 3.521, KP 3.527 to KP 3.546, KP 7.434 to KP 7.439, KP 7.790 to KP 7.794) 6 Mattresses partially buried and broken (KP 7.630 to KP 7.788) 16 Mattresses predominantly buried in good condition (KP 0.007 to KP 0.076, KP 3.521 to KP 3.527)
Concrete Mattresses	178	1246	Mattresses on surface-laid jumpers at West Brae	Mattresses are in multiple layers. Visible mattresses are in good condition.
Concrete Mattresses	56	392	Mattresses on surface-laid flowlines and umbilical at Sedgwick	9 mattresses partially or fully buried by rock cover. Some mattresses partially buried by sediment
Grout Bags	600	60	Grout bags associated with jumpers at West Brae	Grout bags are inter-layered with mattresses on flowlines and umbilical jumpers.

Table 2.4: Subsea Pipeline Stabilisation Features

Stabilisation Feature	Approximate Number	Weight (tonne)	Location(s)	Exposed/Buried/Condition
Frond Mats	None	-	-	-
Formwork – Pipeline Ballast Support	14	133	14 Ballast/Support Structures on PL636 (1 of 2) in Brae Alpha safety zone intermittently between KP 0.045 to KP 0.436	7 Ballast/Support Structures exposed in good condition. (KP 0.226 to KP 0.436) 7 Ballast/Support Structures partially buried in good condition. (KP 0.045 to KP 0.196)
Structures/SDU Concrete Structure	17	162	17 Ballast/Support Structures on PL636 (2 of 2) in Brae Alpha safety zone intermittently between KP 0.054 to KP 0.452	12 Ballast/Support Structures exposed in good condition. (KP 0.112 to KP 0.452) 2 Ballast/Support Structures partially buried in good condition. (KP 0.079 to KP 0.086)
	16	96	16 Ballast/Support Structures on PL635 in Brae Alpha safety zone intermittently between KP 0.070 to KP 0.452	3 Ballast/Support Structures predominantly buried in good condition. (KP 0.054 to KP 0.072)
	1	20	SDU Concrete Structure at Sedgwick located on PLU1446JV1 line between KP 2.308 to KP 2.317	15 Ballast/Support Structures exposed in good condition. (KP 0.095 to KP 0.452) 1 Ballast/Support Structure partially buried in good condition. (KP 0.070 to KP 0.073) SDU Concrete Structure at Sedgwick in good condition
Insulation Shells	6	4	At Brae Alpha. 3 installed on PL636 (1 of 2), 3 installed on PL636 (2 of 2)	
Half Shells	440	3	At Brae Alpha installed on PLU4031, covering the line to a distance of approximately 150m from the plan centre of the platform footings.	Half shells present in good condition. The half shells overlap one another to form around 330m of ducting

Table 2.4: Subsea Pipeline Stabilisation Features

Stabilisation Feature	Approximate Number	Weight (tonne)	Location(s)	Exposed/Buried/Condition
Rock Cover	4.2km of cover	N/A	Between KP 1.283 and 5.494 on PL636 (1 of 2)	Rock cover present
Rock Cover	4.2km of cover	N/A	Between KP1.284 and 5.502 on PL636 (2 of 2)	Rock cover present
Rock Cover	0.26km of cover	N/A	Between KP 4.816 and 5.072 on umbilical PL637.1	Rock cover present
Rock Cover	0.32km of cover	N/A	Between KP 4.83 and 5.15 on PLU4217	Rock cover present
Rock Cover	0.020km of cover	N/A	Between KP 14.465 and 14.485 on umbilical PL894.1	Rock cover present
Rock Cover	0.004km of cover	N/A	Between KP 0.058 and 0.062 on PL1442.1	Rock cover present
Rock Cover	0.102km of cover	N/A	Between KP 8.639 and 8.741on umbilical PLU1446	Rock cover present
Rock Cover	0.119km of cover	N/A	Between KP 1.856 to KP 1.886 and KP 1.981 to KP 2.070 on umbilical PL1447	Rock Cover present.
Rock Cover	0.5km of cover	N/A	Between KPs 1.4 and 1.5, 1.6 and 1.9, 1.98 and 2.02, and 2.03 and 2.1 on PL1448 West Brae to Sedgwick gas lift flowline	Rock Cover present.
Rock Cover	Intermittent	N/A	Between KP0.477 and 5.636 on PLU4031 Brae Alpha to West Brae and Sedgwick Electrical Umbilical	Rock Cover present.

2.4 Wells

The Brae Alpha and Brae Bravo platform wells and Central Brae, West Brae and Sedgwick subsea wells are listed in Table 2.5.

Table 2.5: Wells Information

Well	Designation	Status	Abandonment Category
Platform Wells (Brae Alpha)			
16/07a-A01 (South Brae)	Oil Producer	Active	PL 3-3-3
16/07a-A02 (South Brae)	Oil Producer	Active	PL 3-3-3
16/07a-A03 (South Brae)	Oil Producer	Suspended	PL 3-3-3
16/07a-A04 (South Brae)	Oil Producer	Suspended	PL 3-3-3
16/07a-A05 (South Brae)	Oil Producer	Shut In	PL 3-3-3
16/07a-A07 (South Brae)	Oil Producer	Suspended	PL 4-3-3
16/07a-A08 (South Brae)	Oil Producer	Active	PL 3-3-3
16/07a-A10 (South Brae)	Water Injector	Shut In	PL 3-3-3
16/07a-A11 (South Brae)	Water Injector	Suspended	PL 4-3-3
16/07a-A14 (South Brae)	Water Injector	Suspended	PL 3-3-3
16/07a-A15 (South Brae)	Water Injector	Shut In	PL 3-3-3
16/07a-A16 (South Brae)	Oil Producer	Active	PL 4-3-3
16/07a-A18 (South Brae)	Oil Producer	Active	PL 4-3-3
16/07a-A20 (South Brae)	Water Injector	Suspended	PL 3-3-3
16/07a-A22 (South Brae)	Oil Producer	Suspended	PL 3-3-3
16/07a-A24 (South Brae)	Oil Producer	Active	PL 3-3-3
16/07a-A25Z (South Brae)	Oil Producer	Active	PL 4-3-3
16/07a-A27 (South Brae)	Oil Producer	Suspended	PL 3-3-3
16/07a-A28 (South Brae)	Oil Producer	Shut In	PL 3-3-3
16/07a-A30Z (South Brae)	Not Completed	Suspended	PL 3-3-3
16/07a-A32Z (South Brae)	Oil Producer	Active	PL 3-3-3
16/07a-A35 (South Brae)	Not Completed	Suspended	PL 3-3-3
16/07a-A36 (South Brae)	Oil Producer	Active	PL 3-3-3

Table 2.5: Wells Information

Well	Designation	Status	Abandonment Category
16/07a-A37 (South Brae)	Oil Producer	Active	PL 4-3-3
16/07a-A38 (South Brae)	Oil Producer	Shut In	PL 3-3-3
16/07a-A40 (South Brae)	Oil Producer	Active	PL 4-3-3
16/07a-A41 (South Brae)	Oil Producer	Active	PL 4-3-3
16/07a-A42Z (South Brae)	Oil Producer	Shut In	PL 4-3-3
16/07a-A43 (South Brae)	Not Completed	Suspended	PL 3-3-3
16/07a-A44Z (Central)	Water Injector	Active	PL 4-3-3
16/07a-A45Z (South Brae)	Oil Producer	Active	PL 3-3-3
16/07a-A46 (South Brae)	Oil Producer	Active	PL 3-3-3
16/07a-A47 (South Brae)	Oil Producer	Active	PL 4-3-3
16/07a-A48 (South Brae)	Oil Producer	Active	PL 3-3-3
Platform Wells (Brae Bravo)			
16/07a-B01 (North Brae)	Gas Condensate Producer	Shut In	PL 3-3-3
16/07a-B02 (North Brae)	Gas Condensate Producer	Active	PL 4-3-3
16/07a-B03 (North Brae)	Gas Condensate Producer	Shut In	PL 3-3-3
16/07a-B04 (North Brae)	Gas Condensate Producer	Suspended	PL 3-3-3
16/07a-B05 (North Brae)	Gas Condensate Producer	Active	PL 4-3-3
16/07a-B06 (North Brae)	Gas Condensate Producer	Active	PL 3-3-3
16/07a-B08 (North Brae)	Gas Injector	Suspended	PL 3-3-3
16/07a-B09 (North Brae)	Gas Condensate Producer	Shut In	PL 3-3-3
16/07a-B15 (North Brae)	Gas Condensate Producer	Shut In	PL 4-3-3
16/07a-B16Z (North Brae)	Gas Condensate Producer	Shut In	PL 3-3-3
16/07a-B17 (North Brae)	Gas Condensate Producer	Active	PL 3-3-3
16/07a-B18 (North Brae)	Gas Condensate Producer	Shut In	PL 3-3-3
16/07a-B19 (North Brae)	Not Completed	Suspended	PL 3-3-3
16/07a-B20 (North Brae)	Oil and Gas Condensate Producer	Active	PL 4-3-3
16/07a-B21 (Beinn)	Oil and Gas Condensate Producer	Active	PL 3-3-3

Table 2.5: Wells Information

Well	Designation	Status	Abandonment Category
16/07a-B22 (North Brae)	Oil and Gas Condensate Producer	Active	PL 3-3-3
16/07a-B23Z (Beinn)	Gas Condensate Producer	Shut In	PL 4-3-3
16/07a-B24 (Central)	Oil Producer	Active	PL 3-3-3
16/07a-B25 (North Brae)	Gas Condensate Producer	Suspended	PL 3-3-3
16/07a-B26 (North Brae)	Gas Condensate Producer	Shut In	PL 4-3-3
16/07a-B27 (North Brae)	Gas Condensate Producer	Active	PL 3-3-3
16/07a-B29 (North Brae)	Gas Condensate Producer	Shut In	PL 4-3-3
16/07a-B30 (Beinn)	Gas Condensate Producer	Suspended	PL 4-3-3
16/07a-B31Z (Central)	Oil Producer	Active	PL 4-3-3
16/07a-B32 (North Brae)	Not Completed	Suspended	PL 3-3-3
16/07a-B33 (Beinn)	Gas Condensate Producer	Shut In	PL 4-3-3
16/07a-B34 (North Brae)	Gas Condensate Producer	Active	PL 3-3-3
16/07a-B35 (Beinn)	Not Completed	Suspended	PL 3-3-3
Subsea Wells (Central Brae)			
16/07a-C01 (Central Brae)	Oil Producer	Shut In	SS 3-3-3
16/07a-C02 (Central Brae)	Water Injector	Suspended	SS 3-3-3
16/07a-C03 (Central Brae)	Oil Producer	Active	SS 3-3-3
16/07a-C04 (Central Brae)	Oil Producer	Shut In	SS 3-3-3
16/07a-C05 (Central Brae)	Water Injector	Shut In	SS 3-3-3
16/07a-C06Z (Central Brae)	Water Injector	Shut In	SS 3-3-3
16/07a-C07 (Central Brae)	Oil Producer	Shut In	SS 3-3-3
16/07a-C09 (Central Brae)	Water Injector	Shut In	SS 3-3-3
Subsea Wells (West Brae)			
16/07a-W03 (West Brae)	Oil Producer	Active	SS 4-3-3
16/07a-W05 (West Brae)	Not Completed	Suspended	SS 3-3-3
16/07a-W07Z (West Brae)	Oil Producer	Active	SS 4-3-3
16/07a-W08Z (West Brae)	Oil Producer	Active	SS 4-3-3

Table 2.5: Wells Information

Well	Designation	Status	Abandonment Category
16/07a-W09X (West Brae)	Oil Producer	Active	SS 3-3-3
16/07a-W10Y (West Brae)	Oil Producer	Active	SS 3-3-3
16/07a-W11 (West Brae)	Oil Producer	Active	SS 3-3-3
16/07a-W12Y (West Brae)	Oil Producer	Active	SS 3-3-3
Subsea Wells (Sedgwick)			
16/06a-V01 (Sedgwick)	Oil Producer	Active	SS 3-3-3
16/07a-32 (Sedgwick)	Exploration	Suspended	SS 3-3-3

2.5 Drill Cuttings

Table 2.6 lists the key parameters of the Brae Alpha and Brae Bravo drill cuttings piles.

Table 2.6: Drill Cuttings

Installation	Location of Pile Centre	Seabed Area (m^2)	Estimated Cuttings Volume (m^3)
Brae Alpha	Beneath Brae Alpha	12,700	28,000
Brae Bravo	Beneath Brae Bravo	17,000	22,500
Central Brae	No Drill Cuttings Pile	0	0
West Brae	No Drill Cuttings Pile	0	0
Sedgwick	No Drill Cuttings Pile	0	0

The Brae Alpha drill cuttings pile, Figure 2.1, is elliptical in plan view (approximately 130m x 115m) and reaches a peak height above the seabed of approximately 11.5m. It is centred beneath the centre of jacket/sub-structure, and extends beyond the northern legs to a distance of approximately 65m. The Brae Bravo drill cuttings pile is also elliptical in plan view (approximately 140m x 90m) and reaches a peak height above the seabed of approximately 8m, Figure 2.2. It is centred approximately mid-way between the two northern legs of the centre of jacket/sub-structure, and extends beyond the legs to a distance of approximately 80m.

Marathon Oil proposes to put in place post-decommissioning safety zones around the Brae Alpha and Brae Bravo footings to assist in preventing fishing vessels inadvertently snagging their nets on the jackets/sub-structure footings or trawling through drill cuttings piles. The post-decommissioning safety zones will be recorded on the FishSAFE system and Admiralty charts to warn mariners of the presence of subsea obstructions.

Figure 2.1: Brae Alpha Drill Cuttings Pile Profile

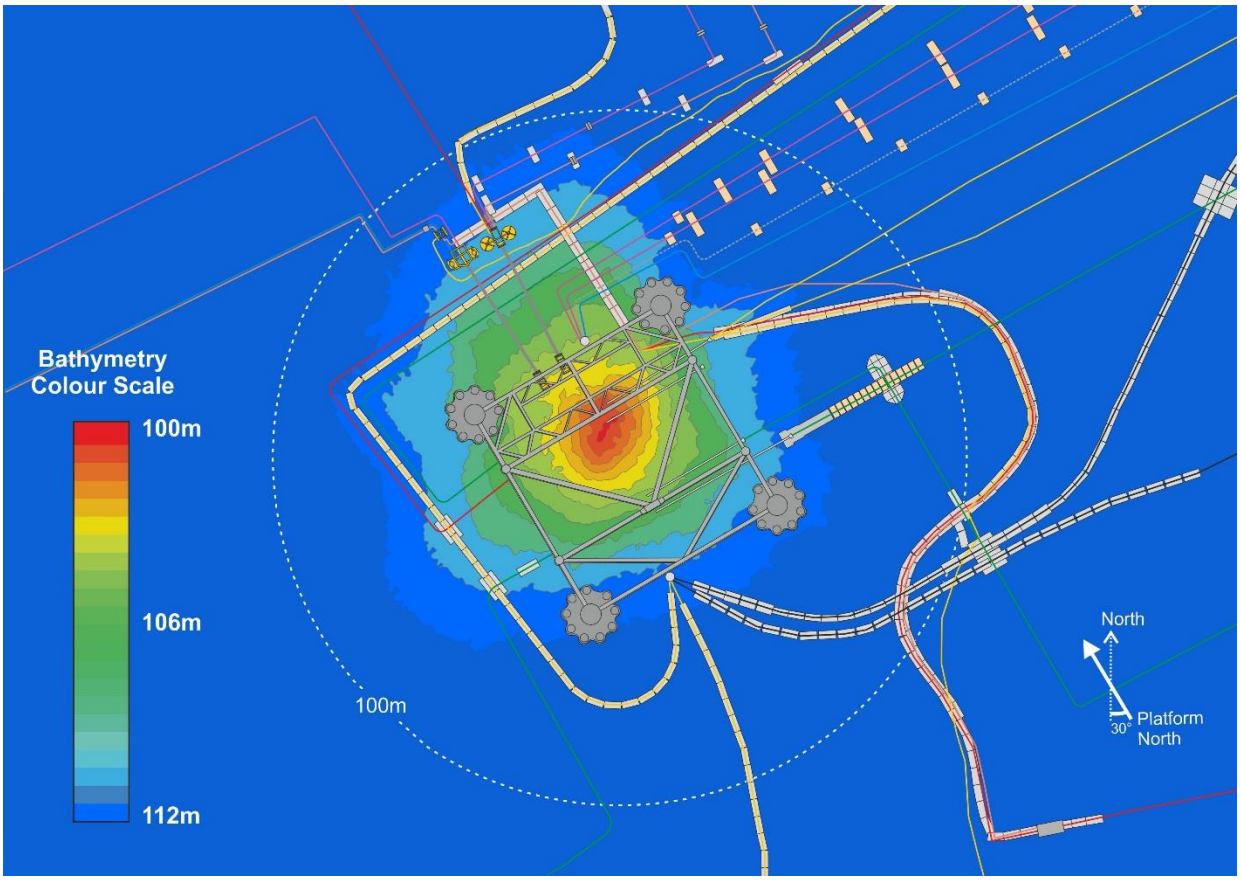
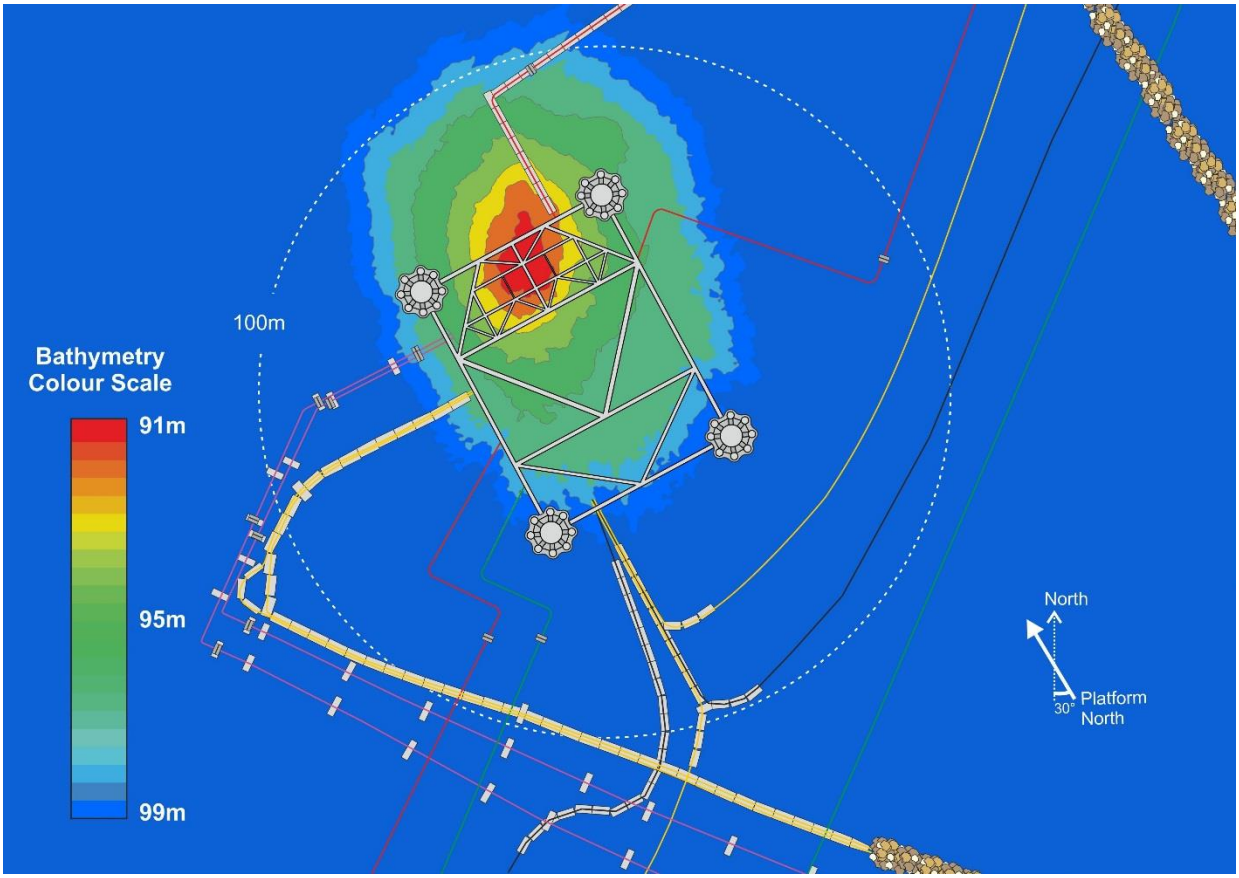


Figure 2.2: Brae Bravo Drill Cuttings Pile Profile



2.6 Inventory Estimates

The approximate amount of key materials used in the make-up of the Brae Alpha, Brae Bravo, Central Brae, West Brae, and Sedgwick installations and the associated pipelines has been evaluated. A focused review of the inventories of materials will be conducted during the detailed engineering phase of decommissioning. The level of detail developed and waste coding of materials will be subject to the reuse, recycling or disposal options selected, and the chosen removal method and destination.

Summaries of the material inventories for the above assets are shown in Figure 2.3 and Figure 2.4.

Appendix 3 provides further information on the main waste types on the facilities known at this stage.

Table 2.7: Material and Waste Management - Installations

Material	Weight (t)	% of Total
Carbon Steel	92,619	78.3%
Concrete	1,996 (inc. 1,342 tonnes grout)	1.6%
Marine Growth	6,100	5.2%
Non-Ferrous	4,215	3.6%
NORM / HAZ	333	0.3%
Other	3,660	3.1%
Plastic	998	0.8%
Stainless Steel	8,429	7.1%
Total	**118,350**	**100%**

Table 2.8: Material and Waste Management - Pipelines

Material	Weight (t)	% of Total
Carbon Steel	85,312	62.0%
Concrete	46,784	34.0%
Copper	2,064	1.5%
NORM / HAZ	138	0.1%
Other	1,238	0.9%
Plastic	2,064	1.5%
Total	**137,600**	**100%**

Figure 2.3: Estimated Inventory – Installations

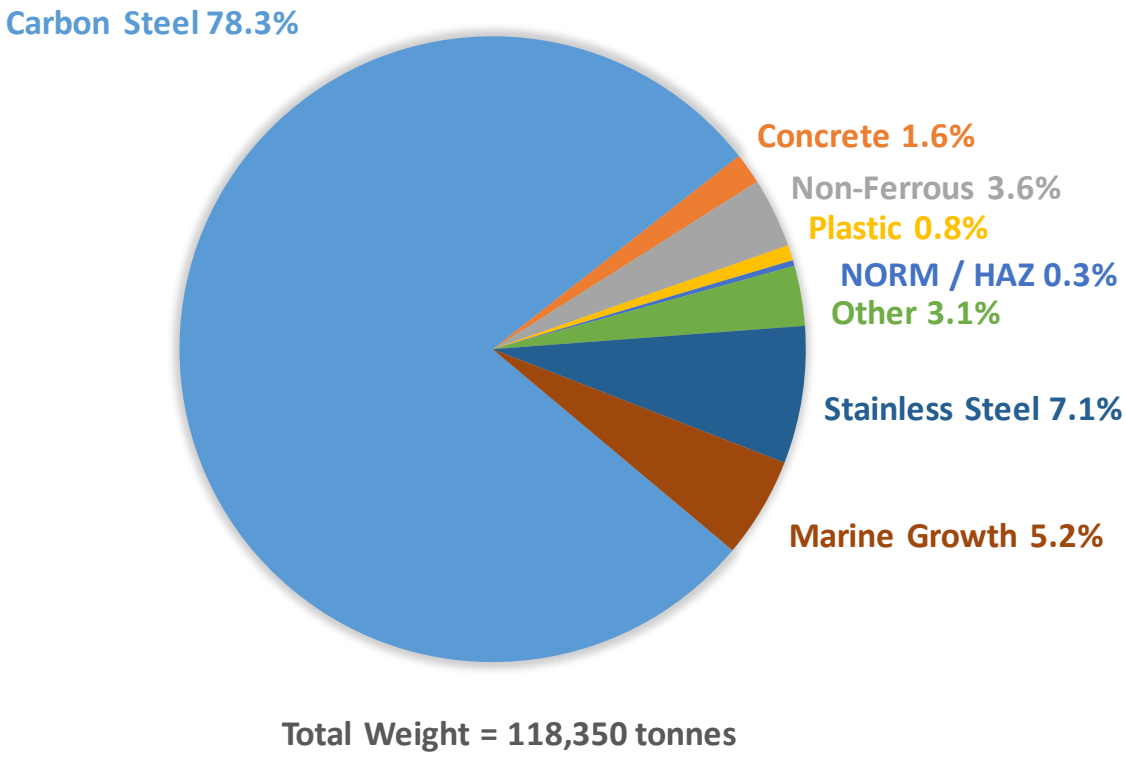
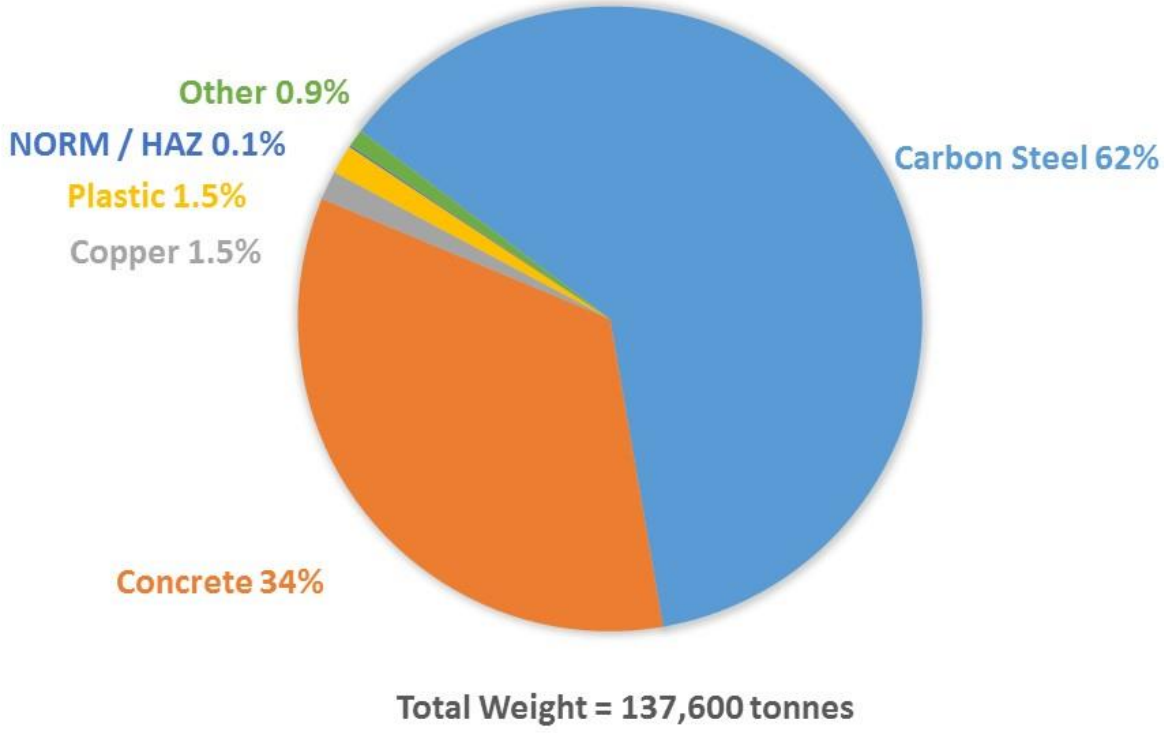


Figure 2.4: Estimated Inventory – Pipelines etc. (Including Stabilisation Features)



3. Removal and Disposal Methods

The reuse of an installation or its constituent parts is the preferred decommissioning option. Marathon Oil carried out a qualitative internal review of options for reusing the Brae Area platforms as producing assets and concluded that due to the age of the process technology, and the high cost of maintaining the fabric and structural integrity of the platforms, there are no technically viable reuse options. Similarly, Marathon Oil has not identified reuse opportunities for the Brae Area subsea installations as they are configured for the specific fields that they serve, and are reaching the end of their useful lives.

Alternate uses for the Brae facilities for power generation using wind energy, wave and tidal were also considered but none of these alternative use options are considered economically viable.

The reuse of the Brae Area facilities and infrastructure, including pipelines, has been considered for carbon capture and storage and in agreement with OGA was found not to be suitable candidates.

Marathon Oil will seek to reuse individual items of equipment where practicable. The majority of the balance of the materials and components that make up the Brae Area facilities will be recycled. For example, a significant proportion of the material making up the facilities is steel, which will be recovered and recycled. The small proportion of materials remaining after reuse and recycling will be disposed of appropriately in accordance with Marathon Oil policies and the relevant regulatory requirements, including waste management, environmental and health and safety expectations.

It is unlikely that significant volumes of recovered material will be landed onshore before 2020. It is not possible to forecast the reuse and recycling market with any accuracy or confidence this far forward. Therefore, Marathon Oil will continue to track reuse market trends in order to exploit reuse opportunities as they arise at the appropriate time.

3.1 Topsides

The Brae Alpha topsides are shown in Figure 3.1. They comprise of drilling, production and utilities facilities that are arranged in four tiers of modules. The lowest tier of modules (57, 58 and 59), make up the MSF (Module Support Frame). The MSF forms the interface between the platform's jacket/sub-structure and the topsides modules. The second tier of modules (01 to 08), consists of the wellheads, production facilities, utilities and flare structures. The third tier of modules (11 to 16), comprises the rig-skidding modules, gas compression, switchgear, and the lower accommodation. The fourth tier of modules (23 to 26, 31 and 32), is made up of the drilling rigs, drilling utilities, power generation, and the upper accommodation. The fourth tier also supports the Additional Living Quarters (ALQ) (module 28), the helideck (module 35), and the refrigeration facilities (module 65). The topsides' plan dimensions are approximately 65m by 45m.

The Brae Bravo topsides are shown in Figure 3.2. They comprise of drilling, production and utilities facilities arranged in three tiers of modules. The lowest tier of modules (57 and 58), make up the MSF (Module Support Frame). The MSF forms the interface between the platform's jacket/sub-structure and the topsides modules, and supports the platform end of the flare bridge (module 59). The second tier of modules consists of the wellheads, production and export facilities, utilities, and accommodation (modules 01 to 09). The third tier of modules (12 to 18, 22 and 32), comprises the rig-skidding module and derrick, the drilling modules, the injection compressor, generators and switchgear, and accommodation. The third tier also supports storage facilities and workshops and the helideck which sits on top of the accommodation modules. The topsides' plan dimensions are approximately 75m by 50m.

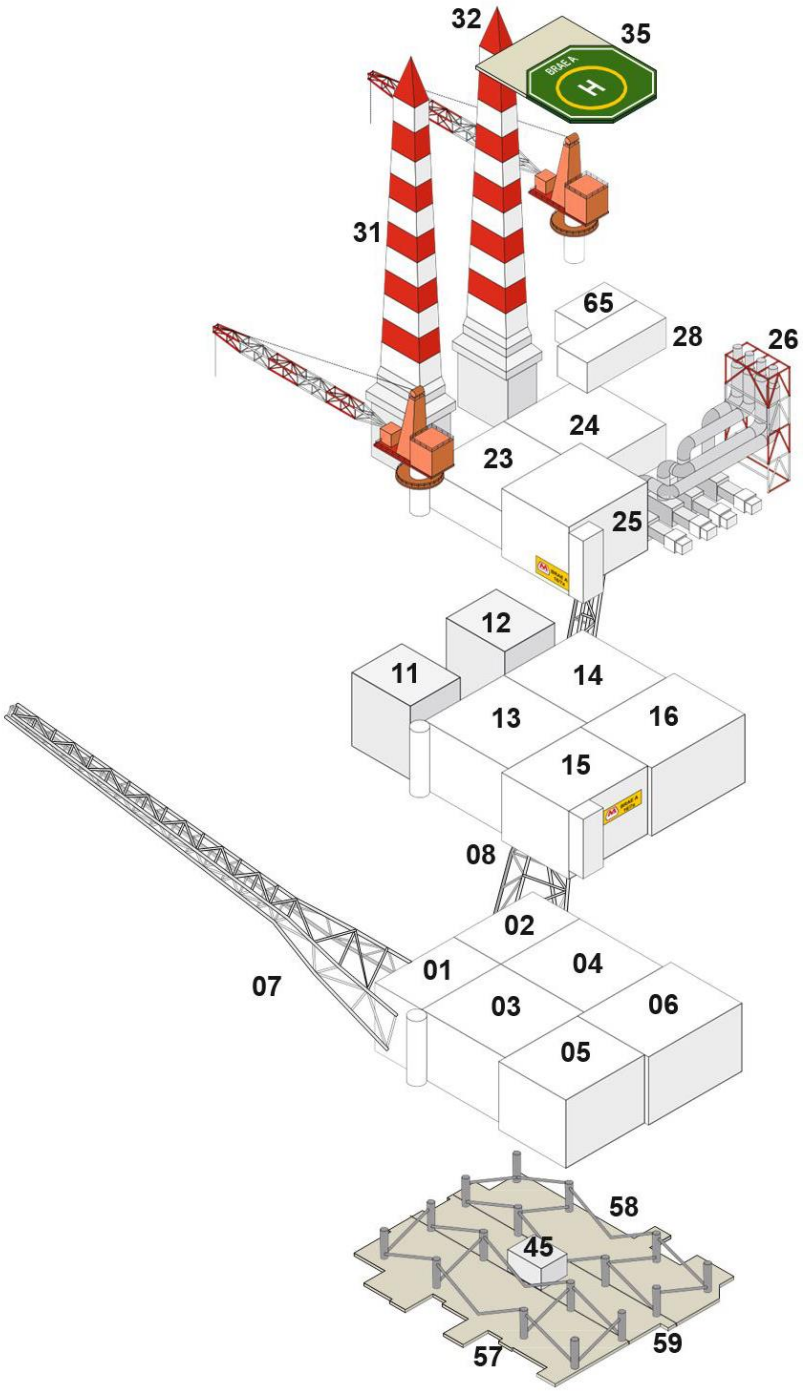
Experience from previous projects and studies completed in support of Brae Area decommissioning, indicate that there are a number of technically feasible options for removal of the Brae Alpha and Brae Bravo topsides. The removal options include Piece Small removal and Piece Medium removal, which are proven techniques. Single lift is also considered to be a technically feasible technique that may be used by Marathon Oil for removal of the Brae Alpha and Brae Bravo topsides. Marathon Oil will decide on the technique, or combination of techniques, to be used in consultation with removal contractors taking account of safety, environmental, technical, socio-economic and cost factors. Marathon Oil will continue to consult with stakeholders during the decision-making process.

The Brae Alpha and Brae Bravo topsides will be returned to shore for reuse, recycling or disposal. Marathon Oil will select recycling and disposal facilities on safety, environmental, socio-economic and cost factors. United Kingdom, European and international facilities will be considered in this selection process.

Some of the topsides equipment, such as rotating equipment, safety equipment and some electrical or electronic equipment may be suitable for reuse or recycling. Other equipment such as structural steel, steel process vessels and piping, and electrical cables may only be suitable for recycling, and there are some components and materials that are only suitable for disposal, including NORM and other hazardous wastes. Marathon Oil will dispose of these wastes appropriately and in accordance with the relevant regulatory requirements.

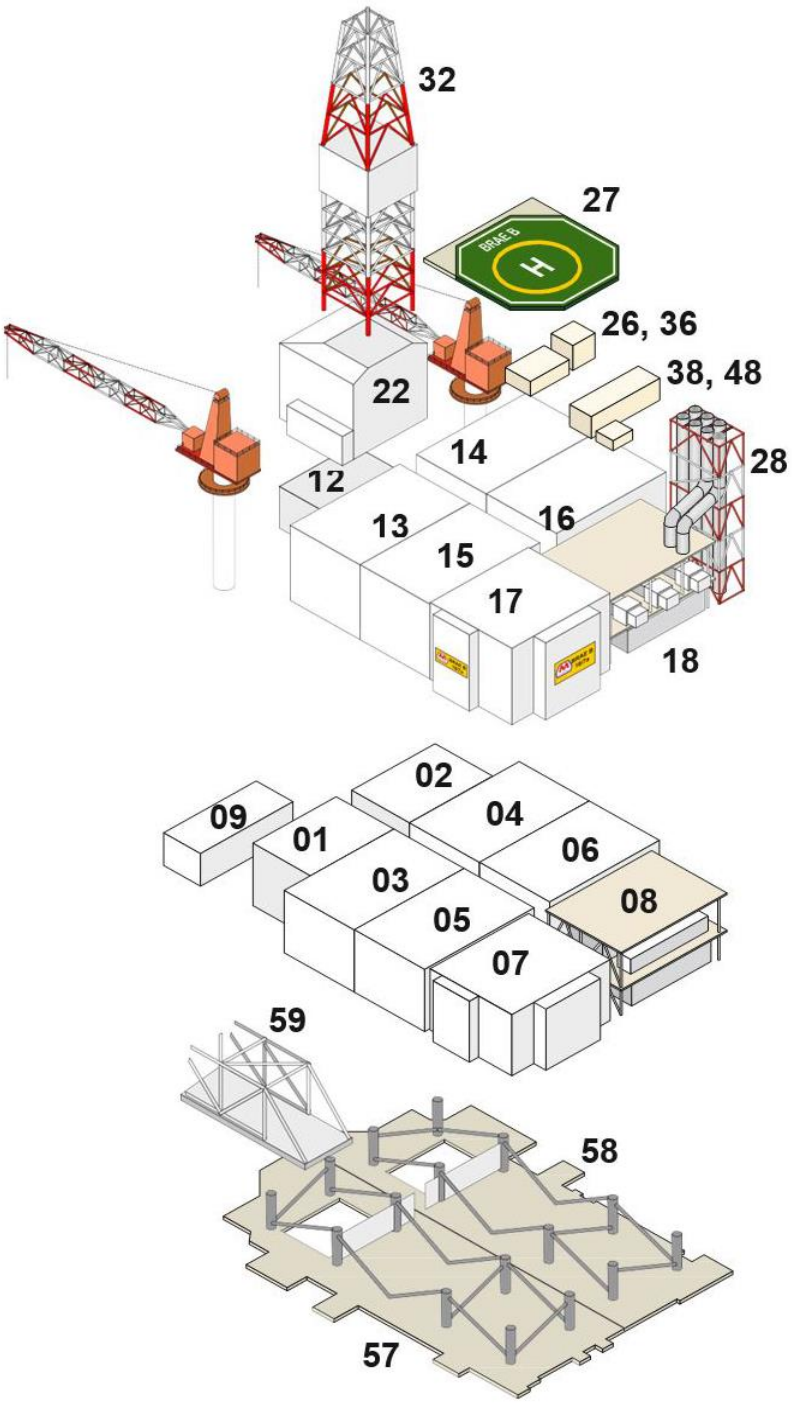
The methods that will be used to clean the Brae Alpha and Brae Bravo topsides are listed in Table 3.1, and the methods considered for topsides removal are listed in Table 3.2.

Figure 3.1: Brae Alpha Topsides



01 - Wellhead (West)
02 - Wellhead (East)
03 - Production Train A
04 - Production Train B
05 - Utilities
06 - Refrigeration/NGL
07 - Flare Boom (West)
08 - Flare Boom (East)
11 - Skidding Module (West)
12 - Skidding Module (East)
13 - Gas Compression
14 - Selexol
15 - Accommodation (Lower)
16 - Switchgear
23 - Drilling Module (West)
24 - Drilling Module (East)
25 - Accommodation (Upper)
26 - Power Generation Waste Heat Recovery
28 - ALQ
31 - Drilling Rig ((West)
32 - Drilling Rig (East)
35 - Helideck
45 - Diving Module
57 - MSF (West)
58 - MSF (East)
59 - MSF Field Splice
65 - Refridge

Figure 3.2: Brae Bravo Topsides



01 - Wellhead (West)
02 - Wellhead (East)
03 - Separation
04 - Compressor & Oil Export
05 - Refrigeration/NGL
06 - Injection Compressor
07 - Accommodation (Lower)
08 - MCC Room & Utilities
09 - Kingfisher Module
12 - Skidding Module
13 - Drilling Module
14 - Drilling Module
15 - Redundant
17 - Accommodation (Upper)
18 - Switchgear & Generators
22 - Substructure
26 - Drilling Annexe (on roof of Module 16)
27 - Helideck & Level 9 Accommodation
28 - Gas Turbines Exhaust Stack
32 - Derrick
36 - Fabrication Shop (on roof of Module 16)
38 - Workshops (on roof of Module 18)
48 - Catering Warehouse (on roof of Module 18)
57 - Module Support Structure (West)
58 - Module Support Structure (East)
59 - Flare Bridge

Table 3.1: Topsides Cleaning Method		
Waste Type	**Composition of Waste**	**Disposal Route**
On-board hydrocarbons	Process fluids, diesel and lubricants	Equipment will be drained, flushed and cleaned, and the residual effluent will be transported onshore for appropriate reuse, recycling or disposal.
Production and drilling chemicals	Proprietary preparations and bulk chemicals	Equipment will be drained, flushed and cleaned, and the residual effluent will be transported onshore for appropriate reuse, recycling or disposal.
Structural and equipment paint coat	Paints may include hazardous components, e.g. isocyanates	Paint may give off toxic fumes or dust during flame-cutting, abrasive blasting or mechanical cutting. This hazard will be managed by sampling and safe systems of work as appropriate. Paint and coatings will be transported onshore for appropriate licensed disposal.
Other hazardous materials	NORM, mercury, radioactive instruments, heavy metals, batteries, etc.	Equipment will be made safe and transported onshore for appropriate licensed reuse, recycling or disposal.
Seals, gaskets and insulation	Asbestos and ceramic fibres	Equipment will be made safe and transported onshore for appropriate licensed recycling or disposal.

Table 3.2: Topsides Removal Methods	
Topsides Removal Methods	
1) HLV Cut and Lift	✓
2) Monohull crane vessel[6]	
3) SLV	✓
4) Piece Small	✓
5) Other	A Hybrid option (combination of *Piece Small* and *Cut and Lift)* is feasible, and for the purpose of these decommissioning programmes is considered to be captured within the *Cut and Lift* and *Piece Small* methods.

Method	**Description**
Single lift removal by SLV	Removal of the topsides in one unit by an SLV. In this case, the topsides will be taken to a suitable onshore decommissioning facility to be broken up for reuse, recycling or disposal.

[6] *The HLV Cut and Lift evaluation has assumed a semi-sub type lift vessel as data exists for the installation of the platforms with such a vessel. However, the selection of actual vessel for decommissioning will ultimately be driven by lift capacity, crane reach and market conditions and does not preclude other vessel types such as a Monohull vessel. Marathon Oil consider the Monohull crane vessel option to be part of the HLV Cut and Lift method.*

Table 3.2: Topsides Removal Methods

Topsides Removal Methods

1) HLV Cut and Lift	✓
2) Monohull crane vessel[6]	
3) SLV	✓
4) Piece Small	✓
5) Other	A Hybrid option (combination of *Piece Small* and *Cut and Lift)* is feasible, and for the purpose of these decommissioning programmes is considered to be captured within the *Cut and Lift* and *Piece Small* methods.

Method	Description
HLV Cut and Lift	Removal of the topsides in several large modules, e.g., the drilling derrick and drilling jacket/sub-structure, etc. These modules will then be taken to an onshore decommissioning facility to be broken up for reuse, recycling or disposal.
Piece Small	Breaking up the topsides offshore using manual labour or excavators fitted with hydraulic shears, etc. The residue will be transported to shore by ship or barge and sorted at an onshore decommissioning facility. Equipment items that are suitable for reuse will be removed as units and shipped to shore.
Proposed removal method and disposal route	**Marathon Oil will select removal methods following a commercial tendering process taking account of safety, environmental, socio-economic, technical feasibility and cost factors. The evaluation of environmental and socio-economic factors will address materials management issues including trans-frontier shipment. All waste materials will be handled in accordance with United Kingdom and relevant international legislation. Marathon Oil and the selected decommissioning contractor(s) will address any trans-frontier shipment of waste to ensure that the associated issues are appropriately**

3.2 Jackets/Sub-Structures

3.2.1 3.2.1 Jackets/Sub-Structures Decommissioning Overview

The jackets/sub-structures, which are in the scope of the Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick combined decommissioning programmes are listed in Table 3.3. The outcomes of the comparative assessments of the decommissioning options for the jackets/sub-structures are presented in Table 3.4. The Brae Alpha and Brae Bravo jackets/sub-structures are illustrated in Figure 3.3 and Figure 3.4.

Table 3.3: Jackets/Sub-Structures

Name of Jacket/Sub-Structure	Jacket/Sub-Structure weight (tonnes)	Date Installed	Seeking Derogation from OSPAR Decision 98/3
Brae Alpha	20,000	1981	Yes
Brae Bravo	22,000	1986	Yes
Brae Bravo Flare	1,000	1986	No

Table 3.4: Outcome of Jackets/Sub-Structures Comparative Assessment

Name of Jacket/Sub-Structure	Recommended Option	Justification
Brae Alpha	The Brae Alpha jackets/sub-structure will be removed to the top of the footings (approximately 28m above the seabed). The exact cut height will be determined following detailed engineering taking into account technical constraints (such as jacket design, cross bracing design and cutting technology), safety and environmental impacts. This option is subject to derogation under OSPAR Decision 98/3.	Marathon Oil conducted a CA [3] to identify the preferred options for decommissioning the Brae Alpha jacket/sub-structure. This assessment concluded: Partial removal entails less risk to personnel carrying out the decommissioning activities, less environmental impact and less technical complexity than full removal. Leaving part of the jacket/sub-structure in place results in a risk of fishing vessels snagging nets. This risk will be managed by recording the hazard on Admiralty charts and through the use of the FishSAFE system. Marathon Oil proposes to maintain a post-decommissioning safety zone around the footings to assist in preventing fishing vessels inadvertently snagging their nets on the jackets/sub-structure footings.

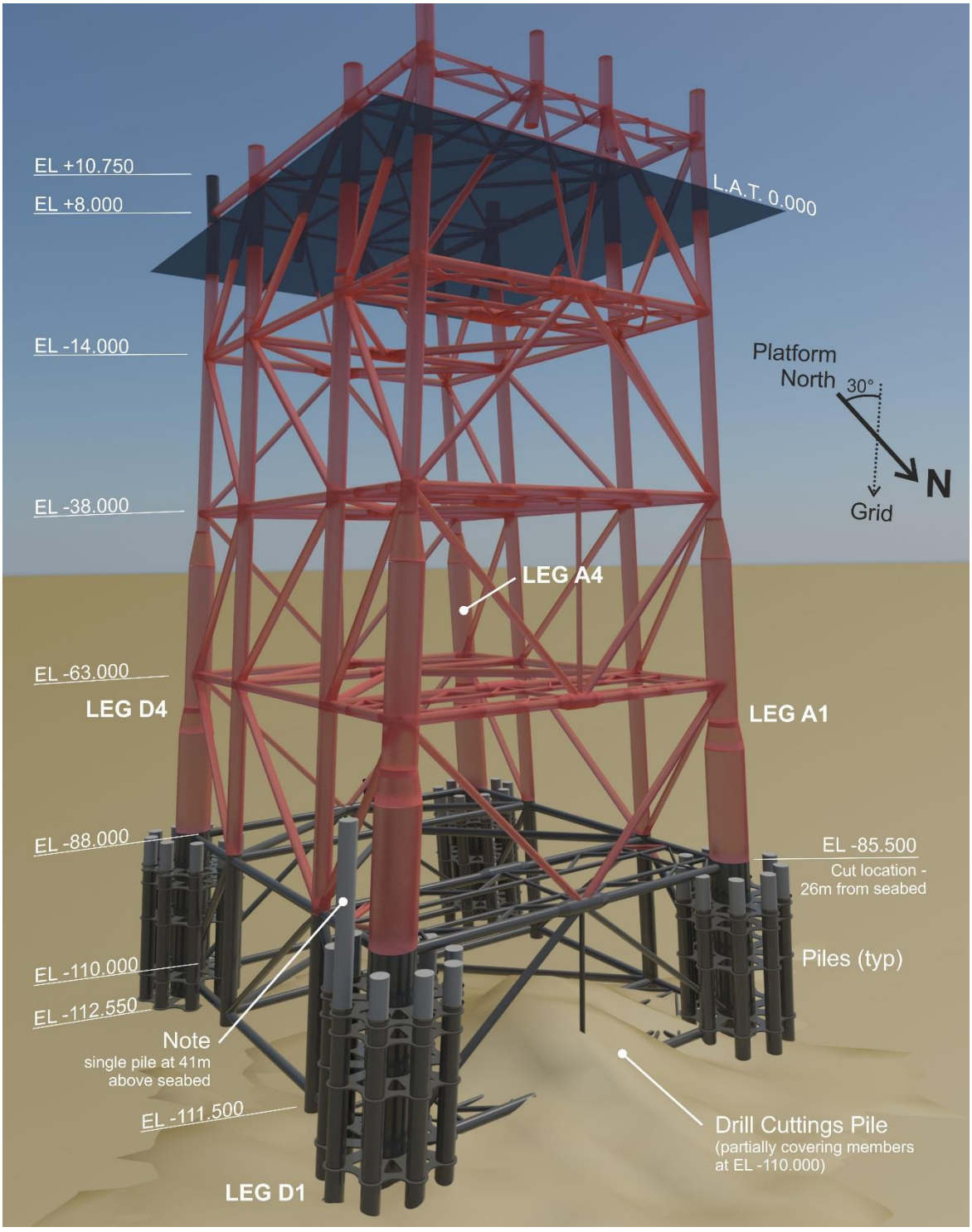
Table 3.4: Outcome of Jackets/Sub-Structures Comparative Assessment

Name of Jacket/Sub-Structure	Recommended Option	Justification
Brae Bravo	The Brae Bravo jackets/sub-structure will be removed to the top of the footings (approximately 34m above the seabed). The exact cut height will be determined following detailed engineering taking into account technical constraints (such as jacket design, cross bracing design and cutting technology), safety and environmental impacts. This option is subject to regulatory approval and derogation under OSPAR Decision 98/3.	Marathon Oil conducted a CA [4] to identify the preferred options for decommissioning the Brae Bravo jacket/sub-structure. This assessment concluded; Partial removal entails less risk to personnel carrying out the decommissioning activities; less environmental impact and less technical complexity than full removal. Leaving part of the jacket/sub-structure in place results in a risk of fishing vessels snagging nets. This risk will be managed by recording the hazard on Admiralty charts and through the use of the FishSAFE system. Marathon Oil proposes to maintain a post-decommissioning safety zone around the footings to assist in preventing fishing vessels inadvertently snagging their nets on the jackets/sub-structure footings.
Brae Bravo Flare	The jacket/sub-structure will be removed to shore for recycling or appropriate disposal.	The Brae Bravo flare jacket/sub-structure is relatively small and there is no drill cuttings pile at its base. Complete removal of this jacket/sub-structure represents the best balance of safety, environmental, technical, social and economic factors.

OSPAR Decision 98/3 prohibits dumping or leaving installations wholly or partly in place, but it recognises the difficulties in removing the footings of large steel jackets/sub-structures weighing more than 10,000 tonnes that were installed prior to 9th February 1999. Both the Brae Alpha and Brae Bravo jackets/sub-structures will be removed to the top of the footings, subject to regulatory approval and derogation under OSPAR Decision 98/3. The recovered sections of the jackets/sub-structures will be returned to shore for recycling. The Brae Alpha and Brae Bravo jackets/sub-structures incorporate tanks that have been used for diesel storage. These storage tanks will be emptied and cleaned before the jackets/sub-structures are removed. Densitometers containing radioactive sources were fitted to the Brae Alpha and Brae Bravo jacket/sub-structure footings to monitor grout flows during installation. The sources were not recovered following installation and will not be recovered during decommissioning, as the safety risk to divers in attempting to retrieve the sources from the jacket footings is considered unreasonable. Marathon Oil will meet all regulatory requirements related to the management of these sources.

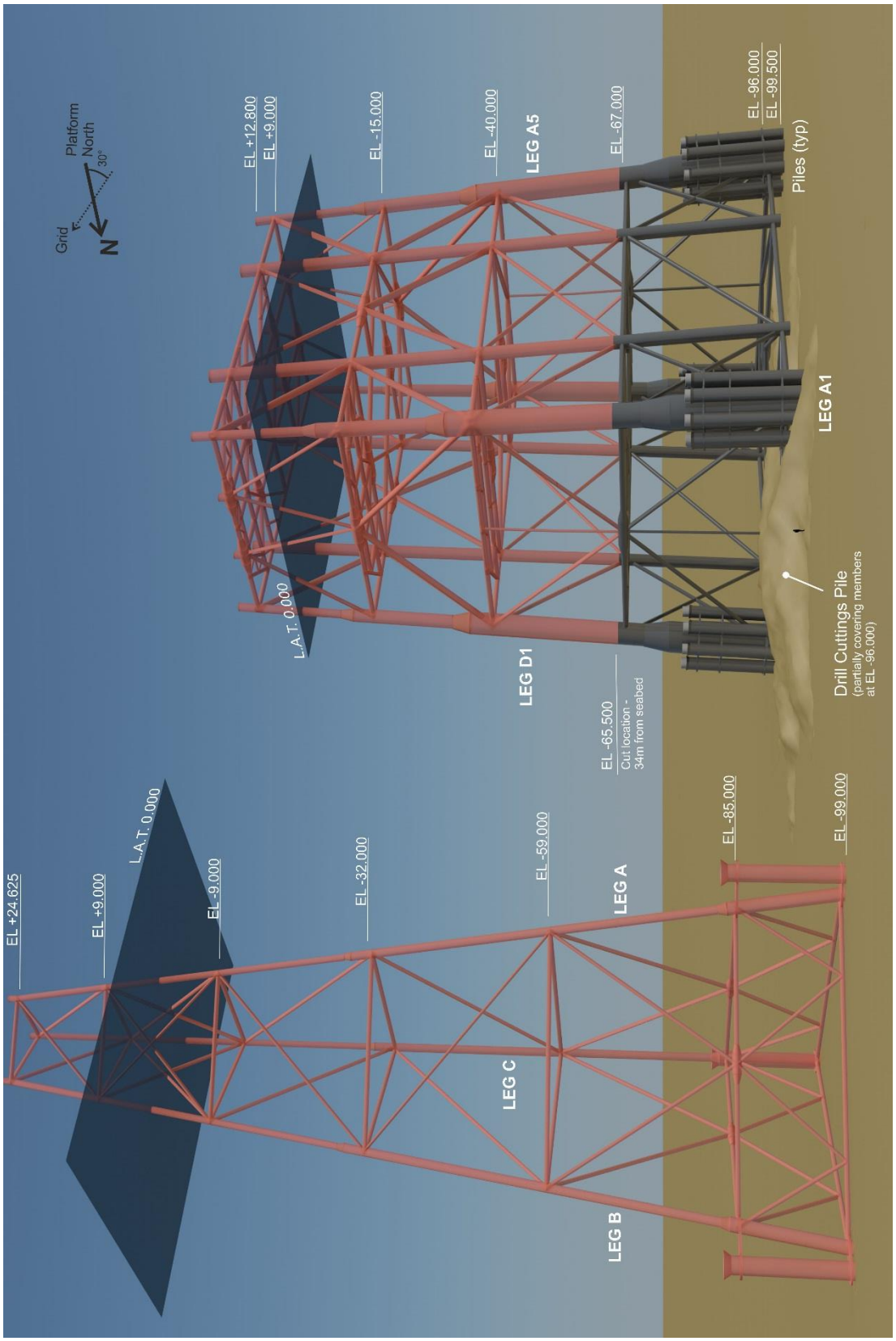
Decommissioning of the jackets/sub-structures and drill cuttings piles were evaluated separately to ensure each was considered on its own merits. There is an inter-relationship with complete jacket/sub-structure removal as the drill cuttings pile would require to be significantly disturbed, displaced or removed to gain access to the base of the footings and lowest sub-structure braces.

Figure 3.3: Brae Alpha Jacket/Sub-Structure



Structure shown in red indicates likely section of jacket/sub-structure to be removed. The exact cut height will be determined following detailed engineering taking into account technical constraints (such as jacket design, cross bracing design and cutting technology), safety and environmental impacts.

Figure 3.4: Brae Bravo Jacket/Sub-Structure



Structure(s) shown in red indicates likely section of jacket/sub-structure to be removed. The exact cut height will be determined following detailed engineering taking into account technical constraints (such as jacket design, cross bracing design and cutting technology), safety and environmental impacts.

3.2.2 Jacket/Sub-Structure Removal Methods

The decommissioning methods considered by Marathon Oil for both the Brae Alpha and Brae Bravo jackets/sub-structures are listed in Table 3.5.

Table 3.5: Jackets/Sub-Structures Decommissioning Methods	
1) HLV (Semi-submersible Heavy Lift Vessel) Cut and Lift	✓
2) Monohull crane vessel[7]	
3) SLV (Single Lift Vessel)	✓
4) Piece Small – included as part of HLV Cut and Lift assessment	
5) Other; BTA (Buoyancy Tank Assembly)	✓

Scope	Method	Description
Brae Alpha and Brae Bravo Jackets/Sub-Structures (Large Steel Jackets)		
Total removal of jacket/sub-structure to clean seabed	SLV	Removal of the jacket/sub-structure using a single lift vessel entails lifting it as a single component. It is not considered possible to retrieve the entire Brae Alpha or Brae Bravo jackets/sub-structures as single components using an SLV.
	BTA	Removal of the jacket/sub-structure using a BTA consists of fastening buoyancy tanks to the jacket/sub-structure, severing it at the sea bed and floating it to an inshore area for dismantling and disposal. It is not considered possible to retrieve the entire Brae Alpha or Brae Bravo jackets/sub-structures using BTA due to concerns over technical feasibility of tank design, installation and use.
	HLV	Total removal of the Brae Alpha and Brae Bravo jackets/sub-structures can be achieved by cutting the jackets/sub-structures into sections (size dictated by vessel lift capacity) and retrieving these sections with an HLV or other suitably sized lift vessel.
Remove jacket/sub-structure to the top of the footings	SLV or HLV	Partial removal of the Brae Alpha and Brae Bravo sub-structures can be achieved by cutting the jackets/sub-structures above the footings and retrieving the severed top part of the jacket/sub-structure as a single component or multiple components by an SLV or HLV.
Brae Bravo Flare Jacket/Sub-Structure (Small Steel)		
Removal to shore	SLV or HLV	The Brae Bravo Flare sub-structure jacket is not considered suitable for reuse because of both its specialised nature and its age. The sub-structure will be recovered by an SLV or HLV as one component in a single lift, or in several pieces. The foundation piles will be cut at an appropriate depth below the seabed. Any depressions in the seabed will be remediated. The sub-structure will be returned to shore for recycling.

[7] *The Comparative Assessment for the HLV Cut and Lift evaluation has assumed a semi-sub type lift vessel as data exists for the installation of the platforms with such a vessel. However, the selection of actual vessel for decommissioning will ultimately be driven by lift capacity, crane reach and market conditions and does not preclude other vessel types.*

Table 3.5: Jackets/Sub-Structures Decommissioning Methods	
Proposed removal method and disposal route	**A final decision on removal method will be made following a commercial tendering process. The tender evaluation will consider safety, environmental, socio-economic and technical metrics as well as cost. Irrespective of the method that is ultimately selected, it is intended that part of the jacket/sub-structure will remain in place, and part of the jacket/sub-structure will be taken ashore. The majority of the jacket/sub-structure taken ashore will ultimately be recycled.** **Tenderers for the jacket/sub-structure removal will be asked to nominate onshore reception facilities, in the United Kingdom, Europe or internationally, that are compatible with the tenderers' proposed removal methods.** **All of the viable removal methods identified above for partial removal of the jackets/sub-structures will be carried forward into the tender process, unless assessment shows that a method does not meet minimum safety expectations. All options will be assessed to ensure risks are kept to a level that is as low as reasonably practicable.** **Marathon Oil and the selected decommissioning contractor(s) will address any trans-frontier shipment of waste to ensure that the associated issues are appropriately managed.**

3.2.3 Jackets/Sub-Structures Removal Comparative Assessment

3.2.3.1 Comparative Assessment Method:

Marathon Oil conducted CAs to determine the decommissioning options for the Brae Alpha and Brae Bravo jackets/sub-structures. The main options considered were full removal and partial removal. Partial removal involves leaving the jacket/sub-structure footings in place. These assessments used the Marathon Oil CA procedure, which is based on the OSPAR 98/3 framework. The CA used quantitative and qualitative data to draw a balanced assessment across the main criteria of safety, technical feasibility, environmental impacts, societal impacts and project cost, as described in the CA reports [3][4].

3.2.3.2 Outcome of Comparative Assessment:

The preferred option identified by the CAs for both Brae Alpha and Brae Bravo is to remove the jackets/sub-structures to the top of the footings (approximately 28m above the seabed for Brae Alpha and 34m above the seabed for Brae Bravo). The exact cut height will be determined following detailed engineering taking into account technical constraints (such as jacket design, cross bracing design and cutting technology), safety and environmental impacts. Recovered sections will be transported to shore for recycling or disposal. This option is subject to consultation with stakeholders and approval from the regulatory authorities and derogation under OSPAR Decision 98/3. The jacket/sub-structure footings that are left in place will be entered into the FishSAFE system. Marathon Oil proposes to put in place a post-decommissioning safety zone around the Brae Alpha footings, and a second safety zone around the Brae Bravo footings. The safety zones would be marked on Admiralty charts to provide a warning of

snagging hazards to other users of the sea, including vessels that may not have access to the FishSAFE system, for example foreign fishing vessels.

3.3 Subsea Installations and Stabilisation Features

The subsea installations and stabilisation features that are in the scope of the Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick combined decommissioning programmes are listed in Table 3.6. Marathon Oil conducted a comparative assessment of the decommissioning options for the subsea facilities and stabilisation features. The preferred decommissioning options and disposal routes identified by the CA are also listed in Table 3.6.

Table 3.6: Subsea Installations and Stabilisation Features

Subsea installations and stabilisation features	Number	Option	Disposal Route (if applicable)
Wellheads[8]	12	Remove	Return to shore for reuse, recycling or disposal.
Manifolds	2	Remove	The West Brae and West Brae extension manifolds will be removed and returned to shore for recycling or disposal.
Templates	1	Remove	The Central Brae template will be removed and returned to shore for recycling or disposal. Detailed engineering will define extent of removal and seabed remediation requirements. This includes the 6 integrated wellheads.
Protection Frames	0		
Mattresses	28	Reuse, Recycle or Remove	Mattresses associated with West Brae and Sedgwick installations will be reused to profile and stabilise features, such as cut ends of pipelines in the proposed Brae Alpha and Brae Bravo post-decommissioning safety zones, or recycled to remediate the seabed at Central Brae. Mattresses that cannot be reused or recycled offshore will be removed to shore for reuse, recycling or appropriate disposal.
Grout bags	0		No grout bags present.
Formwork	0		No formwork present.
Frond mats	0		No frond mats installed.
Rock placement	0		No Rock Placement present.
Other	0		

[8] *Seven West Brae wellheads and the Sedgwick production wellhead, including integrated protection frames, one suspended well at West Brae, one suspended well at Sedgwick, and two Central Brae wellheads that are within the Central Brae template but not part of the template.*

3.4 Pipelines

The decommissioning options considered for the Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick pipelines, umbilicals and PMS cables are listed in Table 3.7. The CA for pipelines considered complete removal as the base case. However, the CA concluded that options 1 and 2, removal by reverse reeling and removal by reverse S-lay, were not feasible. The CA identified 'Piece Small' (also known as 'Cut and Lift') as the complete removal option. This option consists of cutting the line into small sections in place and removal of the resulting pieces by a construction vessel working with divers, ROVs or both. In Table 3.7 this option is recorded under '*10) Other*'.

Table 3.7: Pipeline Decommissioning Options

Key to Decommissioning Options Considered:

1) Remove Reverse Reeling	2) Remove – Reverse S-lay	3) Trench and Bury
4) Rock Placement	5) Partial Removal	6) Leave in Place
7) Remedial Trenching	8) Remedial Removal	9) Remedial Rock Placement
10) Other		

Pipeline or Pipeline Group	Condition of Line or Group	Whole or Part of Pipeline Group	Decommissioning Options Considered
PL64 Export line to Forties Charlie	Surface-laid	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL64 TV1 structure	-	Part	4, 6, 10 - removal
PL64 TV2 structure	-	Part	4, 6, 10 - removal
PL64 TV3 structure	-	Part	4, 6, 10 - removal
PL360 Brae Alpha to Brae Bravo gas transfer pipeline	Surface-laid, rock covered at crossings	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL360 Brae Bravo Gas SSIV structure	-	Part	4, 6, 10 - removal
PL360 Gas Tiffany tie-in TEE structure	-	Part	4, 6, 10 - removal
PL360/PL361 Brae Alpha Gas/Condensate SSIV structure	-	Part	4, 6, 10 - removal
PL361 Brae Bravo to Brae Alpha Condensate transfer pipeline	Surface-laid, rock covered at crossings	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL361 Lateral tie-in structure	Surface-laid	Part	4, 6, 10 - removal
PL361/PL894 Brae Bravo Subsea Wye/SSIV structure	-	Part	4, 6, 10 Piece Small removal

Table 3.7: Pipeline Decommissioning Options

Key to Decommissioning Options Considered:

1) Remove Reverse Reeling	2) Remove – Reverse S-lay	3) Trench and Bury
4) Rock Placement	5) Partial Removal	6) Leave in Place
7) Remedial Trenching	8) Remedial Removal	9) Remedial Rock Placement
10) Other		

Pipeline or Pipeline Group	Condition of Line or Group	Whole or Part of Pipeline Group	Decommissioning Options Considered
PL634 Brae Alpha to Central Brae water injection line	Part trenched and buried, part surface-laid, part surface-laid with rock cover	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL635 Brae Alpha to Central Brae service line	Part trenched and buried, part surface-laid, part surface-laid with protective structures, part surface-laid rock covered	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL636 (1 of 2) Central Brae to Brae Alpha production flowline	Part trenched and buried with rock cover, part surface-laid with rock cover, part surface-laid with protective structures, part surface-laid	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL636 (2 of 2) Central Brae to Brae Alpha production flowline	Part trenched and buried with rock cover, part surface-laid with rock cover, part surface-laid with protective structures, part surface-laid	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL637 Brae Alpha to Central Brae chemical umbilical	Part trenched and buried, part surface-laid mattress protected, part surface-laid rock covered	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL894 East Brae Condensate Export (From East Brae to Brae Bravo WYE Assembly)	Surface-laid	Part – section between East Brae platform and SSIV/Crossover structure is covered in East Brae Decommissioning Programme [6].	3, 4, 5, 6, 10 - Piece Small removal
PL894 Lateral tie-in structure	Surface-laid	Part	4, 6, 10 - removal

Table 3.7: Pipeline Decommissioning Options

Key to Decommissioning Options Considered:

1) Remove Reverse Reeling	2) Remove – Reverse S-lay	3) Trench and Bury
4) Rock Placement	5) Partial Removal	6) Leave in Place
7) Remedial Trenching	8) Remedial Removal	9) Remedial Rock Placement
10) Other		

Pipeline or Pipeline Group	Condition of Line or Group	Whole or Part of Pipeline Group	Decommissioning Options Considered
PL895 East Brae Gas Transfer (From Brae Bravo to East Brae SSIV/Crossover structure)	Surface-laid	Part – section between East Brae platform and SSIV/Crossover structure is covered in East Brae Decommissioning Programme [6].	3, 4, 5, 6, 10 - Piece Small removal
Brae Bravo Gas PL895 SSIV structure	-	Part	4, 6, 10 - removal
PL895/PL896 East Brae SSIV/Crossover structure	-	Part	4, 6, 10 Piece Small removal
PL896 Gas Export from East Brae SSIV/Crossover structure to pipeline PL762 (SAGE)	Surface-laid	Part – this decommissioning programme covers the line between the East Brae SSIV/Crossover structure and the SAGE pipeline Subsea Wye. The portion between the East Brae platform and the SSIV/ Crossover structure is covered by the East Brae Decommissioning Programme [6].	3, 4, 5, 6, 10 - Piece Small removal
PL1441.1 West Brae to Brae Alpha production flowline	Part trenched and buried, part surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1441.2 West Brae production jumper from W8z	Surface-laid, mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1441.3 West Brae production jumper from W12y	Surface-laid, mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1441.4 West Brae production jumper from W3	Surface-laid, mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1441.5 West Brae production jumper from W7z/W10y	Surface-laid, mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1441.6 West Brae production jumper from W9x	Surface-laid, mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal

Table 3.7: Pipeline Decommissioning Options

Key to Decommissioning Options Considered:

1) Remove Reverse Reeling	2) Remove – Reverse S-lay	3) Trench and Bury
4) Rock Placement	5) Partial Removal	6) Leave in Place
7) Remedial Trenching	8) Remedial Removal	9) Remedial Rock Placement
10) Other		

Pipeline or Pipeline Group	Condition of Line or Group	Whole or Part of Pipeline Group	Decommissioning Options Considered
PL1442.1 Brae Alpha to West Brae Gas Lift flowline	Part trenched and buried, part surface-laid mattress protected, part surface-laid rock covered	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1442.1 TEE structure	Surface-laid mattress protected	Part	4, 6, 10 Piece Small removal
PL1442.2 West Brae Gas Lift jumper to W7z/W10y	Surface-laid, mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1442.4 West Brae Gas Lift jumper to W9x	Surface-laid, mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1442.5 West Brae Gas Lift jumper to W10y	Surface-laid, mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1442.6 West Brae Gas Lift jumper to W3	Surface-laid, mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1442.7 West Brae Gas Lift jumper to W12y	Surface-laid, mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1442.8 West Brae Gas Lift jumper to W8z	Surface-laid, mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1443.1 Central Brae to West Brae water injection flowline	Part trenched and buried, part surface-laid mattress protected, part surface-laid rock covered	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1443.3 Water injection jumper at West Brae to W10y	Surface-laid, mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1444.1 Central Brae to West Brae service line	Part trenched and buried, part surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1445 Brae Alpha to base of West Brae Production Riser gas lift	Mounted on Brae Alpha platform sub-structure	Whole	5, 6

Table 3.7: Pipeline Decommissioning Options

Key to Decommissioning Options Considered:

1) Remove Reverse Reeling	2) Remove – Reverse S-lay	3) Trench and Bury
4) Rock Placement	5) Partial Removal	6) Leave in Place
7) Remedial Trenching	8) Remedial Removal	9) Remedial Rock Placement
10) Other		

Pipeline or Pipeline Group	Condition of Line or Group	Whole or Part of Pipeline Group	Decommissioning Options Considered
PLU1446 Chemical Umbilical from Brae Alpha to West Brae	Part trenched and buried, part surface-laid mattress protected, part surface-laid rock covered	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU1446.12 & PLU1446.15 West Brae Manifold to W8z chemical jumper	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU1446.13 & PLU1446.16 West Brae Manifold to W12y chemical jumper	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU1446.14 & PLU1446.17 West Brae Manifold to W3 chemical jumper	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU1446JV1 West Brae to Sedgwick chemical/control umbilical	Part trenched and buried, part surface-laid mattress protected, part surface-laid rock covered	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1447 Sedgwick to West Brae production flowline	Part trenched and buried, part surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL1448 West Brae to Sedgwick gas lift flowline	Part trenched and buried, part surface-laid mattress protected, part surface-laid rock covered	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU3798 West Brae chemical jumper to W9x	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU3799 West Brae chemical jumper to W7z	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU3800 West Brae chemical jumper to W9x	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU3801 West Brae chemical jumper to W10y	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU3802 West Brae chemical jumper to W10y	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal

Table 3.7: Pipeline Decommissioning Options

Key to Decommissioning Options Considered:

1) Remove Reverse Reeling	2) Remove – Reverse S-lay	3) Trench and Bury
4) Rock Placement	5) Partial Removal	6) Leave in Place
7) Remedial Trenching	8) Remedial Removal	9) Remedial Rock Placement
10) Other		

Pipeline or Pipeline Group	Condition of Line or Group	Whole or Part of Pipeline Group	Decommissioning Options Considered
PL3806 West Brae Manifold to W11 production jumper	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PL3809 West Brae manifold to W11 gas lift jumper	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU3811 West Brae manifold to W7z chemical jumper	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU3813 West Brae manifold to W11 chemical jumper	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU4031 Brae Alpha to West Brae and Sedgwick electrical umbilical	Part surface-laid/mattress protected, part trenched and buried	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU4131 & PLU4132 West Brae manifold to W7 electrical jumpers	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU4133 & PLU4134 West Brae manifold to W8 electrical jumpers	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU4135 & PLU4136 West Brae manifold to W9 electrical jumpers	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU4137 & PLU4138 West Brae manifold to W12y electrical jumpers	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU4188 Brae Bravo PL895 SSIV control umbilical	Part surface-laid, part surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU4189 Brae Bravo Subsea Wye/SSIV control umbilical	Part surface-laid, part surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU4190 Brae Bravo PL360 Gas SSIV Control Umbilical	Part surface-laid, part surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal

Table 3.7: Pipeline Decommissioning Options

Key to Decommissioning Options Considered:

1) Remove Reverse Reeling	2) Remove – Reverse S-lay	3) Trench and Bury
4) Rock Placement	5) Partial Removal	6) Leave in Place
7) Remedial Trenching	8) Remedial Removal	9) Remedial Rock Placement
10) Other		

Pipeline or Pipeline Group	Condition of Line or Group	Whole or Part of Pipeline Group	Decommissioning Options Considered
PLU4203 Brae Alpha PL360/PL361 Gas/Condensate SSIV control umbilical	Surface-laid mattress protected	Whole	3, 4, 5, 6, 10 - Piece Small removal
PLU4217 Brae Alpha to Central Brae control umbilical	Part trenched and buried, part surface-laid mattress protected, part surface-laid rock covered	Whole	3, 4, 5, 6, 10 - Piece Small removal
PMS Cable Brae Alpha to Brae Bravo	Part surface-laid/ mattress protected, part trenched and buried	Whole	3, 4, 5, 6, 10 - Piece Small removal
PMS Cable Brae Alpha to East Brae	Part surface-laid/ mattress protected, part trenched and buried	Part – covers PMS cable from Brae Bravo platform to East Brae safety zone only. Remainder of cable is covered by East Brae Decommissioning Programme [6].	3, 4, 5, 6, 10 - Piece Small removal
PMS Cable Brae Bravo to East Brae	Part surface-laid/ mattress protected, part trenched and buried	Part – covers PMS cable from Brae Bravo platform to East Brae safety zone only. Remainder of cable is covered by East Brae Decommissioning Programme [6].	3, 4, 5, 6, 10 - Piece Small removal

3.4.1 Comparative Assessment Method

Marathon Oil adopted a CA method that grouped lines into segments, i.e. parts of lines with similar attributes [5]. For example, surface-laid lines were grouped together, as were trenched lines. This results in a tool kit, or set of templates, that define how Marathon Oil will manage the subsea assets in the Brae Area. The methodology aligns with BEIS [1] and Oil and Gas UK guidance for comparative assessment. Where subsea facilities are not covered by the tool kit, Marathon Oil conducted specific comparative assessments. The Central Brae facilities are an example of this due to the technical challenges and safety concerns associated with decommissioning this facility.

3.4.2 Outcome of Comparative Assessment

The outcome of the comparative assessment process is summarised in Table 3.8.

Table 3.8: Outcomes of Comparative Assessment

Pipeline or Pipeline Group	Recommended Option	Justification
PL64 Export line to Forties Charlie	Remediate in place. Clear gates (number and size to be confirmed in consultation with fishing industry) to facilitate safe transit of fishing gear.	This option minimises the use of resources and generation of emissions, while providing access for fishing. Stakeholder engagement indicates trenching (and burying) preferred for the creation of any gates to avoid 'cut-ends' where sections of pipeline may be removed. Review of fishing locations and routes would be used to support design, size and location of any gates.
PL64 TV1 structure	Remove to shore for reuse, recycling or disposal. Stabilise disconnected pipeline ends by burial, trenching or rock cover.	Removing this structure leaves the seabed unobstructed and reduces the snagging risk to fishermen.
PL64 TV2 structure	Remove to shore for reuse, recycling or disposal. Stabilise disconnected pipeline ends by burial, trenching or rock cover.	Removing this structure leaves the seabed unobstructed and reduces the snagging risk to fishermen.
PL64 TV3 structure	Remove to shore for reuse, recycling or disposal. Stabilise disconnected pipeline ends by burial, trenching or rock cover.	Removing this structure leaves the seabed unobstructed and reduces the snagging risk to fishermen.
PL360 Brae Alpha to Brae Bravo gas transfer pipeline	Partial trench and bury in place to a target depth of 0.6m. Partial leave in place. The line from the SSIV at Brae Alpha to the SSIV at Brae Bravo will be trenched and buried in place. The portions of the line at Brae Alpha and Brae Bravo between the SSIV structures and the platform footings will be left in place.	Trenching and burying the line reduces the risk of snagging fishing nets. Risk assessment has concluded that the surface laid pipelines that are no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving a portion of the line in place also minimises disturbance of the seabed and drill cuttings pile.
PL360 Brae Bravo Gas SSIV structure	Remove to shore, for reuse, recycling or disposal.	Removing this structure leaves the seabed unobstructed and reduces the snagging risk to fishermen [5].

Table 3.8: Outcomes of Comparative Assessment

Pipeline or Pipeline Group	Recommended Option	Justification
PL360 Tiffany tie-in TEE structure	Remove to shore, for reuse, recycling or disposal.	Removing this structure leaves the seabed unobstructed and reduces the snagging risk to fishermen.
PL360/PL361 Brae Alpha Gas/Condensate SSIV structure	Remove to shore, for reuse, recycling or disposal.	Removing this structure leaves the seabed unobstructed and reduces the snagging risk to fishermen [5].
PL361 Brae Bravo to Brae Alpha Condensate transfer pipeline	Partial trench and bury in place to a target depth of 0.6m. Partial leave in place. The bulk of the line from the SSIV at Brae Bravo to the SSIV at Brae Alpha will be trenched and buried in place. The portions of the line at Brae Alpha and Brae Bravo between the SSIV structures and the platform footings will be left in place.	Trenching and burying the line reduces the risk of snagging fishing nets. Risk assessment has concluded that the surface laid pipelines that are no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving a portion of the line in place also minimises disturbance of the seabed and drill cuttings pile.
PL361 Lateral tie-in structure	Remove to shore for reuse recycling or disposal. Stabilise disconnected pipeline ends by burial, trenching or rock cover.	Removing this structure leaves the seabed unobstructed and reduces the snagging risk to fishermen.
PL361/PL894 Brae Bravo Subsea Wye/ SSIV structure	Remove to shore, for reuse, recycling or disposal.	Removing this structure leaves the seabed unobstructed and reduces the snagging risk to fishermen [5].

Table 3.8: Outcomes of Comparative Assessment

Pipeline or Pipeline Group	Recommended Option	Justification
PL634 Brae Alpha to Central Brae water injection line	Partial removal, partial leave in place. Remove the surface-laid line at Brae Alpha greater than 250m from the footings to the trench transition. Return the removed portion to shore for recycling or disposal. Remove the surface-laid line at the Central Brae template and return the removed material to shore for recycling or disposal. A short section of surface laid line terminating within the sub-structure footings will be left in place. Leave the remaining trenched portion of the line in place.	Removing the surface-laid line greater than 250m from the footings to the trench transition minimises the risks to fishermen. Similarly removing the surface-laid line at Central Brae reduces the snagging risk for fishermen. Risk assessment has concluded that the surface laid pipelines that are no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving a portion of the line in place also minimises disturbance of the seabed and drill cuttings pile.
PL635 Brae Alpha to Central Brae service line	Partial removal, partial leave in place. Remove the surface-laid line at Brae Alpha greater than 250m from the footings and the trench transition. Return removed portion to shore for recycling or disposal. Remove the surface-laid line at the Central Brae template and return the removed material to shore for recycling or disposal. Leave the remaining trenched portion of the line in place.	Removing the surface-laid line greater than 250m and the trench transition minimises the risks to fishermen. Similarly removing the surface-laid line at Central Brae reduces the snagging risk for fishermen. Risk assessment has concluded that the surface laid lines that are no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving a portion of the line in place also minimises disturbance of the seabed and drill cuttings pile.

Table 3.8: Outcomes of Comparative Assessment

Pipeline or Pipeline Group	Recommended Option	Justification
PL636 (1 of 2) and PL636 (2 of 2) Central Brae to Brae Alpha production flowlines	Partial removal, partial leave in place. Remove tie-in spools at Brae Alpha between a point no more than 250m from the platform and the trench transition. Return removed portions to shore for recycling or disposal. Remove the surface-laid flowlines at the Central Brae template and return the removed material to shore for recycling or disposal. Leave the remaining trenched portions of the flowlines in place.	Removing the surface-laid line at Central Brae reduces the snagging risk for fishermen. Risk assessment has concluded that the surface laid pipelines that are no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving a portion of the line in place also minimises disturbance of the seabed and drill cuttings pile.
PL637 Brae Alpha to Central Brae chemical umbilical	Partial removal, partial leave in place. Remove the surface-laid umbilical at the Central Brae template and return the removed material to shore for recycling or disposal. Leave the remaining trenched portion of the umbilical and the portion no more than 250m from Brae Alpha jacket/sub-structure footings in place.	Removing the surface-laid umbilical at Central Brae, and the mattresses that protect this portion of the umbilical reduces risks for fishermen. Risk assessment has concluded that the surface laid umbilical that is no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving portions of the umbilical in place also minimises disturbance of the seabed and drill cuttings pile.
PL894 East Brae Condensate Export (From East Brae SSIV /Crossover structure to Brae Bravo Wye Assembly)	Partial trench and bury in place to a target depth of 0.6m. Partial leave in place. Trench and bury the line in place from a point no more than 250m from the footings at Brae Bravo to the East Brae SSIV/Crossover structure.	Trenching and burying the line reduces the risk of snagging fishing nets.
PL894 Lateral tie-in structure	Remove to shore for reuse recycling or disposal. Stabilise disconnected pipeline ends by burial, trenching or rock cover.	Removing this structure leaves the seabed unobstructed and reduces the snagging risk to fishermen.

Table 3.8: Outcomes of Comparative Assessment

Pipeline or Pipeline Group	Recommended Option	Justification
PL895 East Brae Gas Transfer (From Brae Bravo to East Brae SSIV/Crossover structure)	Partial trench and bury in place to a target depth of 0.6m. Partial leave in place. The line from the SSIV at Brae Bravo to the East Brae SSIV/Crossover will be trenched and buried in place. The portions of the line at Brae Bravo between the SSIV structure and the platform footings will be left in place.	Trenching and burying the line reduces the risk of snagging fishing nets. Risk assessment has concluded that the surface laid pipelines that are no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving portions of the pipeline in place also minimises disturbance of the seabed and drill cuttings pile.
Brae Bravo PL895 SSIV structure	Remove to shore, for reuse, recycling or disposal.	Removing this structure leaves the seabed unobstructed and reduces the snagging risk to fishermen [5].
PL895/PL896 East Brae SSIV/Crossover structure	Remove to shore for reuse, recycling or disposal.	Removal of this structure leaves the seabed unobstructed and reduces the snagging risk for fishermen [5].
PL896 Gas Export from East Brae SSIV/ Crossover structure to pipeline PL762 (SAGE)	Remediate in place. Clear gates (number and size to be confirmed in consultation with fishing industry) to facilitate safe transit of fishing gear.	This option minimises the use of resources and generation of emissions, while providing access for fishing. Stakeholder engagement indicates trenching (and burying) preferred for the creation of any gates to avoid 'cut-ends' where sections of pipeline may be removed. Review of fishing locations and routes would be used to support design, size and location of any gates.

Table 3.8: Outcomes of Comparative Assessment

Pipeline or Pipeline Group	Recommended Option	Justification
PL1441.1 West Brae to Brae Alpha production flowline	Partial removal, partial leave in place. Remove the mattress protected surface-laid flowline at the West Brae manifold, and return the removed material to shore for recycling or disposal. Leave the remaining trenched portion of the flowline and the portion no more than 250m from the Brae Alpha jacket/sub-structure footings in place.	Removing the surface-laid flowline at West Brae, and the mattresses that protect this portion of the flowline reduces the snagging risk for fishermen. Risk assessment has concluded that the surface laid pipelines that are no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving portions of the flowline in place also minimises disturbance of the seabed and drill cuttings pile.
PL1441.2, PL1441.3, PL1441.4, PL1441.5, PL1441.6, production jumpers from West Brae Wells	Remove to shore.	Removing the jumpers leaves the seabed clear for other sea users.
PL1442.1 Brae Alpha to West Brae Gas Lift flowline	Partial removal, partial leave in place. Remove the mattress protected surface-laid line at the West Brae manifold and return the removed material to shore for recycling or disposal. Leave the remaining trenched portion of the line and the surface-laid line no more than 250m from the Brae Alpha jacket/sub-structure footings in place.	Removing the surface-laid flowline at West Brae, and the mattresses that protect this portion of the flowline reduces the snagging risk for fishermen. Risk assessment has concluded that the surface laid pipelines that are no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving portions of the flowline in place also minimises disturbance of the seabed and drill cuttings pile.
PL1442.1 'Tee' structure	Remove the structure to shore for reuse, recycling or disposal.	Removing the structure reduces the snagging hazard for fishermen.
PL1442.2, PL1442.4 – PL1442.8 West Brae Gas Lift jumpers	Remove jumpers.	Removing the jumpers leaves the seabed clear for other sea users.

Table 3.8: Outcomes of Comparative Assessment

Pipeline or Pipeline Group	Recommended Option	Justification
PL1443.1 Central Brae to West Brae water injection flowline	Partial removal, partial leave in place. Remove the mattress protected surface-laid lines at the West Brae manifold and the mattress protected surface-laid lines at the Central Brae template and return the removed material to shore for recycling or disposal. Leave the remaining trenched portions of the lines in place.	Removing the surface-laid lines at Central Brae and West Brae, and the mattresses that protect these portions of the lines reduces the snagging hazard for fishermen.
PL1443.3 Water injection jumper at West Brae	Remove jumper.	Removing the jumper leaves the seabed clear for other sea users.
PL1444.1 Central Brae to West Brae service line	Partial removal, partial leave in place. Remove the mattress protected surface-laid lines at the West Brae manifold and the mattress protected surface-laid lines at the Central Brae template and return the removed material to shore for recycling or disposal. Leave the remaining trenched portions of the lines in place.	Removing the surface-laid lines at Central Brae and West Brae, and the mattresses that protect these portions of the lines reduces the snagging hazard for fishermen.
PL1445 Brae Alpha to base of West Brae Production Riser gas lift line	Leave in place.	PL1445 terminates at the base of the sub-structure footings. Risk assessment has concluded that the surface laid pipelines that are no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place.

Table 3.8: Outcomes of Comparative Assessment

Pipeline or Pipeline Group	Recommended Option	Justification
PLU1446 Control/ Chemical Umbilical from Brae Alpha to West Brae	Partial removal, partial leave in place. Remove the mattress protected surface-laid umbilical at the West Brae manifold and return the removed material to shore for recycling or disposal. Leave the remaining trenched portion of the umbilical, the rock covered portion of the umbilical and the length of surface-laid umbilical that is no more than 250m from the Brae Alpha jacket/sub-structure footings in place.	Removing the surface-laid umbilical at West Brae, and the mattresses that protect this portion of the umbilical reduces risks for fishermen. Risk assessment has concluded that the surface laid umbilical that is no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving portions of the umbilical in place also minimises disturbance of the seabed and drill cuttings pile.
PLU1446.12 & PLU1446.15, PLU1446.13 & PLU1446.16, PLU1446.14 & PLU1446.17 West Brae chemical jumpers	Remove jumpers.	Removing the jumpers leaves the seabed clear for other sea users.
PLU1446JV1 West Brae to Sedgwick chemical/control umbilical PL1447 Sedgwick to West Brae production flowline PL1448 West Brae to Sedgwick gas lift flowline	Partial removal, partial leave in place. Remove the mattress protected surface-laid lines at the Sedgwick wellhead and return the removed material to shore for recycling or disposal. Remove the mattress protected surface-laid lines at the West Brae manifold and return the removed material to shore for recycling or disposal. Leave the remaining trenched and rock covered portions of the lines in place.	Removing the surface-laid lines at West Brae and Sedgwick reduces the snagging hazard for fishermen.
PLU3798 - PLU3802, PLU3811 & PLU3813 West Brae chemical jumpers	Remove jumpers.	Removing the jumpers leaves the seabed clear at these locations.

Table 3.8: Outcomes of Comparative Assessment

Pipeline or Pipeline Group	Recommended Option	Justification
PL3806 West Brae production jumper	Remove jumper.	Removing the jumper leaves the seabed clear at this location.
PL3809 West Brae gas lift jumper	Remove jumper.	Removing the jumper leaves the seabed clear at this location.
PLU4031 Brae Alpha to West Brae and Sedgwick electrical umbilical	Partial removal, partial leave in place. Remove the mattress protected surface-laid umbilical at the West Brae manifold and Sedgwick and return the removed material to shore for recycling or disposal. Leave the remaining trenched portion of the umbilical and the length of surface-laid umbilical no more than 250m from the Brae Alpha jacket/sub-structure footings in place.	Removing the surface-laid umbilical at West Brae and Sedgwick, and the mattresses that protect this portion of the umbilical reduces risks for fishermen. Risk assessment has concluded that the surface laid umbilical that is no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving portions of the umbilical in place also minimises disturbance of the seabed and drill cuttings pile.
PLU4131-PLU4138 West Brae electrical jumpers	Remove jumpers.	Removing the jumpers leaves the seabed clear at these locations.
PLU4188 Brae Bravo PL895 SSIV control umbilical	Leave in place.	Risk assessment has concluded that the surface laid umbilical that is no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving the umbilical in place also minimises disturbance of the seabed and drill cuttings pile.

Table 3.8: Outcomes of Comparative Assessment

Pipeline or Pipeline Group	Recommended Option	Justification
PLU4189 Brae Bravo Subsea Wye/ SSIV control umbilical	Leave in place.	Risk assessment has concluded that the surface laid umbilical that is no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving the umbilical in place also minimises disturbance of the seabed and drill cuttings pile.
PLU4190 Brae Bravo PL360 Gas SSIV control umbilical	Leave in place.	Risk assessment has concluded that the surface laid umbilical that is no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving the umbilical in place also minimises disturbance of the seabed and drill cuttings pile.
PLU4203 Brae Alpha PL360/PL361 Gas/Condensate SSIV control umbilical	Leave in place.	Risk assessment has concluded that the surface laid umbilical that is no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving the umbilical in place also minimises disturbance of the seabed and drill cuttings pile.

Table 3.8: Outcomes of Comparative Assessment

Pipeline or Pipeline Group	Recommended Option	Justification
PLU4217 Brae Alpha to Central Brae control umbilical	Partial removal, partial leave in place. Remove the surface-laid umbilical at the Central Brae template and return the removed material to shore for recycling or disposal. Leave the remaining trenched portion of the umbilical and the portion no more than 250m from the Brae Alpha jacket/sub-structure footings in place.	Removing the surface-laid umbilical at Central Brae, and the mattresses that protect this portion of the umbilical reduces risks for fishermen. Risk assessment has concluded that the surface laid umbilical that is no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving portions of the umbilical in place also minimises disturbance of the seabed and drill cuttings pile.
PMS Cable Brae Alpha to Brae Bravo PMS Cable Brae Alpha to East Brae PMS Cable Brae Bravo to East Brae	Leave in place. The lines are trenched for the majority of their length. Leave the mattress protected surface-laid portions of the lines that are no more than 250m from the Brae Alpha and Brae Bravo jacket/sub-structure footings in place.	The trenched portions of the cables do not pose a snagging risk to fishermen. Leaving these portions of the cables in place minimises disturbance of the seabed. Risk assessment has concluded that the mattress protected, surface-laid sections of the cables that are no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Leaving the cables in place also minimises disturbance of the seabed and drill cuttings pile.

3.5 Pipeline Stabilisation Features

The pipeline stabilisation features and the proposed decommissioning options and disposal routes are listed in Table 3.9.

Table 3.9: Pipeline Stabilisation Features

Stabilisation Features	Number	Option	Disposal Route
Concrete Mattresses	956	Mattresses no more than 250m from the footings will be left in place. Risk assessment has concluded that mattresses that are no more 250m from the footings should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Mattresses from other locations within the Brae Area may be reused offshore to stabilise the cut ends of lines at Brae Alpha and Brae Bravo or recycled for seabed remediation at Central Brae and West Brae. Mattresses that cannot be reused or recycled in this way will be returned to shore for recycling or disposal.	Left in place, reused or recycled offshore, or returned to shore for recycling or disposal to landfill.

Table 3.9: Pipeline Stabilisation Features

Stabilisation Features	Number	Option	Disposal Route
Grout Bags	600	Grout bags no more than 250m from the footings will be left in place. Risk assessment has concluded that grout bags, that are no more than 250m from the footings, should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. Grout bags from other locations within the Brae Area may, if possible, be reused offshore to stabilise the cut ends of lines at Brae Alpha and Brae Bravo or recycled for seabed remediation at Central Brae and West Brae. Grout bags that cannot be reused or recycled in this way will be returned to shore for recycling or disposal.	Left in place, reused or recycled offshore, or returned to shore for recycling or disposal to landfill.
Formwork	48	Formwork no more than 250m from the footings will be left in place. Risk assessment has concluded that formwork that is no more than 250m from the footings should be left in place. This is because the risk incurred by decommissioning personnel in removing this equipment has been assessed as greater than the long-term snagging risk to fishermen [5]. Additionally, the presence of a post-decommissioning safety zone around the platform footings would further mitigate the snagging risk from any adjacent subsea infrastructure left in place. All other formwork will be removed.	Left in place, reused or recycled offshore, or returned to shore for recycling or disposal to landfill.
Frond Mats	0		
Rock Cover	12km	Leave in Place.	

3.6 Wells

Table 3.10: Well Plug and Abandonment
The wells listed in Table 2.5 in Section 2.4 will be plugged and abandoned in accordance with Oil and Gas UK Guidelines [2] for the suspension and abandonment of wells. Cement plugs will be installed deep in each well to ensure that the reservoir is completely sealed off and that the borehole is isolated from the surface. In the case of subsea wells, the wellbore components and conductors will be removed to below the seabed. In the case of platforms wells, the well components will be removed to a level below the top of the jacket/sub-structure footings. Relevant permit applications, for example Well Intervention Applications on the BEIS Portal, will be submitted in support of well plug and abandonment work.

3.7 Drill Cuttings

The drill cuttings piles decommissioning options for Brae Alpha and Brae Bravo are listed in Table 3.11. See also Section 2.5.

Table 3.11: Drill Cuttings Piles Decommissioning Options		
How many drill cuttings piles are present?	Two. There is one drill cuttings pile at the Brae Alpha platform and one at the Brae Bravo platform.	
Options examined:		
Remove and Re-inject	Leave in place ✓	Cover
Relocate on seabed ✓	Remove and treat onshore ✓	Remove and treat offshore ✓
Other		
Review of Pile Characteristics	**Brae Alpha Pile**	**Brae Bravo Pile**
How has the cuttings pile been screened?	By a combination of desktop studies and sampling.	By a combination of desktop studies and sampling.
Dates of Sampling	April & May 2015	June 2013
Sampling to be included in pre-decommissioning survey?	No. Sampling has already been completed.	No. Sampling has already been completed.
Do the cuttings piles fall below both OSPAR contamination thresholds?	Yes. The total hydrocarbon leach rate for the Brae Alpha drill cuttings pile is less than 1.4 tonnes per year. This is less than 15% of the OSPAR threshold. The persistence of the Brae Alpha drill cuttings pile is 17km^{2}yr. This is less than 4% of the OSPAR threshold.	Yes. The total hydrocarbon leach rate for the Brae Bravo drill cuttings pile is less than 1.5 tonnes per year. This is less than 15% of the OSPAR threshold. The persistence of the Brae Bravo drill cuttings pile is 69km^{2}yr. This is less than 14% of the OSPAR threshold.

Table 3.11: Drill Cuttings Piles Decommissioning Options

Review of Pile Characteristics	Brae Alpha Pile	Brae Bravo Pile
Will the drill cuttings pile have to be displaced to move the sub-structure?	No. The sub-structure CA concluded that the preferred option is to leave the footings in place. Therefore, the drill cuttings will not have to be displaced to facilitate the preferred decommissioning option for the sub-structure. (If the request for derogation is not granted, the drill cuttings pile will have to be displaced to facilitate sub-structure removal).	No. The sub-structure CA concluded that the preferred option is to leave the footings in place. Therefore, the drill cuttings will not have to be displaced to facilitate the preferred decommissioning option for the sub-structure. (If the request for derogation is not granted, the drill cuttings pile will have to be displaced to facilitate sub-structure removal).
What quantity (m^3) would have to be displaced or removed (to facilitate sub-structure removal)?	N/A	N/A
Will the drill cuttings pile have to be displaced to move any pipelines?	No. The portions of pipelines within the drill cuttings pile will be left in place.	No. The portions of pipelines within the drill cuttings pile will be left in place.
What quantity (m^3) would have to be displaced/removed (to facilitate pipeline removal)?	N/A	N/A
Has a comparative assessment been completed for the drilling cuttings pile?	A comparative assessment has been completed in the form of a Net Environmental Benefit Analysis.	A comparative assessment has been completed in the form of a Net Environmental Benefit Analysis.

There are no drill cuttings piles on the seabed at Central Brae, West Brae or Sedgwick.

3.8 Waste Streams

The methods for managing the waste streams from Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick are listed in Table 3.12. The ultimate disposition of the waste materials is described in Table 3.13, and the proportions of materials that Marathon Oil envisages reusing, recycling or disposing of are given Table 3.14. Onshore cleaning and disposal of equipment will be carried out at appropriately licensed sites, in accordance with relevant legislation. Any activity conducted whilst the platform is in operation will be completed under the current permitting regime. Likely discharges are discussed in Technical Appendix 4.1 of the Environmental Statement [7].

Table 3.12: Waste Stream Management Methods

Waste Stream	Removal and Disposal Method
Bulk Liquids	As far as possible, bulk hydrocarbon liquids will be exported from the platform via the export pipeline. The process equipment will be cleaned and flushed to an appropriate standard prior to decommissioning. Discharges offshore will be managed and risk assessed under the existing permitting regime. Any effluent will be shipped to shore for treatment and disposal in accordance with maritime transportation guidelines. Equipment will be further checked onshore and any residual contamination will be removed from the equipment prior to its reuse, recycling or ultimate disposal.
Marine Growth	The disposal of marine growth will depend on the decommissioning option selected and the techniques used. Therefore, marine growth may be disposed of either offshore or onshore. Notwithstanding, marine growth will be disposed of in accordance with relevant regulations and guidelines.
NORM	NORM may be disposed of either offshore or onshore. In either case, disposal will be in accordance with the relevant guidelines and authorisations.
Asbestos	Any asbestos that is present on Brae Alpha or Brae Bravo, or in subsea equipment, will be contained and taken onshore for disposal in accordance with regulations.
Other Hazardous Wastes	Where no further options are available for the waste stream the waste will be taken onshore to an appropriately licensed site for recycling, or disposal.
Onshore Dismantling Sites	An appropriate licenced site will be selected by the removals contractor. Marathon Oil will ensure that the removal contractor has a proven disposal track record and waste stream management throughout the deconstruction process and demonstrate their ability to deliver innovative recycling options. Marathon Oil will carry out audits on disposal yards to provide assurance that they are compliant with legislation.

Table 3.13: Inventory Disposition

	Total Inventory (tonnes)	Planned Tonnage to Shore (tonnes)	Planned Tonnage Left In-Situ (tonnes)
Installations	110,908	90,908	Approximately 20,000
Pipelines	137,600	16,600	Approximately 121,000

Table 3.14: Reuse, Recycling and Disposal of Material Returned to Shore (By Weight)			
	Reuse	**Recycle**	**Disposal**
Installations	10%	85-90%	<5%
Pipelines	0	75%	<25%

Marathon Oil's intent is to maximise the reuse and recycling of materials that are returned to shore, and thereby minimise the quantity of material that is disposed of to landfill. Significant volumes of material are unlikely to be returned to shore before 2020. It is not possible to predict the state of the reuse and recycling market at that time, therefore the reuse and recycling rates listed in Table 3.14 are provisional.

It is recognised that there will be large quantities of material returned to shore for reuse, recycling and disposal. Regardless of ultimate destination, there will be sufficient notice provided to ensure that there is suitable capacity for the processing of landed material (taking cognisance of destination handling capacity and availability) and to allow all applicable regulatory bodies, stakeholders and contractors to be engaged appropriately.

4. Environmental Impact Assessment

4.1 Environmental Sensitivities (Summary)

The environmental sensitivities in the Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick areas, and the impacts of decommissioning operations are listed in Table 4.1 and Table 4.2 respectively.

Table 4.1: Environmental Sensitivities Summary

Environmental Receptor	Main Features
Conservation Interests	The Braemar Pockmarks Special Area of Conservation (SAC) is approximately 23km from Brae Bravo, which is the closest facility covered by the decommissioning programmes described in this document. A Marine Life Study of the Brae Area infrastructure has not identified the presence of the cold water coral (*Lophelia* spp).
Seabed	The seabed community in the Brae Area is classed as representative of the Central North Sea and is dominated by the bristle worm (*Paramphinone jeffreysii*), with other species such as *Spiophanes bombyx*, *Galthowenia oculata*, *Tharyx killariensis* and *Pholoe assimilies* also present.
Fish	Several fish species are present in the Brae Area and use the area for spawning and/or nursery grounds; these include Norway pout, Nephrops, mackerel, haddock and blue whiting. The basking shark, tope, porbeagle, common skate and angel shark may also be present in low numbers.
Fisheries	Commercial fishing in the Brae Area is dominated by demersal and shellfish fisheries, with fishing effort peaking during spring and autumn. Gear types used are trawlers and seine nets. Peterhead is the main landing port for the area.
Marine Mammals	The seven most commonly sighted species of cetacean in the Brae Area are the harbour porpoise, Atlantic white-sided dolphin, white-beaked dolphin, Risso's dolphin, killer whale, minke whale and long-finned pilot whale. Grey and harbour seals have also been recorded.
Birds	Seabirds are present in the central North Sea throughout the year, though densities in the Brae Area tend to be lower due to the distance from coastal colonies. Seabird densities in the Brae Area are at their lowest in late spring/early summer during the breeding season. After this, diversity and density of seabirds offshore increases. Seabirds are particularly vulnerable to surface pollutants during moulting (July) when the birds are flightless.
Onshore Communities	Onshore communities are potentially sensitive to disturbance from cleaning, dismantling and disposal activities. Marathon Oil will select onshore decommissioning facilities that comply with all regulatory requirements to ensure that potential impacts are appropriately controlled.
Other Users of the Sea	There are no ferry routes and no known military uses in the vicinity of the Brae Area. Recreation activity in the offshore North Sea is limited to the occasional yachts in passage. Telecommunications cables are charted to the north of the Brae platforms. No designated wreck sites or marine archaeological features are located within the area.
Atmosphere	The primary source of atmospheric emissions will be from vessel activity during decommissioning activities.

4.2 Potential Environmental Impacts and their Management

The Environmental Impact Assessment (EIA) process has considered the potential for significant environmental effects as a result of interactions between the proposed decommissioning activities and sensitive environmental receptors. The EIA has been developed by means of a multi stage scoping process with the aim of delivering a focused and proportionate EIA and ES. The process was developed in consultation with key stakeholders including, BEIS, JNCC, Marine Scotland and SEPA.

Following the scoping stage, the key issues identified for further detailed assessment were:

- Seabed disturbance effects
- Underwater noise effects
- Cumulative and transboundary effects

The ES [7] and Table 4.2 provide a summary of the environmental effects.

The environmental assessment has not identified any significant residual environmental effects as a result of activities described within this DP, however Marathon Oil has set out a schedule of environmental management commitments within the ES to further reduce the potential for environmental effects.

Table 4.2: Environmental Impacts and Management

Activity	Main Impacts	Management
Topsides Removal	Energy and Emissions	All vessels will comply with MARPOL 73/78 Annex VI on air pollution and machinery will be maintained in an efficient state.
	Underwater Noise	A noise assessment has been undertaken to identify the potential impacts of noise on marine mammals. The results are documented in the Environmental Statement [7]. Procedures for vessel operations and cutting will incorporate mitigation measures identified by the noise study.
	Accidental Events	The potential for spills, dropped objects or other contaminants to impact the ecosystem has been assessed. This is documented in the Environmental Statement [7]. The Brae Alpha and Brae Bravo Oil OPEPs (Oil Pollution Emergency Plans) will be revised to incorporate decommissioning activities. Topsides will be drained down and cleaned prior to any removal activities.
Sub-Structure Removal and Subsea Installation Removal	Energy and Emissions	All vessels will comply with MARPOL 73/78 Annex VI on air pollution and machinery will be maintained in an efficient state.
	Underwater Noise	Noise modelling has been conducted to identify the impacts of noise on marine mammals and potential mitigation measures. The results are documented within the Environmental Statement [7]. Procedures for vessel operations and underwater cutting will incorporate mitigation measures identified by the noise study. There are no plans to use explosives at this time. However, should the use of explosives be necessary Marathon Oil will complete appropriate evaluations and consultations.

Table 4.2: Environmental Impacts and Management

Activity	Main Impacts	Management
	Seabed Disturbance	Seabed disturbance and subsequent resettlement is considered within the Environmental Statement [7]. Activities will be risk assessed and permitted under MCAA (Marine and Coastal Access Act).
	Accidental Events	The potential for spills, dropped objects or other contaminants to impact the ecosystem has been assessed. This assessment is documented in the Environmental Statement [7]. The Brae Alpha and Brae Bravo OPEPs will be revised to incorporate decommissioning activities. These OPEPs include the Central Brae, West Brae and Sedgwick subsea facilities.
Decommissioning Pipelines	Energy and Emissions	All vessels will comply with MARPOL 73/78 Annex VI on air pollution and machinery will be maintained in an efficient state.
	Underwater Noise	A noise assessment has been undertaken to identify the potential impacts of noise on marine mammals. The results are documented in the Environmental Statement [7]. Procedures for vessel operations and underwater cutting will incorporate mitigation measures identified by the noise study.
	Seabed Disturbance	Seabed disturbance and subsequent resettlement is considered within the Environmental Statement [7]. Activities will be risk assessed and permitted under MCAA.
	Discharge to Sea	Pipelines will be cleaned and flushed prior to decommissioning. Any residual discharges during decommissioning activities will be managed and risk assessed under the existing permitting regime.
	Accidental Events	The potential for spills, dropped objects or other contaminants to impact the ecosystem has been assessed. This assessment is documented in the Environmental Statement [7]. The Brae Alpha and Brae Bravo OPEPs will be revised to incorporate decommissioning activities. These OPEPs include the Central Brae, West Brae and Sedgwick subsea facilities.
Decommissioning Stabilisation Features	Seabed Disturbance	Seabed disturbance and subsequent resettlement is considered within the Environmental Statement [7]. Activities will be risk assessed and permitted under MCAA.
Decommissioning Drill Cuttings	Remobilisation of contaminants	Surveys of the drill cuttings piles have confirmed that the piles fall below the OSPAR Recommendation 2006/5 thresholds and may therefore be left in place. NEBA has confirmed this as the preferred option.

5. Interested Party Consultations

Marathon Oil has consulted a wide range of interested parties during the decommissioning planning stages, preparation of the comparative assessments and environmental statements, and compilation of the decommissioning programmes. These include:

- BEIS Environmental Management Team
- BEIS Offshore Decommissioning Unit
- Greenpeace
- HSE
- Joint Nature Conservation Committee
- Marine Conservation Society
- Marine Scotland
- National Federation of Fishermen's Organisations
- Oil and Gas Authority
- OSPAR
- Scottish Environment Protection Authority
- Scottish Fishermen's Federation
- WWF

Marathon Oil has also made information regarding decommissioning of the Brae Area available to other interested parties and the general public via Marathon Oil Brae Decommissioning website, www.marathonoil.com/braedecom.

Following completion of the formal consultation process, Marathon Oil will complete Table 5.1 with comments received from stakeholders, and the company's responses.

Table 5.1: Summary of Stakeholder Comments

UK

Stakeholder	Comment	Response
The National Federation of Fishermen's Organisations		
Scottish Fishermen's Federation		
Northern Irish Fish Producers' Organisation		
Global Marine Systems Limited		
Public		

OSPAR

Contracting Party	Comment	Response

6. Programme Management

6.1 Project Management and Verification

Marathon Oil, on behalf of the Section 29 Notice Holders, has appointed a project management team to manage the planning and execution of these combined decommissioning programmes. Marathon Oil health, environmental and safety management principles will govern operational controls, hazard identification and risk management. The work will be coordinated with due regard to interfaces with other operators' oil and gas assets and with other users of the sea. Marathon Oil will control and manage the progress of all permits, licences, authorisations, notices, consents and consultations required. Any significant changes to the decommissioning programmes will be discussed and agreed with BEIS.

6.2 Post-decommissioning Debris Clearance and Verification

A post-decommissioning site survey will be carried out within a 500m radius of installation sites and a 200m corridor along each pipeline route. Any oilfield-related seabed debris that is found will be recovered and returned to shore for recycling or appropriate disposal.

Independent verification of the state of the seabed will be obtained by trawling the pipeline corridors and within the safety zones. Following verification Marathon Oil will issue a statement of clearance to all relevant governmental departments and non-governmental organisations.

The post-decommissioning survey results will be notified to the UK Fisheries Offshore Oil and Gas Legacy Trust Fund Ltd for inclusion in their FishSAFE system, and to the United Kingdom Hydrographic Office for notification and marking on Admiralty charts and notices to mariners.

6.3 Schedule

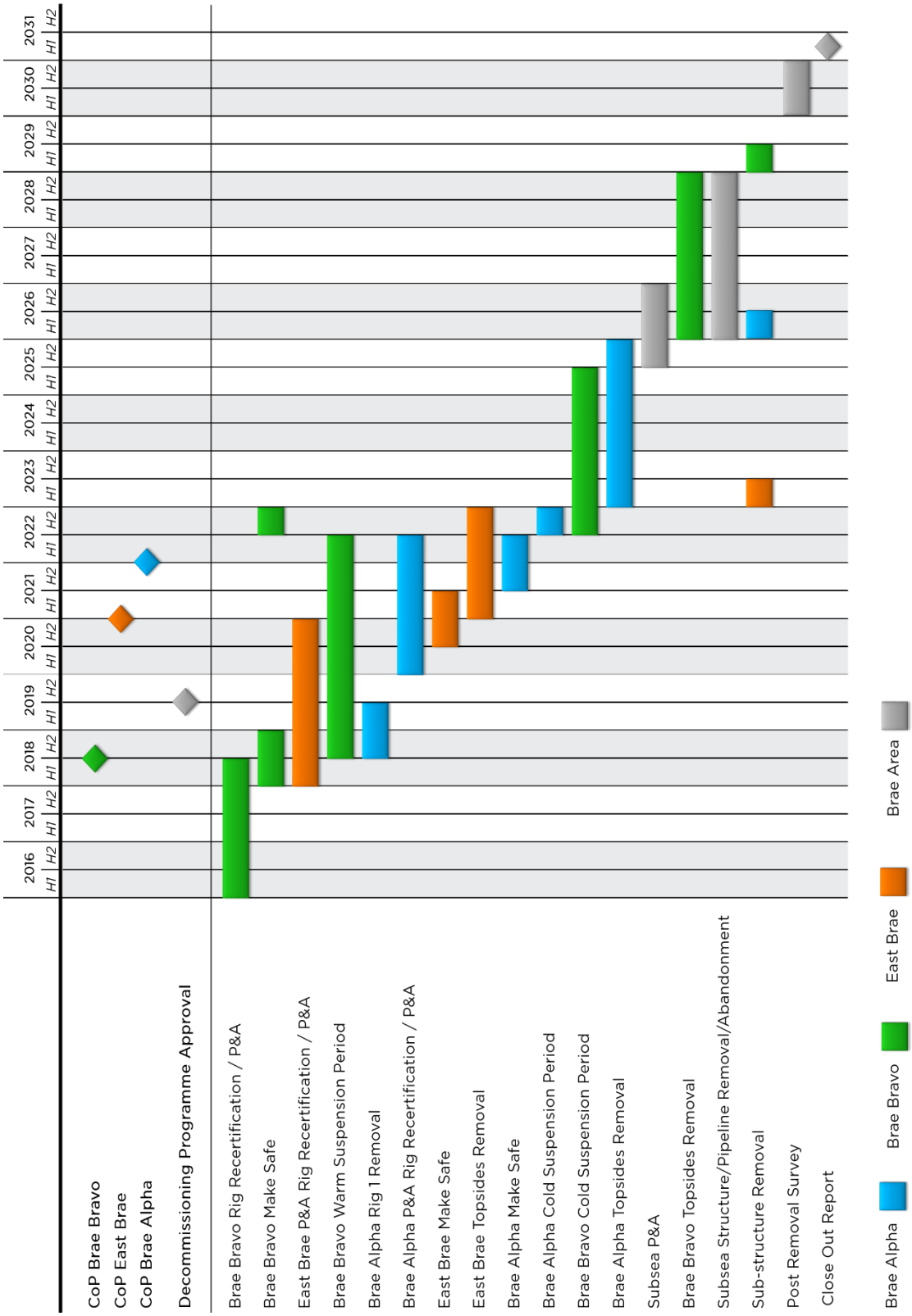
The main milestones in the Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick decommissioning process are anticipated to be:

- Brae Bravo rig recertification/wells plug and abandon: 2016 - 2018
- Brae Bravo facilities making safe: 2018
- Brae Bravo cessation of production: 2018
- Brae Alpha Rig 1 Removal: 2019
- Brae Alpha rig recertification/wells plug and abandon: 2020 - 2022
- Brae Alpha facilities making safe: 2021 - 2022
- Brae Alpha cessation of production: 2021
- Subsea facilities cessation of production: 2021
- Brae Alpha platform topsides removal: 2023 – 2025
- Brae Alpha jackets/sub-structures removal: 2026
- Subsea wells plug and abandon: 2025 - 2026
- Brae Bravo platform topsides removal: 2026 - 2028
- Subsea infrastructure removal: 2026 - 2028
- Brae Bravo jackets/sub-structures removal: 2029
- Post removal survey: 2030 - 2031

This schedule may change to maximise economic recovery, or to exploit opportunities to minimise decommissioning impacts by combining Brae Area decommissioning activities into campaigns, or by

combining Brae Area decommissioning operations with third-party decommissioning. The Brae Area overall decommissioning programme is illustrated in Figure 6.1.

Figure 6.1: Overall Brae Area Decommissioning Programme



6.4 Long Term Facilities Management

The decommissioning of the Brae Area is planned to be over an extended period. Throughout this period, the assets and infrastructure will be in various stages of dismantlement and remediation. At all times, the facilities will be maintained to a standard that enables completion of the programmes safely and in compliance with regulations and Marathon Oil's corporate standards.

Following removal of the Brae Alpha Platform topsides, there will be a period of time prior to jacket/sub-structure removal, where the jacket/sub-structure remains above sea level. At this time the existing 500m safety zone will remain in place and the standby vessel which serves the Brae Bravo will continue to monitor the Brae Alpha safety zone. The Brae Alpha Consent to Locate will be revised to reflect the change in structure and appropriate navigational aids will be fitted in accordance with requirements of the amended Consent to Locate. Similarly, following the removal of the Brae Bravo topsides, the Consent to Locate will be revised and the 500m safety zone will remain in place. There will subsequently be a period of time following the removal of the Brae Bravo topsides when both the Brae Alpha and Brae Bravo jackets/sub-structures remain above sea level. During this time, all requirements of the amended Consents to Locate will be adhered to and a guard vessel assigned to the field if specified in the Consent.

6.5 Costs

Marathon Oil has used the Oil and Gas UK work breakdown structure presented in Table 6.1 to develop cost estimates for the Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick decommissioning programmes. The provisional estimated costs have been provided to BEIS in confidence.

Table 6.1: Provisional Decommissioning Costs

Item	Estimated Cost (£m)
Operator Project Management	Provided to BEIS in confidence
Facility Running/Owner Costs	
Well Plugging and Abandonment	
Facilities/Pipelines Making Safe	
Topsides Preparation	
Topsides Removal	
Sub-Structure Removal	
Topsides and Sub-Structure Onshore Recycling	
Subsea Infrastructure (Pipelines, Umbilicals)	
Site Remediation	
Monitoring	

6.6 Close Out

A close out report will be submitted to BEIS within four months of the completion of the offshore decommissioning scopes, including debris removal and independent verification of seabed clearance and the first post-decommissioning environmental survey.

Any variances from the approved decommissioning programmes will be explained in the close out report.

6.7 Post-Decommissioning Monitoring and Evaluations

Marathon Oil will carry out a post-decommissioning environmental seabed survey, centred on sites of the Brae Alpha and Brae Bravo platforms and the Central Brae, West Brae and Sedgwick subsea installations.

All pipeline routes and subsea structure sites, including the jacket/sub-structure footings, will be the subject of surveys when decommissioning activity has concluded. A survey of the condition of the footings and the adjacent seabed will also be undertaken at the end of the removal activities. The footings, which are proposed to be left in place will be subject to a monitoring programme agreed between Marathon Oil and BEIS.

A copy of the survey results will be forwarded to BEIS. After the survey results have been sent to BEIS and reviewed, a post monitoring survey regime will be agreed by both parties and take account of ongoing liability, the status and findings of previous surveys and a risk based approach to frequency/scope.

6.8 Management of Residual Liability

Any equipment that is left in place will remain the property and responsibility of the Brae Alpha, Brae Bravo and the Central Brae, West Brae and Sedgwick parties to the Programmes. In addition:

- Marathon Oil recognises that the parties to the Programmes will continue, post monitoring, to retain ownership of, and residual liability for, the infrastructure left in situ.
- Marathon Oil will engage with BEIS on all future legacy and liability matters and requirements relating to the infrastructure left in place.

7. Supporting Documents

[1] Guidance Notes Decommissioning of Offshore Oil and Gas Installations and Pipelines under the Petroleum Act 1998, Version 6, DECC March 2011.

[2] Guidelines for the Abandonment of Wells, Issue 5, Oil and Gas UK, July 2015.

[3] Brae Alpha Sub-Structure Comparative Assessment, 9020-MIP-99-PM-RT-00001-000, Marathon Oil Decommissioning Services.

[4] Brae Bravo Sub-Structure Comparative Assessment, 9010-MIP-99-PM-RT-00001-000, Marathon Oil Decommissioning Services.

[5] Brae Area Subsea Assets Decommissioning Comparative Assessment Methodology, 9000-MIP-99-PM-FD-00003-000, Marathon Oil Decommissioning Services.

[6] East Brae and Braemar Decommissioning Programmes, 9000-MIP-99-PM-FD-00002-000, Marathon Oil Decommissioning Services.

[7] Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick Combined Decommissioning Programmes – Environmental Statement, 9000-MIP-99-EV-RT-00001-000, Marathon Oil Decommissioning Services.

8. Partners' Letters of Support

Letters of support will be attached following incorporation of the consultation draft comments.

Appendix 1 Public Notice

PUBLIC NOTICE

The Petroleum Act 1998

BRAE AREA DECOMMISSIONING PROJECT

Marathon Oil U.K. LLC (MOUK) has submitted, for the consideration of the Secretary of State for Business, Energy and Industrial Strategy, draft Decommissioning Programmes for the Brae Area infrastructure in accordance with the provisions of the Petroleum Act 1998. It is a requirement of the Act that interested parties be consulted on such decommissioning proposals. The items/facilities covered by the Decommissioning Programmes are:

> The Brae Area facilities located approximately 274 km north-east of Aberdeen within four principal UK Blocks: 16/7a, 16/3a, 16/3b and 16/3c. The facilities comprise the Brae Alpha, Brae Bravo and East Brae production platforms, three equity subsea installations and connecting pipelines, flowlines, control umbilicals and utility/power cables, and export pipelines.

MOUK hereby gives notice that the Brae Area Decommissioning Programmes can be viewed at the internet address: www.marathonoil.com/braedecom.

Alternatively hard copies of the Programmes can be inspected at the following location during office hours:

> Marathon Oil U.K. LLC
> Marathon House
> Rubislaw Hill, Anderson Drive
> Aberdeen, AB15 6FZ, Scotland

Contact:
David Wilson
StakeholderBraeDecom@Marathonoil.com

Representations regarding the Brae Area Decommissioning Programme should be submitted in writing to the address and contact shown above, where they should be received by the 24th July 2017 and should state the grounds upon which any representations are being made.

Appendix 2 Statutory Consultees Correspondence

This section will be updated with comments and correspondence from the consultees following the consultation process.

Appendix 3 Estimated Material Inventory

Table A3.1 lists a breakdown of the inventory that may be present on the Brae Alpha and Brae Bravo platforms, associated pipelines and subsea facilities.

Marathon Oil's main objective in breaking down the inventory in this way is to ensure that potentially harmful substances that may be present are identified so that risks to personnel and the environment can be effectively managed.

The list identifies bulk fluids and other substances that may be present, such as hydrocarbon fluids and cement powder. These bulk substances will be removed from the platform in the final stages of the operational phase. Therefore, only traces of these substances will be present at the decommissioning phase.

Table A3.1: Brae Alpha, Brae Bravo and Subsea Facilities Inventory

Material	Present?	Quantity	Location
ABS	Yes	To be quantified	Topsides and subsea, precise locations unknown at this time.
Ac 228	Yes (To be confirmed)	To be quantified	Present in NORM scale potentially present in wells and in subsea and topsides piping and equipment.
Alloy Steel	Yes	To be quantified	Topsides and subsea
Aluminium	Yes	Estimated 1,100 Te	Topsides and subsea
Aluminium Bronze	Yes (To be confirmed)	To be quantified	Topsides and subsea
Americium	Yes (To be confirmed)	To be quantified	Topsides in some smoke detectors.
Anodes (total)	Yes	Estimated 2,200 Te	Platform sub-structures, pipelines and subsea structures
Asbestos Blue Asbestos White/Brown	Yes (To be confirmed)	To be confirmed <1 Te total	Potentially present in topsides partitions and gaskets.
Batteries:	Yes	To be confirmed 17 Te Lead Acid 28 Te NiCad	Topsides.
Biocides by type (including TBT)	Yes (To be confirmed)	Trace	Topsides, wells and pipelines.
Brass	Yes	Estimated 47 Te	Topsides and subsea
Bronze	Yes (To be confirmed)	To be quantified	Topsides and subsea
Buna	Yes (To be confirmed)	Estimated 6 Te	Topsides and subsea
Butyl Rubber	Yes (To be confirmed)	Estimated 6 Te	Topsides and subsea

Table A3.1: Brae Alpha, Brae Bravo and Subsea Facilities Inventory			
Material	**Present?**	**Quantity**	**Location**
Carbon Steel	Yes	Estimated 177,931 Te	Topsides and subsea
Cement Powder	Yes	Trace	Bulk bins in topsides drilling service modules
Concrete Mattresses	Yes	Estimated 984 mattresses Estimated 6,888 Te	Subsea
Concrete	Yes	Estimated 41,892Te	Subsea, including pipeline coatings
Ceramics (all types)	Yes	Estimated 1,333 Te	Topsides and subsea
CFC/HCFC	Yes (To be confirmed)	Estimated 5 Te	Topsides
Chartek/fire protection	Yes	Estimated 57 Te	Topsides
Chlouro-paraffins	No (To be confirmed)	To be quantified	Topsides and subsea
Chromium	Yes	To be quantified	Topsides and subsea
Copper	Yes	Estimated 4,070 Te	Topsides and subsea
Copper nickel alloys	Yes	Estimated 440 Te	Topsides and subsea
Cork	No (To be confirmed)	To be quantified	Topsides
Cotton	Yes	To be quantified	Topsides
Diesel	Yes	Trace	Topsides
Drill Cutting Residues	Yes	Trace	In drilling mud system
EPDM	Yes (To be confirmed)	Estimated 6 Te	Topsides and subsea
Ethylene / Polypropylene	Yes (To be confirmed)	To be quantified	Topsides and subsea
Fire Extinguishers	Yes	Estimated 12 Te	Topsides
Fire Foam	Yes	Trace	Topsides
Flame Retardants – Brominated etc	Yes (To be confirmed)	To be quantified	Topsides
Fluorescent Tubes	Yes	Estimated 2 Te	Topsides
Formica	Yes (To be confirmed)	To be quantified	Topsides
Glass	Yes	To be quantified	Topsides

Table A3.1: Brae Alpha, Brae Bravo and Subsea Facilities Inventory

Material	Present?	Quantity	Location
Glycol	Yes	Trace	Topsides
GRP	Yes	Estimated 217 Te	Topsides and subsea
Graphite/Charcoal	Yes (To be confirmed)	To be quantified	Topsides and subsea
Gunmetal	Yes (To be confirmed)	Estimated 17 Te	Topsides and subsea
Heli-fuel	Yes	Trace	Topsides
Hydrocarbons	Yes	Trace	Topsides and subsea
Inconel/Nimoics	Yes (To be confirmed)	Estimated 486 Te	Topsides and subsea
Insulation	Yes	To be quantified	Topsides and subsea
Iron(cast)	Yes (To be confirmed)	Estimated 28 Te	Topsides and subsea
Lead	Yes	To be quantified	Topsides and subsea
Marine Growth	Yes	Estimated 6,100 Te	Platform Sub-structures
Mercury	Yes (To be confirmed)	To be quantified	Topsides and subsea
Methanol	Yes	To be quantified	Topsides
NORM Scale	Yes	Estimated 471 Te	NORM scale potentially present in wells and in subsea and topsides piping and equipment.
Neoprene	Yes	To be quantified	Topsides and subsea
Ni-Resist	No (To be confirmed)	To be quantified	Topsides and subsea
Nylon	Yes (To be confirmed)	To be quantified	Topsides and subsea
Organotin	Yes (To be confirmed)	To be quantified	Topsides and subsea
Paint – by type containing- e.g. Isocyanates, Polyurethane, Lead, Asbestos, Bitumen etc.	Yes (To be confirmed)	To be quantified	Topsides and subsea
Pb-210/226/228	Yes (To be confirmed)	To be quantified	Topsides and subsea
PCB	Yes (To be confirmed)	To be quantified	Topsides and subsea
PTFE	Yes (To be confirmed)	To be quantified	Topsides and subsea
Plastics	Yes	Estimated 2,845 Te	Topsides and subsea

Table A3.1: Brae Alpha, Brae Bravo and Subsea Facilities Inventory			
Material	**Present?**	**Quantity**	**Location**
PVC	Yes (To be confirmed)	To be quantified	Topsides and subsea
Radium (Ra-226)	Yes (To be confirmed)	To be quantified	Topsides and subsea
Radium (Ra-228)	Yes (To be confirmed)	To be quantified	Topsides and subsea
Residual HC	Yes	To be quantified	Topsides and subsea
Rubber	Yes	To be quantified	Topsides and subsea
Sewage	Yes	Trace	Topsides
Smoke Detectors	Yes	To be quantified	Topsides
Stainless Steel	Yes	Estimated 8,429 Te	Topsides and subsea
Stellite	No (To be confirmed)	To be quantified	Topsides and subsea
Tin	Yes (To be confirmed)	To be quantified	Topsides and subsea
Titanium	Yes	To be quantified	Topsides and subsea
Wood	Yes	To be quantified	Topsides
Zinc	Yes	To be quantified	Topsides and subsea

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Consultation Draft

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