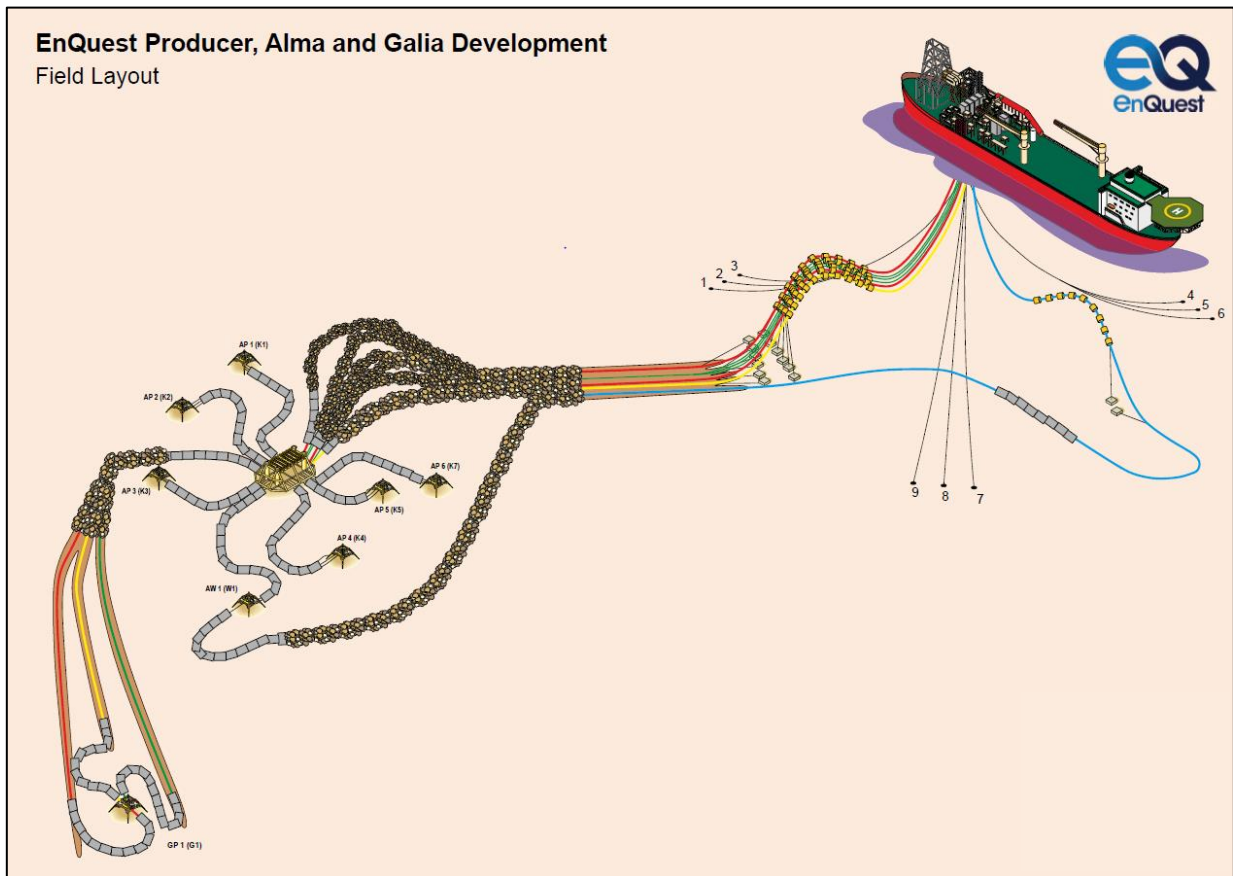


Alma & Galia Decommissioning Programmes



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ABBREVIATION	EXPLANATION
AHV	Anchor Handling Vessel
AP1 through 9	Alma anchor pile AP1 through to AP9
AP1 through AP6	Alma Production Wells K1 through K7 respectively, noting that K6 is partially decommissioned with infrastructure rerouted to K7
AW1 & AW2	Alma Water Injection Wells (AW2 - future not installed)
CSV	Construction Support Vessel
DBB	Double Block and Bleed (valve arrangement with vent)
dia.	Diameter
DSV	Diving Support Vessel
EA	Environmental Appraisal
EHC	Electro-Hydraulic Control
E/H/C	Electric, Hydraulic, Chemicals; products conveyed in umbilical pipeline
EnQuest	EnQuest Heather Limited
ESP	Electrical Submersible Pump
FPSO	(EnQuest Producer) Floating, Production, Storage, Offloading (Vessel)
Gabion	1m ³ 'builder's bag sometimes filled with 25kg grout bags
GMG	Global Marine Group
HP	High Pressure (Hydraulic)
HSE	Health and Safety Executive
" , in	Inch; 25.4 millimetres
Installation	Offshore structure, typically comprising topsides and jacket, or a subsea wellhead protection structure, subsea manifold structure or an FPSO
km	Kilometre
KUFPEC UK Ltd	Kuwait Foreign Petroleum Exploration Co UK Limited
LAT	Lowest Astronomical Tide
LP	Low Pressure (Hydraulic)
m	Metre(s)
MAT, SAT	Master Application Template, Supplementary Application Template
MSV	Multipurpose Support Vessel
N,S,E,W	North, South, East, West
n/a	Not Applicable
NFFO	National Federation of Fishermen's Organisations
NIFPO	Northern Ireland Fish Producers Organisation Ltd
NORM	Naturally Occurring Radioactive Material
NORPIPE	34in nominal bore oil pipeline, 220 miles long connecting Ekofisk 2/4-J facility and the oil or Natural Gas Liquids terminal in Teeside, UK
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning

ABBREVIATION	EXPLANATION
OSPAR	Oslo-Paris Convention
P1, P2	Production Flowline Identifier
PL	Pipeline Identification numbers (UK)
PLA	Pipeline Operations as defined in MAT Operation Types
PON	Petroleum Operations Notice
PVDF/PA12	Polyvinylidene fluoride (Kinar® PVDF/PA12 Polyamide 12) resins are used for chemical resistance
PVDF/HDPE	Polyvinylidene fluoride/High Density polyethylene; flexible plastic pipe
PWA	Pipeline Works Authorisation
ROV	Remotely Operated Vehicle
ROVSV	Remotely Operated Vehicle Support Vessel
SFF	Scottish Fishermen's Federation
SPCDU A, B	Subsea Power & Communications Distribution Unit
Topsides	Offshore structure typically furnished with reception and processing equipment for produced hydrocarbons, in this case an FPSO.
Turret	A mooring turret is where all anchoring lines terminate and around which the ship is free to make rotations, enabling it to select a favourable heading for the environment
UK	United Kingdom
UKCS	United Kingdom Continental Shelf
WGS84	World Geodetic System 1984
WIF	Water Injection Flowline
x	Number of (e.g. 16x = 16 in Number)

1. EXECUTIVE SUMMARY

1.1 Combined Decommissioning Programmes

This document contains four Decommissioning Programmes, one for each set of notices under Section 29 of the Petroleum Act 1998. The Decommissioning Programmes are:

- The EnQuest Producer floating production storage and offloading vessel (FPSO) complete with all subsea equipment, including manifolds and wellhead protection structures;
- All pipelines associated with the Alma field including **PL3006**, **PL3007**, **PL3008**, **PLU3009**, **PL3011**, **PL3012**, and **PL3013** and associated jumpers;
- The Galia installation, a wellhead protection structure; and,
- All associated pipelines including **PL3014**, **PLU3015**, and **PL3016**.

Installations: In accordance with the Petroleum Act 1998, EnQuest Heather Limited, as operator of the Alma and Galia fields, and on behalf of the Section 29 notice holders (Table 1.3.2 & Table 1.4.2), is applying to the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) to obtain approval for decommissioning the installations detailed in Section 2 of this document. Partner Letters of Support will be provided directly to OPRED.

Pipelines: In accordance with the Petroleum Act 1998, EnQuest Heather Limited, as operator of the Alma and Galia pipelines, and on behalf of the Section 29 notice holders (Tables 1.3.4 & Table 1.4.4), is applying to OPRED to obtain approval for decommissioning the pipelines detailed in Section 2 of this document. Partner Letters of Support will be provided directly to OPRED.

In conjunction with public, stakeholder and regulatory consultation, the Decommissioning Programmes are submitted in compliance with national and international regulations and OPRED guidance notes. The schedule outlined in this document is for a seven-year period with FPSO sailaway due to begin sometime Q3 2020.

1.2 Introduction

The Alma and Galia oil fields are situated in blocks 30/25c and 30/24b respectively of the United Kingdom Continental Shelf and operated by EnQuest Heather Limited. These fields are located approximately 282km north-east of Northumberland coast (Seahouses), in water depths of ~77m.

The Alma and Galia fields were developed as a single joint development and came onstream in late 2015. They produce via subsea wells tied-back to the FPSO vessel via one central hub for all fields. Alma has six production wells and one water injector, while Galia produces via one well. The Cessation of Production documentation for the Alma & Galia fields is currently under consideration by the Oil and Gas Authority.

The Decommissioning Programmes explain the principles of the removal activities and are supported by an environmental appraisal report. The Decommissioning Programmes for the pipelines are also supported by a comparative assessment.

1.3 Alma Field – Overview

1.3.1 Alma Field - Installations

Table 1.3.1: Installations Being Decommissioned			
Field(s):	Alma	Production Type	Oil
Water Depth (m)	Approx. 77m	UKCS Block	30/25c
Topside Installation(s)		Weights	
Number	Type	Weight	Anchor Pile Weight (Te)
1	FPSO	95,300	629.64 (9)
Subsea Installation(s)		Number of Wells	
7	WHPS	Topsides	Subsea
1	Manifold, piled	n/a	7
Drill Cuttings piles		Distance to median	Distance from nearest UK coastline
n/a		17km	282km NE of Northumberland Coast (Seahouses)

Table 1.3.2: Alma Installation Section 29 Notice Holders Details		
Section 29 Notice Holder	Registration Number	License Equity Interest (%)
EnQuest Dons Leasing Limited	07848478	0%
EnQuest Heather Limited	02748866	65%
KUFPEC UK Limited	07253693	35%
EnQuest plc	07140891	0%
Kuwait Foreign Petroleum Exploration Company K.S.C.	n/a	0%

1.3.2 Alma Field - Pipelines

Table 1.3.3: Alma Pipelines Being Decommissioned ¹		
Number of Pipelines, Cables, Umbilicals	7 (22)	See Table 2.3.1

Table 1.3.4: Alma Pipelines Section 29 Notice Holders Details		
Section 29 Notice Holder	Registration Number	License Equity Interest (%)
EnQuest Heather Limited	02748866	65%
EnQuest plc	07140891	0%
KUFPEC UK Limited	07253693	35%
Kuwait Foreign Petroleum Exploration Company K.S.C.	n/a	0%

¹ The figure in brackets is total no. of pipelines including jumpers.

1.4 Galia Field - Overview

1.4.1 Galia Field – Installations

Table 1.4.1: Galia Installations Being Decommissioned			
Field(s):	Galia	Production Type	Oil
Water Depth (m)	Approx. 77m	UKCS Block	30/24b
Surface Installations			
Number	Type	Topsides Weight (Te)	Jacket Weight (Te)
None	n/a	n/a	n/a
Subsea Installation(s)		Number of Wells	
Number	Type	Platform	Subsea
1	WHPS	n/a	1
Drill Cuttings piles		Distance to median	Distance from nearest UK coastline
n/a	n/a	22km	279km NE of Northumberland Coast (Seahouses)

Table 1.4.2: Galia Installation Section 29 Notice Holders Details		
Section 29 Notice Holder	Registration Number	License Equity Interest (%)
EnQuest Heather Limited	02748866	65%
EnQuest plc	07140891	0%
KUFPEC UK Limited	07253693	35%
Kuwait Foreign Petroleum Exploration Company K.S.C.	n/a	0%

1.4.2 Galia Field - Pipelines

Table 1.4.3: Galia Pipelines Being Decommissioned ¹		
Number of Pipelines, Cables, Umbilicals	3 (7)	See Table 2.8.1

Table 1.4.4: Galia Pipelines Section 29 Notice Holders Details		
Section 29 Notice Holder	Registration Number	License Equity Interest (%)
EnQuest Heather Limited	02748866	65%
EnQuest plc	07140891	0%
KUFPEC UK Limited	07253693	35%
Kuwait Foreign Petroleum Exploration Company K.S.C.	n/a	0%

1.5 Summary of Proposed Decommissioning Programmes

Table 1.5.1: Summary of Decommissioning Programmes	
Proposed Decommissioning Solution	Reason for Selection
1. FPSO	
<p>Complete removal and recycle. The FPSO will be removed and recovered to shore and recycled unless alternative re-use options are found to be viable and more appropriate.</p> <p>Any permit applications required for work associated with removal of the topsides will be submitted to the regulator as required.</p>	<p>Allows FPSO to be removed and maximises opportunity for re-use or recycling of materials</p>
2. Mooring & Anchors	
<p>Partial removal and recycling. 8 of the 9 mooring anchor piles will be left at least 1.0m below seabed, with the remaining one at 0.75m below the seabed. The mooring chain will be cut locally to the mooring pile and buried to 1m below seabed.</p> <p>Any permit applications required for work associated with the mooring piles will be submitted to the regulator as required.</p>	<p>To comply with OSPAR requirements leaving unobstructed seabed. Removes a potential obstruction to fishing operations and maximises recycling of materials</p>
3. Subsea Installations	
<p>The Alma and Galia subsea installations including wellheads and production manifolds will be removed from the seabed. It is proposed to use reasonable endeavours to cut the piles associated with the Alma manifold at 1.0m below the seabed.</p>	<p>To comply with OSPAR requirements leaving unobstructed seabed. Removes a potential obstruction to fishing operations and maximises recycling of materials.</p>
4. Pipelines	
<p>The flexible risers, pipelines electrical cables and umbilical pipelines associated with the Alma field (PL3006, PL3007, PL3008, PLU009, PL3011, PL3012, and PL3013) will be cleaned and flushed, and together with the riser bases will be fully recovered to shore;</p> <p>The Galia pipelines including PL3014, PLU3015, and PL3016 will be cleaned and flushed and fully recovered to shore.</p> <p>Any permit applications required for work associated with pipeline pigging, flushing, cutting and removal will be submitted to the regulator as required.</p>	<p>Removes a potential obstruction to fishing operations and maximises recycling of materials.</p>
5. Wells	
<p>All wells will be decommissioned to comply with HSE “Offshore Installations and Wells (Design and Construction, etc.) Regulations 1996” and in accordance with the latest version of the Oil & Gas UK Well Decommissioning Guidelines.</p> <p>The wells will be decommissioned using a semi-submersible drilling rig. A Master Application Template (MAT) and the supporting Subsidiary Application Templates (SATS) will be submitted in support of activities carried out. A PON5 will also be submitted to OPRED for application to decommission the wells.</p>	<p>Meets the OGA and HSE regulatory requirements.</p>
5. Interdependencies	
<p>The whole of the FPSO vessel will be removed. The lower mooring chains will be cut near the anchor piles with small amounts of seabed sediment either being displaced to allow access for cutting or displaced to allow burial of the short end of the lower mooring chain being left <i>in situ</i>.</p> <p>No third-party pipeline crossings will be disturbed as a result of the decommissioning proposals.</p> <p>Pipeline stabilisation features such as concrete mattresses and any grout bags found that are exposed (i.e. not buried under deposited rock) will be removed as part of the pipeline decommissioning activities. Although some deposited rock will be disturbed during the removal activities, it will remain <i>in situ</i>.</p> <p>The decommissioning works will be carried out in two phases. 1) FPSO sail away and 500m zone clean up; Phase 2) decommissioning of remaining installations and infrastructure.</p>	

1.6 Field Locations including Field Layout and Adjacent Facilities

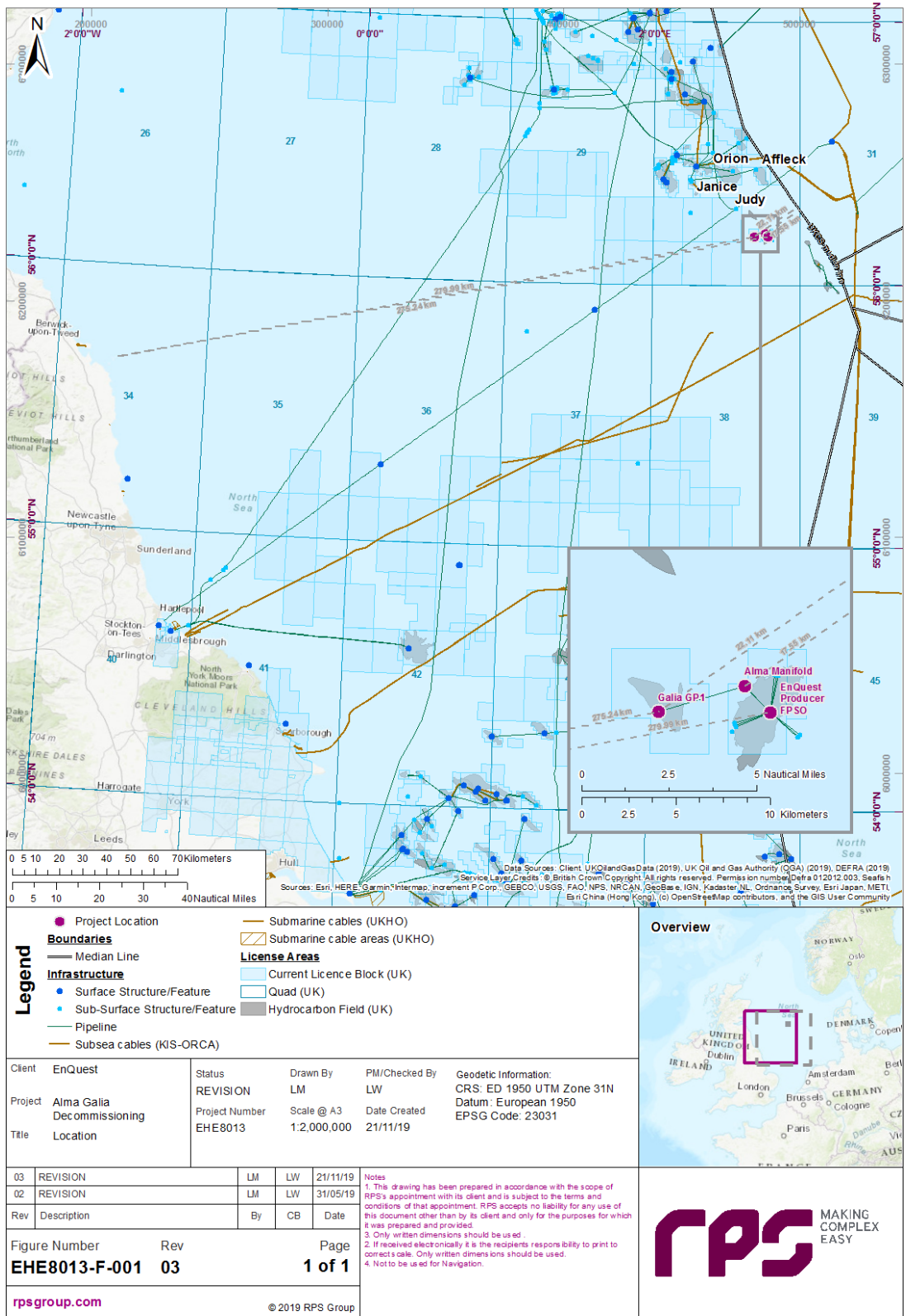


Figure 1.6.1: Alma & Galia Adjacent Facilities

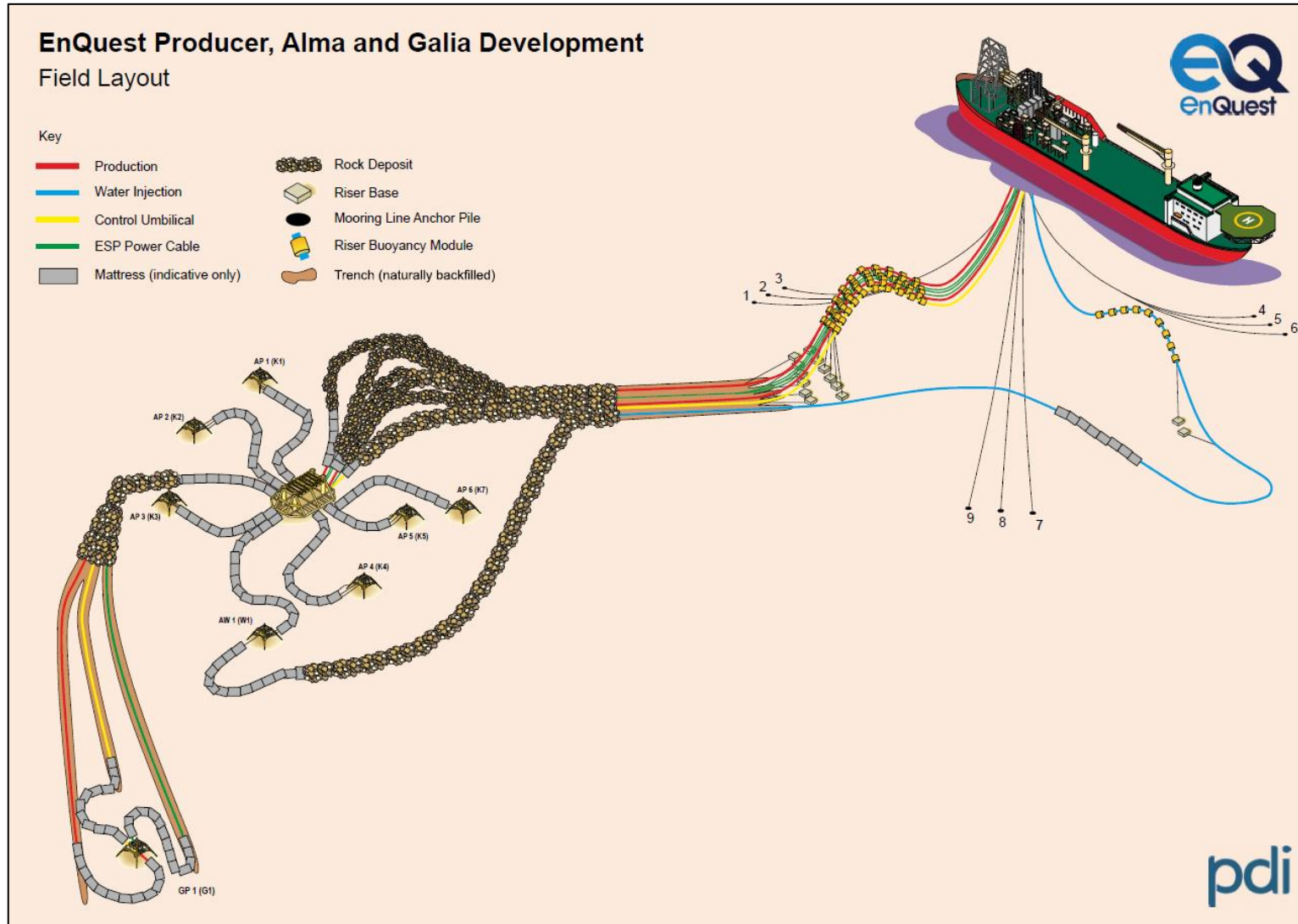


Figure 1.6.2: Alma & Galia Prior to Decommissioning

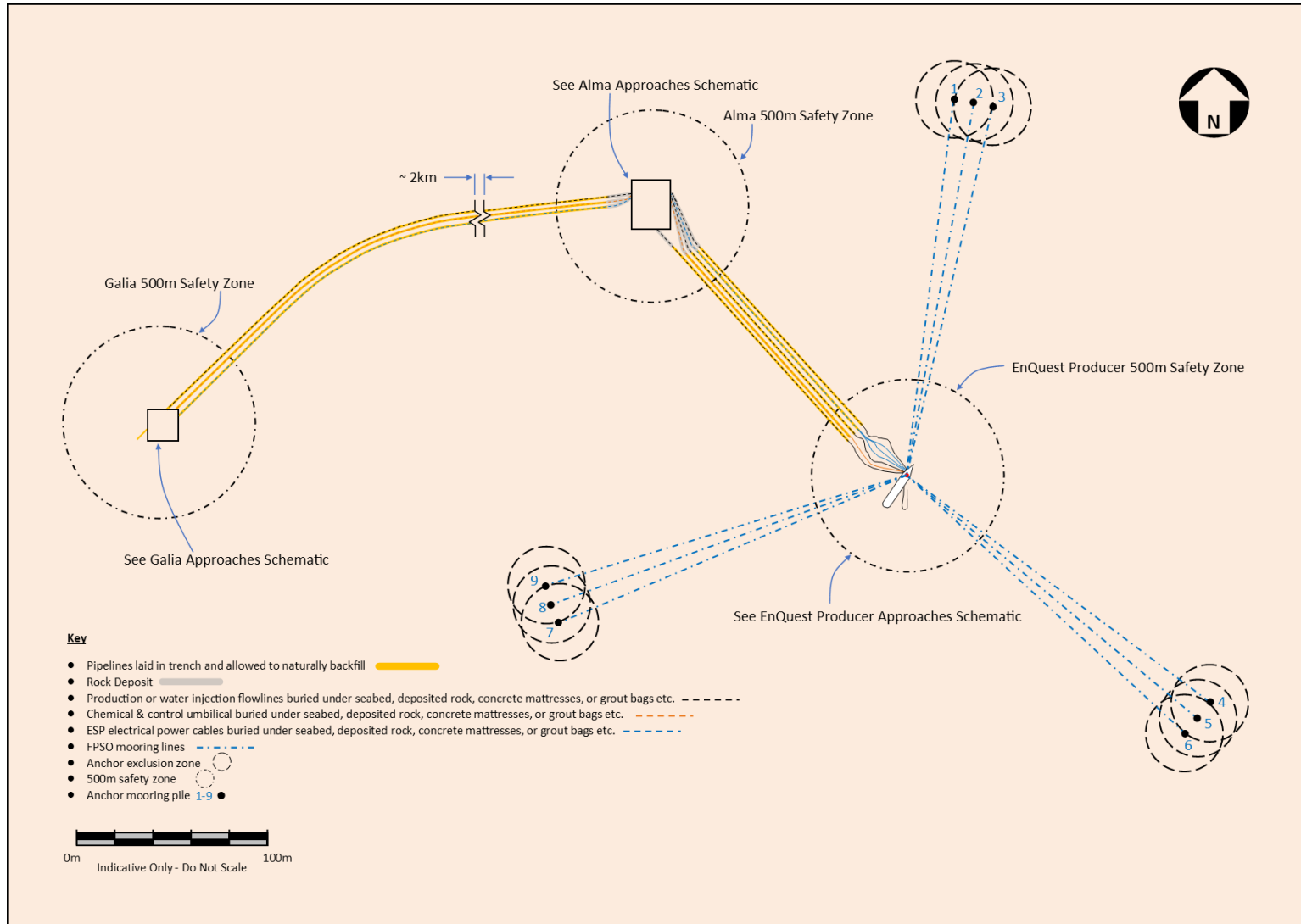


Figure 1.6.3: Overview of Alma & Galia

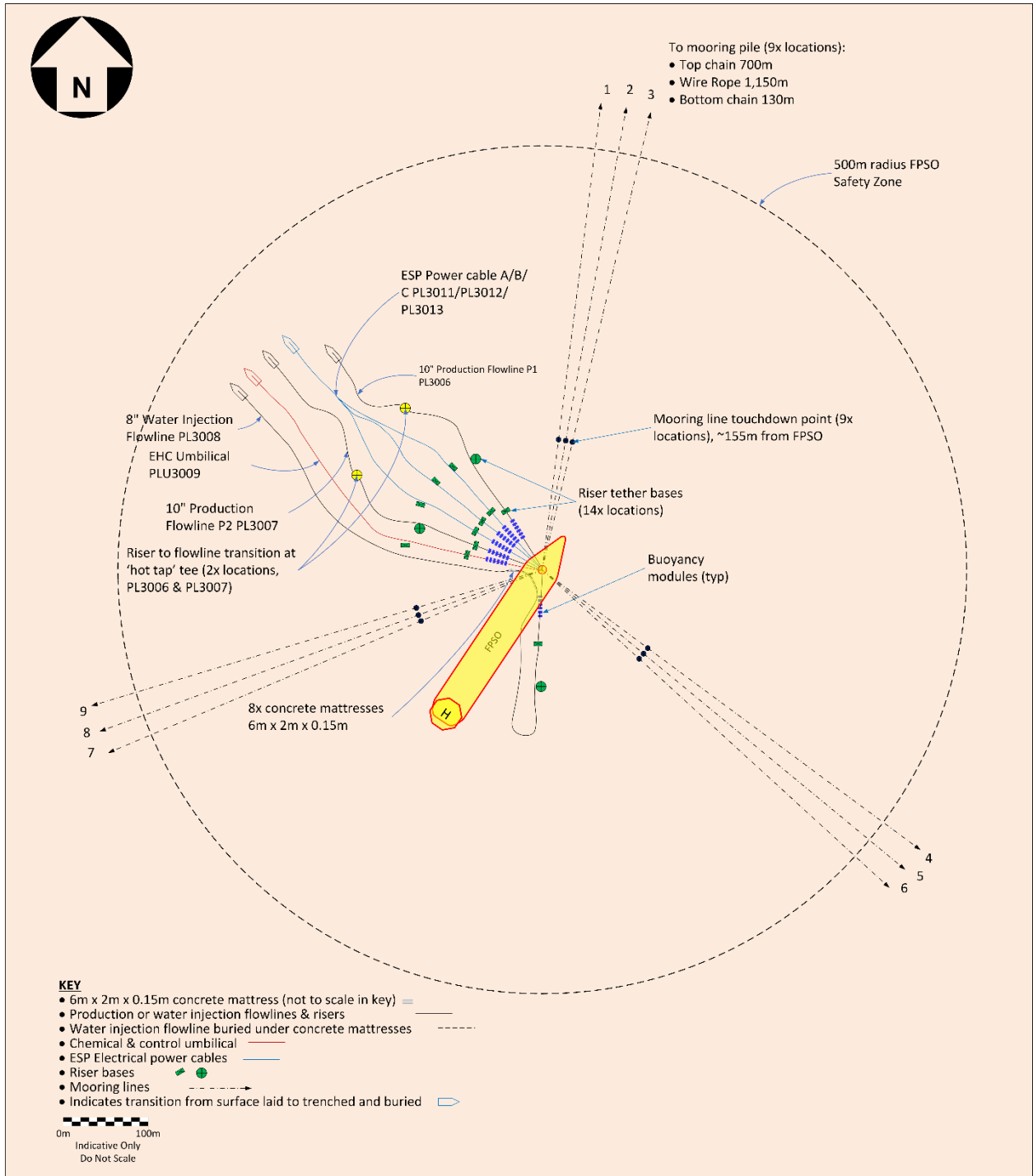


Figure 1.6.4: Overview of EnQuest Producer Approach

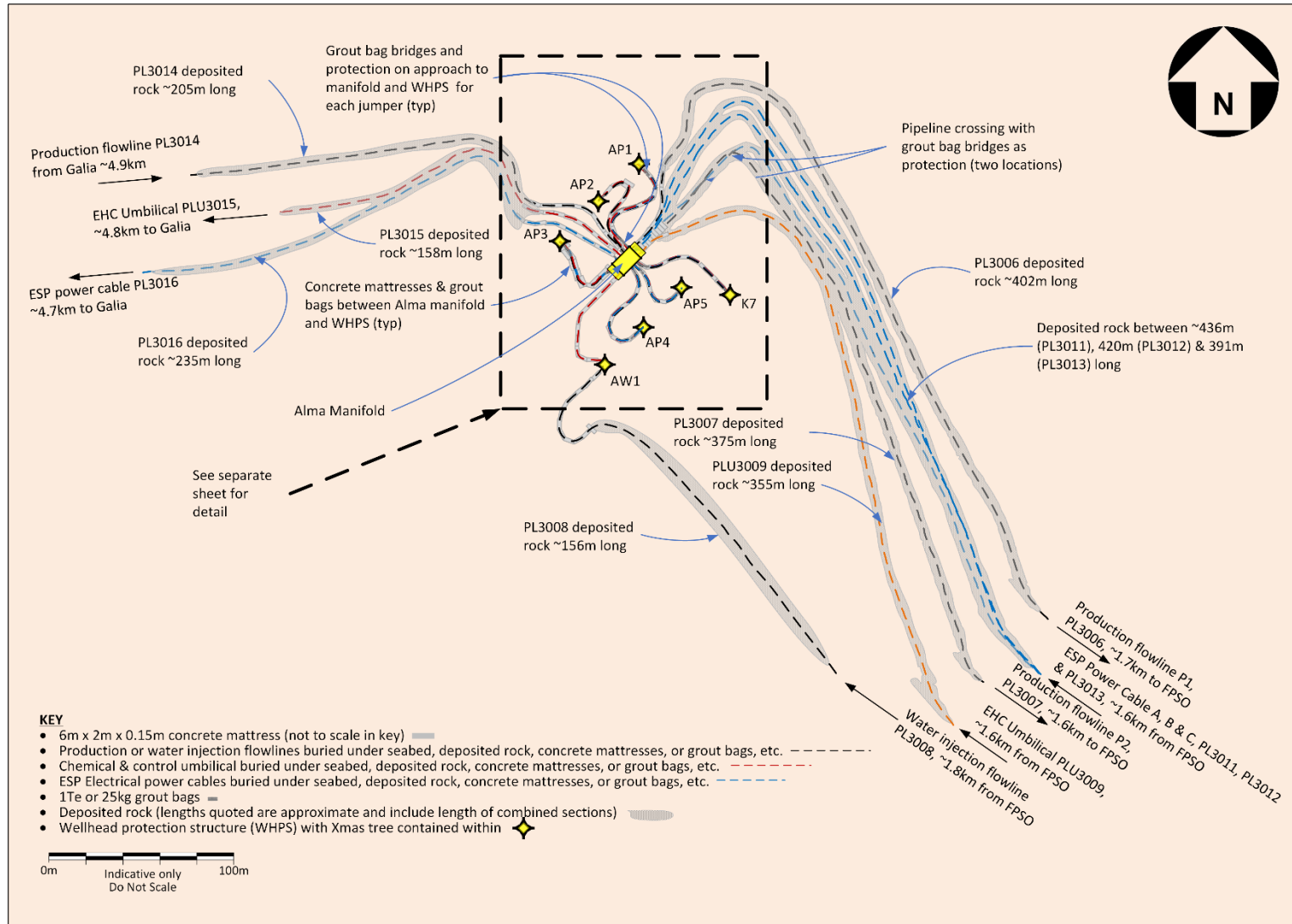


Figure 1.6.5: Overview of Alma Manifold & Well Approaches

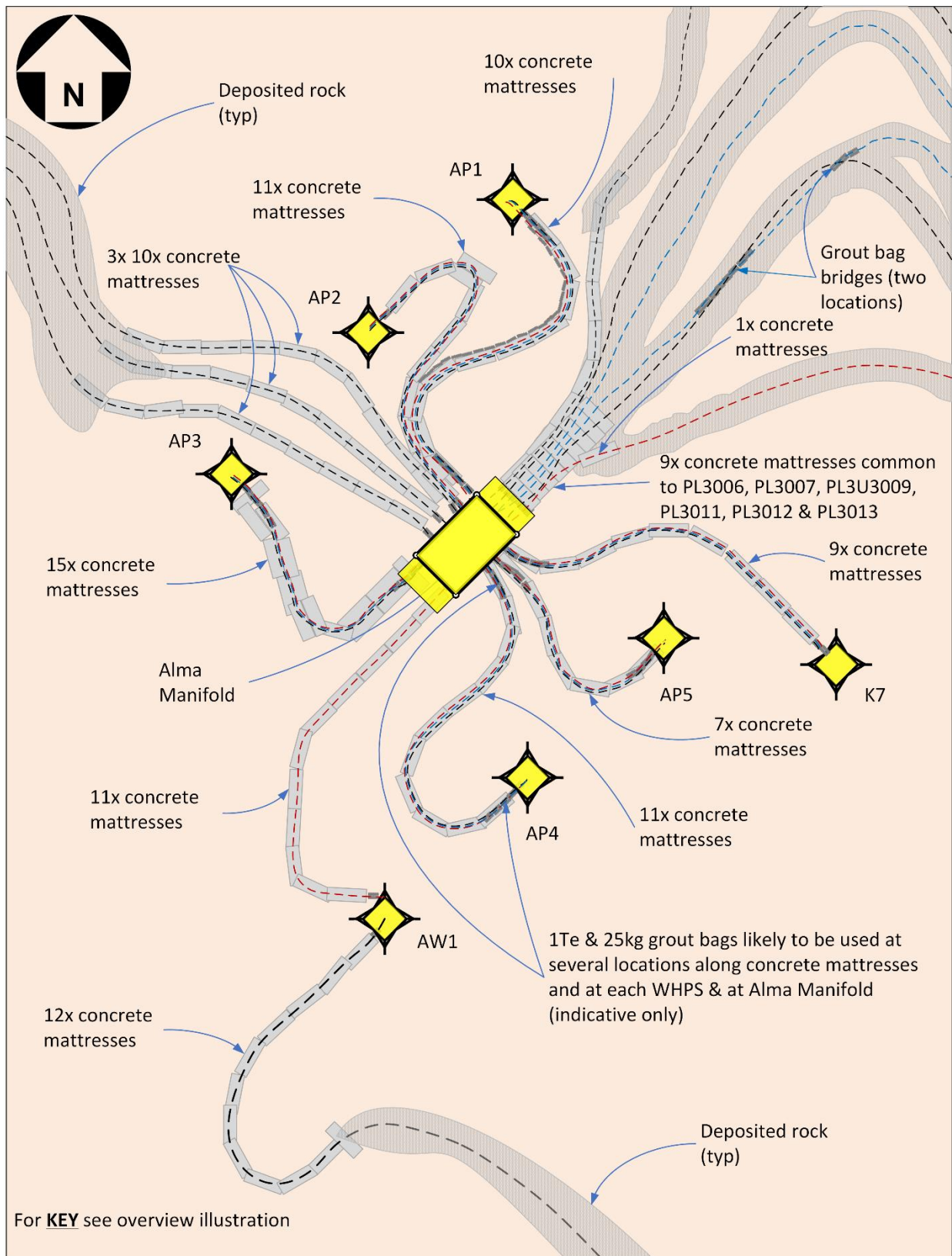


Figure 1.6.6: Detail of Alma Manifold & Well Approaches

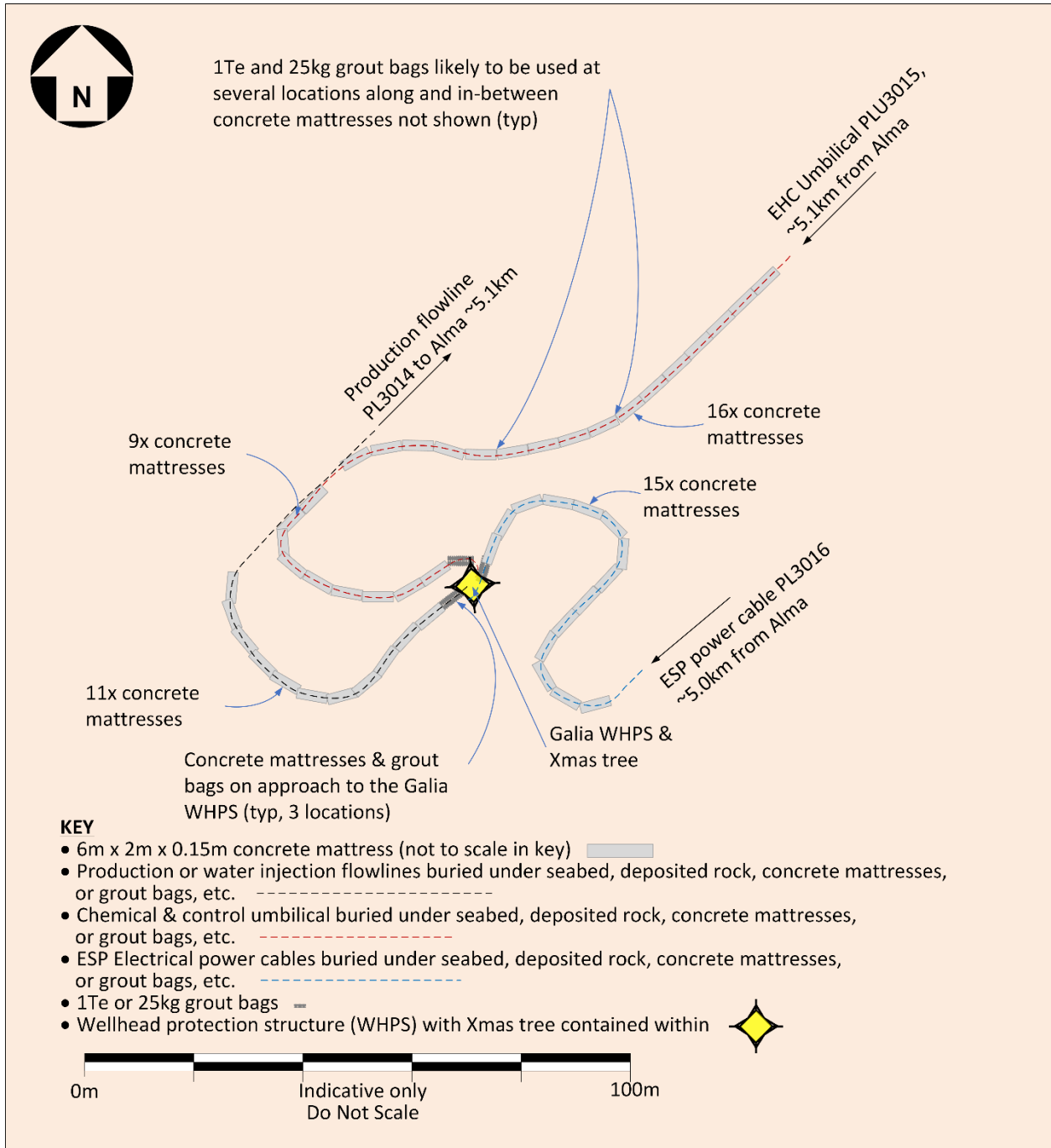


Figure 1.6.7: Overview of Galia Well Approaches

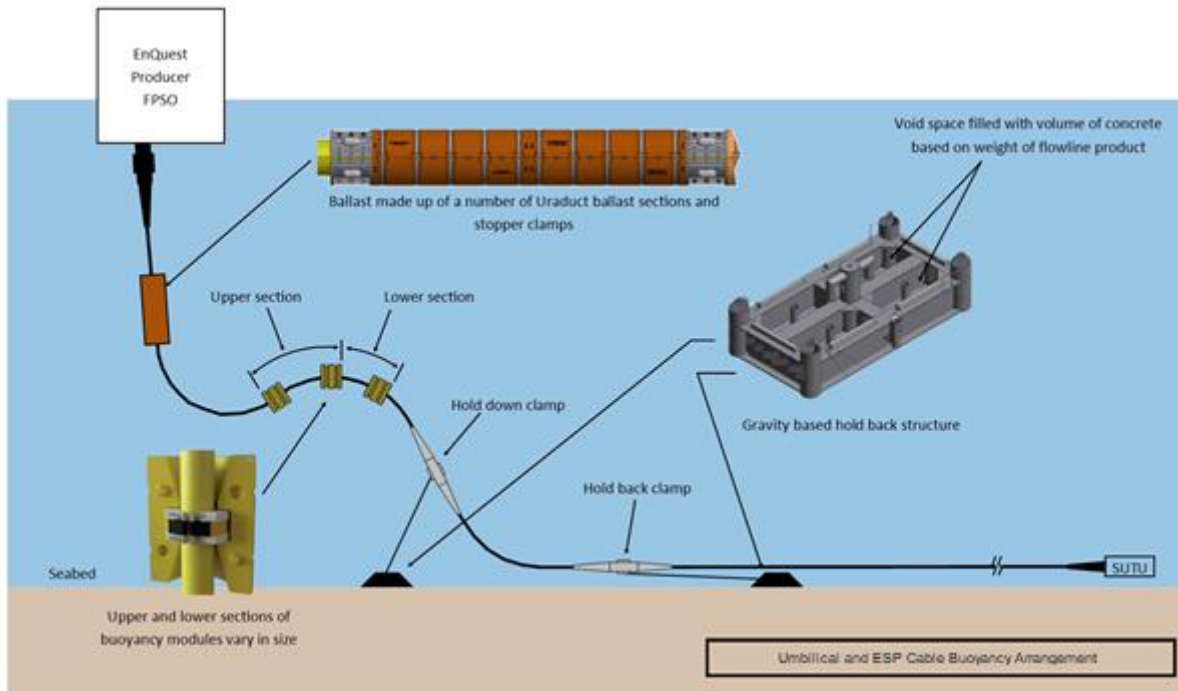


Figure 1.6.8: Overview of Umbilical and ESP Cable Buoyancy Arrangement

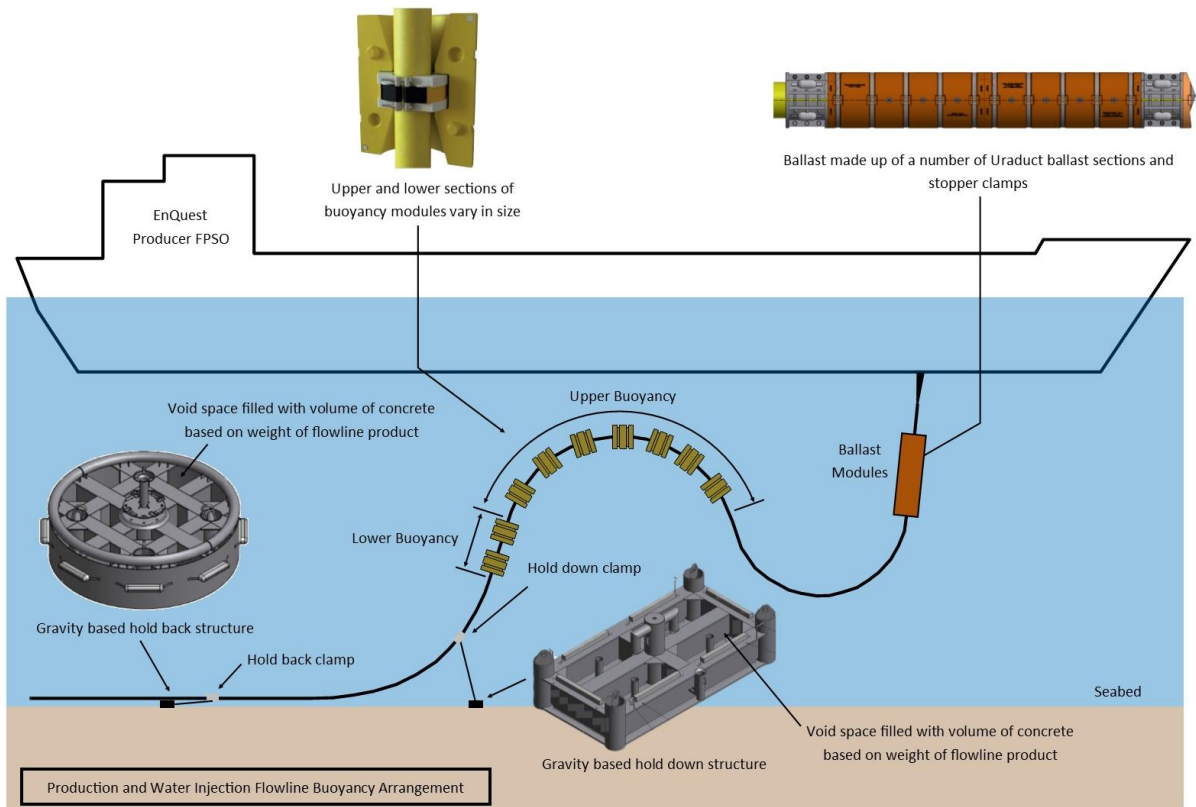


Figure 1.6.9: Overview of Production and Water Injection Flowline Buoyancy Arrangement

Table 1.6.1: Adjacent Facilities

Owner	Name	Type	Distance/Direction	Information	Status
Chrysaor Petroleum Company Limited U.K.	Judy	NORPIPE Wye Tie-In	~16.1km N of Alma ~14.1km N of Galia	24" Oil line connection to NORPIPE	Operational
EnQuest	Alma	Manifold & 7x WHPS	~4.8km NE of Galia	Connected to the EnQuest Producer	Operational
EnQuest	Galia	1x WHPS	~4.8km SW of Alma	Connected to the EnQuest Producer via Alma Manifold	Operational
Repsol Sinopec Resources Ltd	Orion	TOR Remote Wellhead	~29.8km N of Alma ~29.3km N of Galia	Tied back to the Clyde Platform	Operational
Total Oil UK Limited	Affleck	Manifold & Wellheads	~27.4km N of Alma ~28.5km N of Galia	Refer Janice, James and Affleck Decommissioning Programmes	Non-operational
Total Oil UK Limited	Janice	Gas & Oil Export SSIVs	~38.8km NW of Alma ~36.2km NW of Galia	Refer Janice, James and Affleck Decommissioning Programmes	Non-operational

Impacts of Decommissioning Proposals

There are no direct impacts on adjacent facilities from the decommissioning works associated with the Alma and Galia installations and pipelines.

As part of the environmental assessment it has been considered the potential in combination or cumulative effect of activities in the area, including decommissioning and new developments. This has been done using data that is publicly available. However, operational windows tend to include a degree of flexibility, so it is not possible to be precise. However, as part of the operational phase any potential impacts will be mitigated in two ways. The first is via direct communication with the parties involved, and the other is via submission of the MATs and SATs.

1.7 Industrial Implications

The subsea well decommissioning will be completed using a semi-submersible drilling rig. The FPSO will be taken off station with the assistance of anchor handing vessels (AHV) and ROV Support Vessel (ROVSV) or Dive Support Vessel (DSV). The activities to decommission the subsea installations and pipelines will be completed using a ROVSV, DSV, Construction Support Vessel (CSV) or Multi Support Vessel (MSV).

It is EnQuest’s intention to develop a contract strategy and Supply Chain Action Plan that will result in an efficient and cost-effective execution of the decommissioning works. Where appropriate existing framework agreements may be used for decommissioning of the pipelines and pipeline stabilisation features. EnQuest will try to combine Alma and Galia decommissioning activities with other development or decommissioning activities to reduce mobilisation costs should the opportunity arise. The decommissioning schedule is extended to allow flexibility for when decommissioning operations are carried out and completed.

2. DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

2.1 Alma Installations: Surface Facilities

Table 2.1.1: Surface Facilities Information								
Name	Facility Type	Location		Topsides/ Facilities		Mooring System		
				Weight (Te)	No of modules	Weight (Te)	Number of mooring lines & piles	Weight of piles (Te)
EnQuest Producer	FPSO	WGS84 Decimal	56.18587°N 2.78424°E	93,300	1	4,071.96	9	629.64
		WGS84 Decimal Minute	56°11.1520"N 2°47.05464"E					

2.2 Alma Installations: Subsea including Stabilisation Features

Table 2.2.1: Alma Subsea Facilities Information						
Subsea Installations Including Stabilisation Features	Number	Size / Weight (Te)	Location		Comments/ Status	
FPSO mooring piles	9	AP1 63.36Te	WGS84 Decimal	56.20539°N 2.78949°E	Cluster 1, 84in diameter piled anchors, 32m long, AP2 & AP3 top of pile 1m below seabed. AP1 top of pile 0.75m below seabed	
			WGS84 Decimal Minute	56°12.32351N 2°47.36930E		
		AP2 63.36Te	WGS84 Decimal	56.20527°N 2.79116°E		
			WGS84 Decimal Minute	56°12.31593N 2°47.46939E		
		AP3 63.36Te	WGS84 Decimal	56.20508°N 2.792788°E		
			WGS84 Decimal Minute	56°12.30486N 2°47.56726E		
		AP4 79.2Te	WGS84 Decimal	56.17716°N 2.81113°E		Cluster 2, 84in diameter piled anchors, 40m long, AP4 & AP5 top of pile 1m below seabed. AP6 top of pile 1.4m below seabed.
			WGS84 Decimal Minute	56°10.62949N 2°48.66784E		
		AP5 79.2Te	WGS84 Decimal	56.17643°N 2.81011°E		
			WGS84 Decimal Minute	56°10.58557N 2°48.60664E		

Table 2.2.1: Alma Subsea Facilities Information

Subsea Installations Including Stabilisation Features	Number	Size / Weight (Te)	Location		Comments/ Status			
		AP6 79.2Te	WGS84 Decimal	56.17573°N 2.80901°E	Cluster 3, 84in diameter piled anchors, 34m long, top of pile 1m below seabed			
			WGS84 Decimal Minute	56°10.54376N 2°48.54086E				
		AP7 67.32Te	WGS84 Decimal	56.18080°N 2.75646°E				
			WGS84 Decimal Minute	56°10.84811N 2°45.38772E				
		AP8 67.32Te	WGS84 Decimal	56.18166°N 2.75587°E				
			WGS84 Decimal Minute	56°10.89936N 2°45.35212E				
		AP9 67.32Te	WGS84 Decimal	56.18254°N 2.75533°E				
			WGS84 Decimal Minute	56°10.95269N 2°45.31956E				
		Mooring lines	9	Length - 1980m (each) Weight – 4,071.96Te (452.44Te each)		Top chain 142mm dia. studlink 700m long Sheathed Spiral Strand Rope 1150m long Bottom chain 142mm dia. studlink 130m long		Connected to anchor piles
		Xmas trees & protection structures	7	AP1 (K3) 9.2x8.8x6.7m 55.9Te		WGS84 Decimal	56.198792°N 2.762797°E	Includes weight of protection structure
						WGS84 Decimal Minute	56°11.92752N 2°45.76782E	
				AP2 (K5) 9.2x8.8x6.7m 55.9Te		WGS84 Decimal	56.198608°N 2.76245°E	Includes weight of protection structure
WGS84 Decimal Minute	56°11.91648N 2°45.747E							
AP3 (K4) 9.2x8.8x6.7m 55.9Te	WGS84 Decimal			56.198417°N 2.762114°E	Includes weight of protection structure			
	WGS84 Decimal Minute			56°11.90502N 2°45.72684E				
AP4 (K1) 9.2x8.8x6.7m 55.9Te	WGS84 Decimal			56.198014°N 2.76285°E	Includes weight of protection structure			
	WGS84 Decimal Minute			56°11.88084°N 2°45.771°E				

Table 2.2.1: Alma Subsea Facilities Information

Subsea Installations Including Stabilisation Features	Number	Size / Weight (Te)	Location		Comments/ Status
		AP5 (K2) 9.2x8.8x6.7m 55.9Te	WGS84 Decimal	56.198203°N 2.763181°E	Includes weight of protection structure
			WGS84 Decimal Minute	56°11.89218°N 2°45.79086°E	
		AP6 (K7) 9.2x8.8x6.7m 55.9Te	WGS84 Decimal	56.198342°N 2.762703°E	Includes weight of protection structure
			WGS84 Decimal Minute	56°11.9005N 2°45.7622E	
		AW1 9.2x8.8x6.7m 55.9Te	WGS84 Decimal	56.197922°N 2.762503°E	Includes weight of protection structure
			WGS84 Decimal Minute	56°11.87532°N 2°45.75018°E	
Manifold	1	17.2x9.4x5.0m 186.0Te 4x. 0.61m dia. Piles 22.0Te	WGS84 Decimal	56.198342°N 2.762703°E	Secured with four steel piles, 0.61m dia. x 14.65m long x 5.5 Te each
			WGS84 Decimal Minute	56°11.90052N 2°45.76218E	
Concrete mattresses	n/a	n/a	n/a	n/a	n/a
Grout bags	n/a	n/a	n/a	n/a	n/a
Formwork	n/a	n/a	n/a	n/a	n/a
Deposited rock	n/a	n/a	n/a	n/a	n/a
Other	n/a	n/a	n/a	n/a	n/a

2.3 Alma Pipelines including Stabilisation Features

Table 2.3.1: Alma Pipeline/Flowline/Umbilical Information									
Description	Pipeline Number (as per PWA)	Diameter (NB) (inches) ¹	Length (m) ²	Description of Component Parts	Product Conveyed	From – To End Points ³	Burial Status	Pipeline Status	Current Content
P1 Production Flowline / Hot Tap Tee / Production Riser	PL3006	10	1848	Flexible flowline Kynar® PVDF/HDPE Yellow	Produced Crude Oil	Alma manifold flange to hot tap tee tie-in flange	Trenched & buried	Operational	Produced Crude Oil
		10	5	Steel pipe with Glass Flake Epoxy coating		Hot tap tee to topside tie-in flange	Surface laid		
		8	355	Flexible riser Kynar® PVDF/PA12 Black Mix		Hot tap tee 10in Production to topsides tie-in flange	Surface laid or suspended in water		
Pipe spool	PL3006JAP1	6	25	Steel pipe with Glass Flake Epoxy coating	Produced Crude Oil		Surface laid	Operational	Produced Crude Oil
Flexible production jumper			61.8	Flexible jumper Kynar® PVDF/HDPE Yellow			Surface laid		
Pipe pool	PL3006JAP2	6	25	Steel pipe with Glass Flake Epoxy coating	Produced Crude Oil	Xmas tree flange to Alma manifold flange at each well	Surface laid	Operational	Produced Crude Oil
Flexible production jumper			57.6	Flexible jumper Kynar® PVDF/HDPE Yellow			Surface laid		
Pipe spool	PL3006JAP3	6	25	Steel pipe with Glass Flake Epoxy coating	Produced Crude Oil		Surface laid	Operational	Produced Crude Oil
Flexible production jumper			44.7	Flexible jumper Kynar® PVDF/HDPE Yellow			Surface laid		
Pipe spool	PL3006JAP4	6	25	Steel pipe with Glass Flake Epoxy coating	Produced Crude Oil	Xmas tree flange to Alma manifold flange at each well	Surface laid	Operational	Produced Crude Oil
Flexible production jumper			64	Flexible jumper Kynar® PVDF/HDPE Yellow			Surface laid		

Table 2.3.1: Alma Pipeline/Flowline/Umbilical Information

Description	Pipeline Number (as per PWA)	Diameter (NB) (inches) ¹	Length (m) ²	Description of Component Parts	Product Conveyed	From – To End Points ³	Burial Status	Pipeline Status	Current Content
Pipe spool	PL3006JAP5	6	25	Steel pipe with Glass Flake Epoxy coating	Produced Crude Oil		Surface laid	Operational	Produced Crude Oil
Flexible production jumper			40	Flexible jumper Kynar® PVDF/HDPE Yellow			Surface laid		
Pipe spool	PL3006JAP6 (K7)	6	25	Steel pipe with Glass Flake Epoxy coating	Produced Crude Oil		Surface laid	Operational	Produced Crude Oil
Flexible production jumper			57	Flexible jumper Kynar® PVDF/HDPE Yellow			Surface laid		
P2 Production riser / flowline	PL3007	10	1799	Flexible flowline Kynar® PVDF/HDPE Yellow	Produced Crude Oil	Alma manifold flange to hot tap tee tie-in flange	Trenched & buried with exposures	Operational	Produced Crude Oil
		10	5	Steel pipe with Glass Flake Epoxy coating		Hot tap tee to topside tie-in flange	Surface laid		
		8	352	Flexible riser Kynar® PVDF/PA12 Black Mix		Hot tap tee 10in production to topsides tie-in flange	Surface laid or suspended in water		
Water injection riser & flowline	PL3008	8	343	Flexible riser PA12 Natural/PA12 Black Mix	Treated water	FPSO Turret J-tube to 8in WIF tie-in flange	Surface laid or suspended in water	Operational	Treated water
		8	2111	Flexible flowline Nylon PA12 /HDPE Yellow		8in WIF tie-in flange to AW1 well 8in tee piece	Trenched & buried with exposures		
		8	2	Steel daisy chain tee piece with Glass Flake Epoxy coating		AW1 8in tee piece to AW1 Xmas tree flange	Surface laid		
Water injection flowline jumper.	PL3008JAW2	8	52	Flexible flowline Kynar® PVDF/HDPE Yellow	Treated water	AW1 8in tee piece to AW2 8in tee piece	Surface laid	Operational	Treated water

Table 2.3.1: Alma Pipeline/Flowline/Umbilical Information

Description	Pipeline Number (as per PWA)	Diameter (NB) (inches) ¹	Length (m) ²	Description of Component Parts	Product Conveyed	From – To End Points ³	Burial Status	Pipeline Status	Current Content
		8	2	Steel daisy chain tee piece with Glass Flake Epoxy coating		AW2 well 8in tee piece to AW2 Xmas tree flange	Surface laid		
EHC Production control umbilical	PLU3009	200mm	2138	Umbilical pipeline	Signal & power cables, 8x cores	FPSO turret J-tube to Alma manifold	Part suspended in water & trenched & buried	Operational	E/H/C
EHC production control umbilical jumpers	PLU3009JAP1	100mm	78	Umbilical jumpers	Signal & power cables, 8x cores	Alma manifold to Xmas Tree for each Production Well	Surface laid	Operational	E/H/C
	PLU3009JAP2		72				Surface laid	Operational	E/H/C
	PLU3009JAP3		60				Surface laid	Operational	E/H/C
	PLU3009JAP4		79				Surface laid	Operational	E/H/C
	PLU3009JAP5		56				Surface laid	Operational	E/H/C
	PLU3009JAP6 (K7)		72				Surface laid	Operational	E/H/C
Water Injection Control jumper	PLU3009JAW1	109mm	70	Umbilical jumper	HP/LP Hydraulic	Alma manifold to each WI Xmas tree	Surface laid	Operational	Hydraulic fluids
	PLU3009JAW2		42				Surface laid	Operational	Hydraulic fluids
ESP Power Cable A	PL3011	251mm	2177	Electrical cable in plastic sheath	Electrical power	FPSO turret J-tube to Alma manifold SPCDU A	Part suspended in water & trenched & buried	Operational	Electrical

Table 2.3.1: Alma Pipeline/Flowline/Umbilical Information

Description	Pipeline Number (as per PWA)	Diameter (NB) (inches) ¹	Length (m) ²	Description of Component Parts	Product Conveyed	From – To End Points ³	Burial Status	Pipeline Status	Current Content
ESP power cable jumpers	PLU3011JAP1	54mm	2x75	Electrical cable in plastic sheath	Electrical power	Alma manifold SPCDU to Xmas tree for each well	Surface laid	Operational	Electrical
	PLU3011JAP2		2x74				Surface laid	Operational	Electrical
	PLU3011JAP3		2x68				Surface laid	Operational	Electrical
	PLU3011JAP4		2x83				Surface laid	Operational	Electrical
	PLU3011JAP5		2x59				Surface laid	Operational	Electrical
	PLU3011JAP6 (K7)		2x76				Surface laid	Operational	Electrical
ESP Power Cable B	PL3012	251mm	2150	Electrical cable in plastic sheath	Electrical power	FPSO turret J-tube to Alma manifold SPCDU B	Part suspended in water & trenched & buried	Operational	Electrical
ESP Power Cable C	PL3013	251mm	2135	Electrical cable in plastic sheath	Electrical power	FPSO turret J-tube to Alma manifold SPCDU C	Part suspended in water & trenched & buried	Operational	Electrical

NOTES

1. If diameter is expressed in mm it refers to outside diameter of electrical cable or umbilical pipeline;
2. Final pipeline lengths are as-built lengths and as such may vary slightly from lengths detailed within the PWAs;
3. The description of the End to End Points may differ slightly from those consented. Where appropriate, any affected PWAs will be updated.

Table 2.3.2: Alma Subsea Pipeline Stabilisation Features

Stabilisation Feature	Total Number	Total Weight (Te)	Location(s)	Exposed/Buried/Condition
Concrete mattresses (Note 1)	113	405.7	PL3006, x9 at Alma	Latest survey information suggests the concrete mattresses are exposed.
			PL3006, PL3007, PLU3009, PL3011, PL3012, PL3013, x9 concrete mattresses common for all pipelines at Alma	
			PL3008, x12 at Alma x8 at FPSO	
			PLU3009, x1 at Alma	
			PL3006JAP1, x10	
			PL3006JAP2, x11	
			PL3006JAP3, x15	
			PL3006JAP4, x11	
			PL3006JAP5, x7	
			PL3006JAP6, x9	
			PL3008JAW1, x11	
Grout bags (1Te gabions, Note 2)	66	66	PL3006, x 6	Latest survey information suggests these grout bags are exposed.
			PL3007, x 6	
			PL3006JAP1-6, x26	
			PLU3009, x4	
			PL3008JAW1, PL3009JAW1, x12	
PL3011, PL3012, PL3013, x12				
Grout bags (25kg, Note 2)	240	6	PL3006JAP1-6, PLU3009JAP1-6, PL3011JAP1-6, x240	Grout bags are covered under mattresses

Table 2.3.2: Alma Subsea Pipeline Stabilisation Features

Stabilisation Feature	Total Number	Total Weight (Te)	Location(s)	Exposed/Buried/Condition
Deposited Rock (Note 4)	n/a	16,692	PL3006, 3,468Te	Latest survey information would suggest that the deposited rock is exposed (buried under a light covering of seabed sediment).
			PL3007, 2,839Te	
			PL3008, 1,051Te	
			PLU3009, 2,481Te	
			PL3011, PL3012, PL3013, 6,853Te	
Riser ballast modules	342 half shells 58 clamps	96.6	PL3006 13.7Te ballast (50 half shells & 10 clamps)	Connected to risers
			PL3007 13.7Te ballast (50 half shells & 10 clamps)	
			PL3008 12.3Te ballast (50 half shells & 10 clamps)	
			PLU3009 10.1Te ballast (48 half shells & 7 clamps)	
			PL3011 15.6Te ballast (48 half shells & 7 clamps)	
			PL3012 15.6Te ballast (48 half shells & 7 clamps)	
			PL3013 15.6Te ballast (48 half shells & 7 clamps)	
Riser buoyancy modules	99 Upper 67 Lower	103.3	PL3006 6.7Te upper (14) 7.0Te lower (9)	Connected to risers
			PL3007 6.7Te upper (14) 7.0Te lower (9)	
			PL3008 6.6Te upper (14) 5.7Te lower (9)	
			PLU3009 6.2Te upper (15) 7.3Te lower (10)	
			PL3011 7.9Te upper (14) 8.7Te lower (10)	
			PL3012 7.9Te upper (14) 8.7Te lower (10)	
			PL3013 7.9Te upper (14) 8.7Te lower (10)	

Table 2.3.2: Alma Subsea Pipeline Stabilisation Features

Stabilisation Feature	Total Number	Total Weight (Te)	Location(s)	Exposed/Buried/Condition
Riser Bases Flexible riser hold down (5.8 x 3.3 x 2.1m), 54.1Te Umbilical & ESP power cable hold back (6.0 x 2.8 x 1.2m), 55.5Te Flexible riser hold back (Ø4.9 x 1.4m), 55.7Te ESP power cable hold back (5.5 x 2.8 x 1.8m), 88.7Te Umbilical holdback (5.5 x 2.8 x 1.8m), 60.1Te	7 Hold Down Structures	877.6	PL3006 54.1Te	Gravity based structures
			P3007 54.1Te	
			PL3008 54.1Te	
			PLU3009 55.5Te	
			PL3011 55.5Te	
			PL3012 55.5Te	
			PL3013 55.5Te	
	7 Hold Back Structures		PL3006 55.7Te	
			P3007 55.7Te	
			PL3008 55.7Te	
			PLU3009 60.1Te	
			PL3011 88.7Te	
			PL3012 88.7Te	
			PL3013 88.7Te	
FronDED Mats	n/a	n/a	n/a	n/a
Other (describe briefly)	n/a	n/a	n/a	n/a

NOTES

1. Concrete mattresses are 'Pipeshield' Type 1: 6m x 3m x 0.15m c/w 16mm diameter polypropylene rope; Approx. weight each mattress 3.59Te;
2. The quantity of 1Te and 25kg grout bags is based on design information and deposit consents and so the quantities should be considered indicative only, as they are not 'as-built';
3. All JAP6 related jumpers connect to well K7;
4. The quantity of deposited rock may differ from that described on the original PWA application; the quantities quoted here are based on 'as-built' data.

2.4 Alma Wells

Table 2.4.1: Alma Well Information			
Well ID	Designation	Status	Category of Well
30/24c-K1	Oil production	In Service	SS-3-1-1
30/24c-K2	Oil production	In Service	SS-3-1-1
30/24c-K3	Oil production	In Service	SS-3-1-1
30/24c-K4	Oil production	In Service	SS-3-1-1
30/24c-K5	Oil production	In Service	SS-3-1-1
30/24c-K6	Oil production	Partially decommissioned	SS-0-1-1
30/24c-K7	Oil production	In Service	SS-3-1-1
30/24c-W1	Water injection	Shut In	SS-2-1-1

For details of well categorisation please refer the latest version of the Oil & Gas UK Guidelines for the Decommissioning of Wells.

2.5 Alma Drill Cuttings

Table 2.5.1: Alma Drill Cutting(s) Pile Information		
Location of Pile Centre	Seabed Area (m ²)	Estimated Volume of drill Cuttings (m ³)
These wells were drilled after changes to legislation, so no drill cuttings piles exist at Alma	n/a	n/a

2.6 Alma Inventory Estimates

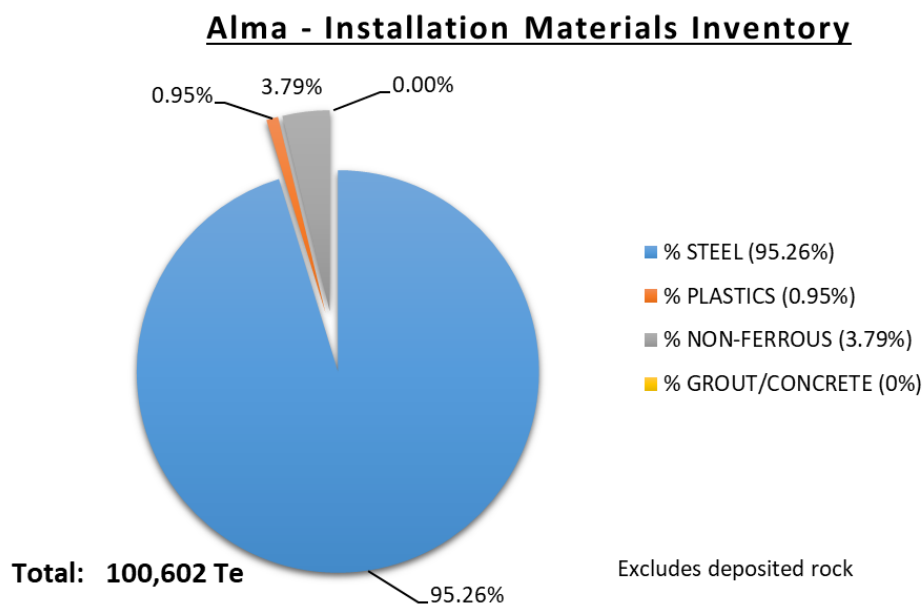


Figure 2.6.1: Pie-Chart of Material Inventory for Alma Installations

Alma - Pipeline Materials Inventory

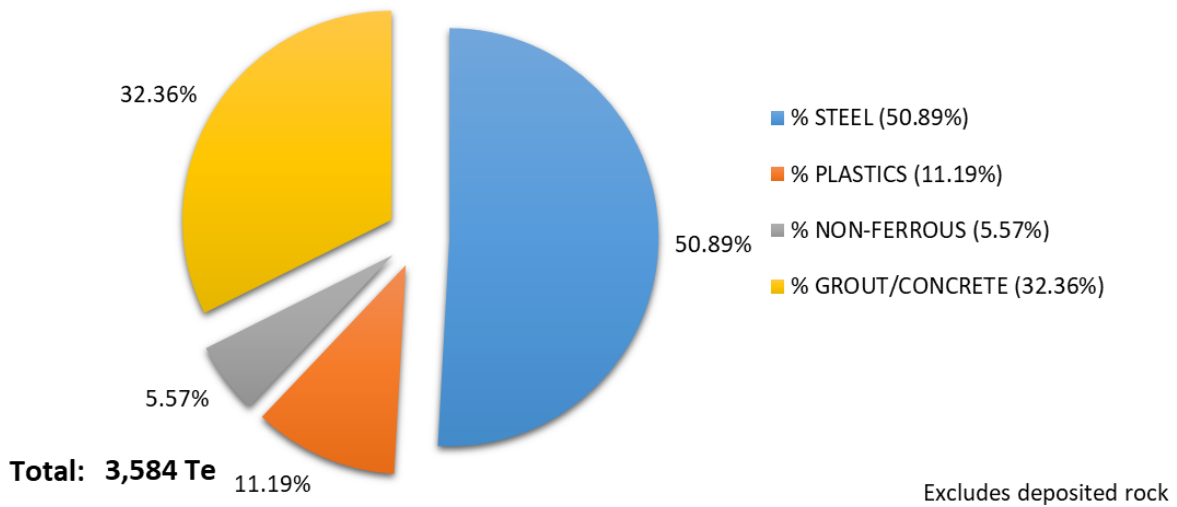


Figure 2.6.2: Pie-Chart of Material Inventory for Alma Pipelines

Refer to section 2.4 of the Environmental Appraisal [2] for further details.

2.7 Galia Installations: Subsea including Stabilisation Features

Table 2.7.1: Galia Subsea Facilities Information					
Subsea Installations Including Stabilisation Features	Number	Size / Weight (Te)	Location		Comments/ Status
Xmas trees & protection structures	1	GP1 9.2x8.8x6.7m 55.9Te	WGS84 Decimal	56.1558°N 2.688786°E	Includes weight of protection structure
			WGS84 Decimal Minute	56°9.348N 2°41.32716E	
Concrete mattresses	n/a	n/a	n/a	n/a	n/a
Grout bags	n/a	n/a	n/a	n/a	n/a
Formwork	n/a	n/a	n/a	n/a	n/a
Deposited rock	n/a	n/a	n/a	n/a	n/a
Other	n/a	n/a	n/a	n/a	n/a

2.8 Galia Pipelines including Stabilisation Features

Table 2.8.1: Galia Pipeline/Flowline/Umbilical Information

Description	Pipeline Number (as per PWA)	Diameter (NB) (inches)	Length (m)	Description of Component Parts	Product Conveyed	From – To End Points ³	Burial Status	Pipeline Status	Current Content
GP1 Production Flowline	PL3014	8	1	Split gate valve with DBB	Produced Crude Oil	Future tie-in valve to GP1 flowline tee	Surface laid	Operational	Produced Crude Oil
		6	4	Steel pipe with Glass Flake Epoxy coating		GP1 Xmas tree flange to 8” flexible production flowline	Surface laid		
		8	5134	Flexible flowline Kynar® PVDF/HDPE Yellow		Hot tap tee 10in Production to topsides tie-in flange	Trenched & buried		
Production control umbilical	PLU3015	200mm	8	Umbilical pipeline	Signal & power cables, 8x cores, LP/HP hydraulic	GP1 Xmas tree to SUTU on GP1 Xmas tree	Surface laid	Operational	E/H/C
			5060	Kynar® PVDF/HDPE Yellow		SUTU on GP1 Xmas tree to SUTU on Alma manifold	Trenched & buried		
ESP power cable & jumpers	PL3016 (1)	54mm	8	Electrical cable in plastic sheath	Electrical power	GP1 Xmas tree to SPCDU SP01, SP02	Surface laid	Operational	Electrical power
	PL3016 (2)	54mm							
	PL3016 (3)	145mm	5050			GP1 SPCDU to Galia SPCDU	Trenched & buried		
	PL3016 (4)	54mm	20			Galia SPCDU to Alma manifold SPCDU (A, B or C)	Surface laid		
	PL3016 (5)	54mm							

NOTES

1. If diameter is expressed in mm it refers to outside diameter of electrical cable or umbilical pipeline;
2. Final pipeline lengths are as-built lengths and as such may vary slightly from lengths detailed within the PWAs;
3. The description of the End to End Points may differ slightly from those consented. Where appropriate, any affected PWAs will be updated.

Table 2.8.2: Galia Subsea Pipeline Stabilisation Features

Stabilisation Feature	Total Number	Total Weight (Te)	Location(s)	Exposed/Buried/Condition
Concrete mattresses (Note 1)	51 Galia 30 Alma	290.8	PL3014, x21 (x10 at Alma and x11 at Galia)	Latest survey information suggests the concrete mattresses are exposed.
			PLU3015, x35 (x10 at Alma and x25 at Galia)	
			PL3016, x25 (x10 at Alma and x15 at Galia)	
Grout bags (1Te gabions, Note 2)	9.5	9.5	PL3014, x6	Latest survey information suggests the grout bags are exposed.
			PLU3015, x1.5	
			PL3016, x2	
Grout bags (25kg, Note 2)	75	1.875	PLU3015, x50	The burial status of these grout bags is not known.
			PL3016, x25	
Deposited Rock (Note 3)	n/a	3,746	PL3014, 1,509Te Refer Figure 1.6.6 and Figure 1.6.7.	Latest survey information would suggest that the deposited rock is exposed, buried under a light covering of seabed sediment.
			PLU3015, 865Te Refer Figure 1.6.6 and Figure 1.6.7.	Latest survey information would suggest that the deposited rock is exposed, buried under a light covering of seabed sediment.
			PL3016, 1,372Te. Refer Figure 1.6.6 and Figure 1.6.7.	Latest survey information would suggest that the deposited rock is exposed, buried under a light covering of seabed sediment.
FronDED Mats	n/a	n/a	None found in 'as-built' documentation	n/a
Other (describe briefly)	n/a	n/a	n/a	n/a

NOTES

- Concrete mattresses are 'Pipeshield' Type 1: 6m x 3m x 0.15m c/w 16mm diameter polypropylene rope; Approx. weight of each mattress 3.59Te;
- The quantity of 1Te and 25kg grout bags is based on design information and deposit consents and so the quantities should be considered indicative only, as they are not 'as-built';
- The quantity of deposited rock may differ from that described on the original PWA application; the quantities quoted here are based on 'as-built' data.

2.9 Galia Wells

Table 2.9.1: Galia Well Information			
Well ID	Designation	Status	Category of Well
30/24c-G1	Oil production	In Service	SS-3-1-1

For details of well categorisation please refer the latest version of the Oil & Gas UK Guidelines for the Decommissioning of Wells.

2.10 Galia Drill Cuttings

Table 2.10.1: Galia Drill Cutting(s) Pile Information		
Location of Pile Centre	Seabed Area (m ²)	Estimated Volume of drill Cuttings (m ³)
These wells were drilled after changes to legislation so no drill cuttings pile exists at Galia	n/a	n/a

2.11 Galia Inventory Estimates

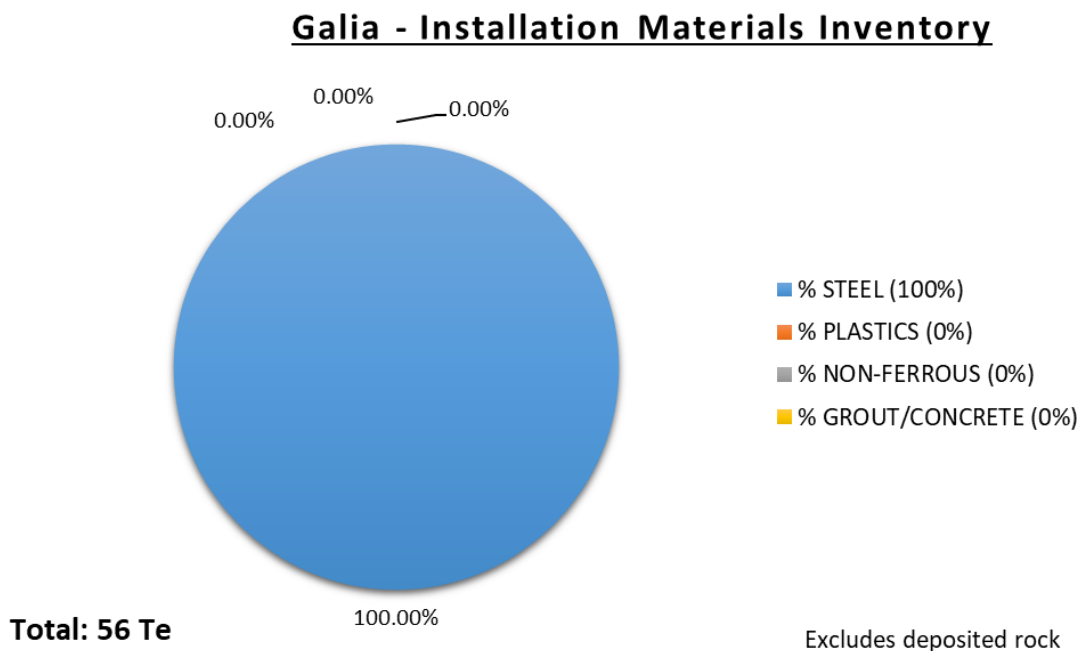
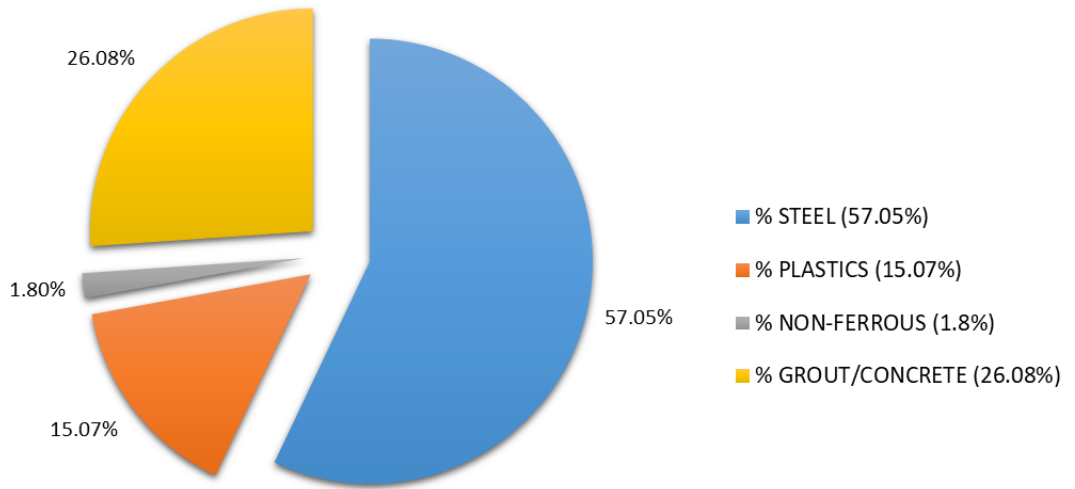


Figure 2.11.1: Pie-Chart of Material Inventory for Galia Installations

Galia - Pipeline Materials Inventory



Total: 1,159 Te

Excludes deposited rock

Figure 2.11.2: Pie Chart of Material Inventory for Galia Pipelines

Refer to section 2.4 of the Environmental Appraisal [2] for further details.

3. REMOVAL AND DISPOSAL METHODS

Waste will be dealt with in accordance with the Waste Framework Directive. The re-use of an installation, pipeline, umbilical pipeline or cable – or parts thereof, is first in the order of preferred decommissioning options. Options for re-use of an installation, pipeline, umbilical pipeline or cable – or parts thereof are currently under investigation. Waste generated during decommissioning will be segregated by type and periodically transported to shore in an auditable manner through licensed waste contractors. Steel and other recyclable metals are estimated to account for the greatest proportion of the materials inventory. Refer to Section 2.4 of the Environmental Appraisal [2] for further details concerning the disposal of waste.

3.1 Installations - Surface Facilities, FPSO

The FPSO will be towed from the field to a suitable quayside for preparation for re-use or decommissioning, the fate of which will be determined by the owner. The owner will be responsible for taking reasonable measures to assure itself that proposals to re-use the vessel will be credible, and that disposal of the FPSO will be in compliance with the IMO Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships.

Preparation and cleaning: The methods that will be used to vent and purge the FPSO prior to removal to shore are summarised in Table 3.1.1.

Table 3.1.1: Cleaning of FPSO for removal		
Waste type	Composition of Waste	Disposal Route
On-board hydrocarbons	Full recovery	Where possible, on-board hydrocarbons will be evacuated to tanker with residual materials being pumped into a donor well. Should this approach be unsuccessful, on-board hydrocarbons will be returned to shore for separation and use.
Other hazardous materials	The presence of NORM will be identified.	NORM, if present, will be disposed of in accordance with the appropriate permit.

Table 3.1.2: Topping Removal Methods	
1) Semi-Submersible Crane Vessel <input type="checkbox"/> ; 2) Monohull Crane Vessel <input type="checkbox"/> ; 3) Shear Leg Vessel <input type="checkbox"/> ; 4) Jack up Work barge <input type="checkbox"/> ; 5) Piece small or large <input type="checkbox"/> ; 6) Complete with jacket <input type="checkbox"/> ; 7) Other <input checked="" type="checkbox"/>	
Method	Description
Proposed removal method and disposal route	<p>The FPSO will be released from its moorings after all risers, flowlines and jumpers having been cleaned, flushed, cut and removed. The FPSO will then be towed to a suitable quayside where it will be refurbished for re-use or to an alternative location at a licensed facility to be decommissioned.</p> <p>The opportunities for re-use are still to be confirmed.</p> <p>A final decision on any decommissioning activities will be made following a commercial tendering process.</p>

3.2 Installations - Subsea Facilities & Stabilisation Features

Table 3.2.1: Subsea Installations & Stabilisation Features			
Subsea installations and stabilisation features	Number	Option	Disposal Route (if applicable)
FPSO mooring piles	9	Leave <i>in situ</i> ²	n/a
Mooring lines	9	Complete recovery with exception of a short section of buried chain (3x22.5m, 3x39.0m, 3x14.5m) that will be cut and left <i>in situ</i> .	Return to shore for re-use or recycling.
Xmas trees & protection structures	8	Complete recovery	Return to shore for re-use or recycling
Manifold	1	Complete recovery.	Piles will be severed at 1.0m below seabed. ³

3.3 Pipelines, Umbilicals and Cables

*Key to options:

1. **Complete removal** – This involves the complete removal of the pipelines by whatever means would be most practicable and acceptable from a technical perspective;
2. **Partial removal** – This will involve removing exposed, poorly buried or potentially unstable sections of pipelines. Necessary remedial work will be carried out to make the remaining pipeline safe for leaving the remainder *in situ*; Please note, this option is only relevant for those pipelines that have known exposures, either because of upheaval buckling or because of poor depth of cover. There will likely be a need to verify their status via future surveys;
3. **Leave *in situ*** – This involves leaving the pipeline *in situ* with no remedial works but possibly needing to verify their status via future surveys.

Table 3.3.1: Pipeline or Pipeline Groups Decommissioning Options			
Pipeline or Group	Condition of line/group (Surface laid/Trenched/Buried/ Spanning)	Whole or part of pipeline/group	Decommissioning options considered
Alma Pipelines			
PL3006, PL3006JAP1-6	Flowline trenched and buried, riser suspended in water, pipe spools and jumpers are surface laid	8in Riser, 10in flowline, & associated 6in pipe spools & jumpers	1 (Riser) 1 & 3 (Flowline) 1 (Pipe spools & jumpers)
PL3007	Flowline trenched and buried with exposures, riser suspended in water	8in Riser, 10in flowline	1 (Riser) 1 & 3 (Flowline)
PL3008, PL3008JAW2	Water injection flowline trenched and buried with exposures, riser suspended in water, jumpers are surface laid	8in riser, 8in flowline, 8in jumper	1 (Riser) 1 & 3 (Flowline) 1 (Pipe spools & jumpers)
PLU3009, PLU3009JAP1-6, PLU3009JAW1-2	Umbilical pipeline trenched and buried, and part suspended in	Umbilical pipeline and associated electrical and hydraulic jumpers	1 & 2 (umbilical) 1 (umbilical jumpers)

² This option was determined as a result of a comparative assessment. Given the stability of the seabed, the mooring piles will remain sufficiently buried with no intervention required;

³ Given the stability of the seabed the top of the piles will remain sufficiently buried.

Table 3.3.1: Pipeline or Pipeline Groups Decommissioning Options			
Pipeline or Group	Condition of line/group (Surface laid/Trenched/Buried/ Spanning)	Whole or part of pipeline/group	Decommissioning options considered
	water, umbilical jumpers are surface laid		
PL3011, PL3011JAP1-6	Electrical power cable part suspended in water, part trenched and buried with short exposure, electrical jumpers are surface laid	Electrical power cable and associated jumpers	1, 2 & 3 (electrical power cable); 1 (electrical jumpers)
PL3012	Electrical power cable part suspended in water, part trenched and buried with short exposures	Electrical power cable	1, section suspended in water; 1, 2 & 3
PL3013	Electrical power cable part suspended in water, part trenched and buried with short exposures	Electrical power cable	1, section suspended in water; 1, 2 & 3
Galia Pipelines			
PL3014	Flowline trenched and buried with exposures, pipe spools and valves at ends	Flowline and associated pipe spools and valves	1, 2 & 3 (flowline) 1 (pipe spools & valves)
PLU3015	Umbilical pipeline trenched and buried	Umbilical pipeline and umbilical jumper	1 & 3 (umbilical pipeline) 1 (umbilical jumpers)
PL3016	Electrical jumpers on GP1 tree and at Alma manifold, electrical cable trenched and buried,	Electrical cable and electrical jumpers	1 & 3 (Electrical cable) 1 (Electrical jumpers)

All surface laid equipment including flexible flowlines, risers that have not been trenched or buried will be completely recovered from the seabed and taken to shore for re-use or recycling or final disposal.

A comparative assessment of the decommissioning options was performed where each decommissioning option was qualitatively assessed against Safety, Environment, Technical and Societal Impact and Cost. Refer [1] for details.

3.3.1 Outcome of Comparative Assessment

Table 3.3.2: Outcomes of Comparative Assessment		
Pipeline or Group	Recommended Option	Justification
PL3006, PL3006JAP1-6	Completely remove the 8in riser (355m long) between the FPSO and the hot tap tee riser flange. Completely remove the 10in hot-tap tee (5m long), the 10in flowline (1848m long), pipe spools (6x25m long) and 6x6in jumpers (61.8m, 57.6m, 44.7m, 64m, 40m and 57m long respectively).	Leaves a clear seabed free of potential snagging hazards. Avoids need for future monitoring activities.
PL3007	Completely remove the riser (352m long) between the FPSO and the hot tap tee riser flange. Completely remove the hot-tap tee (5m long) and 10in flowline (1799m long).	Leaves a clear seabed free of potential snagging hazards. Avoids need for future monitoring activities.

Table 3.3.2: Outcomes of Comparative Assessment		
Pipeline or Group	Recommended Option	Justification
PL3008, PL3008JAW2	Completely remove the 8in riser (343m long) between the FPSO and the water injection flowline tie-in flange. Completely remove the 8in water injection flowline (2111m long) and the daisy chain tee piece (2m long). Completely remove water injection flowline jumper (52m long) and associated 8in daisy chain tee piece.	Leaves a clear seabed free of potential snagging hazards. Avoids need for future monitoring activities.
PLU3009, PLU3009JAP1-6, PLU3009JAW1-2	Completely remove the umbilical pipeline (2138m long). Completely remove the associated umbilical pipeline electrical jumpers (78m, 72m, 60m, 79m, 56m, and 72m long respectively). Completely remove the associated umbilical pipeline hydraulic jumpers (70m and 42m long respectively).	Leaves a clear seabed free of potential snagging hazards. Avoids need for future monitoring activities.
PL3011, PL3011JAP1-6	Completely remove the ESP power cable A (2177m long) and associated power cable jumpers (2x75m, 2x74m, 2x68m, 2x83m, 2x59m and 2x76m long respectively).	Leaves a clear seabed free of potential snagging hazards. Avoids need for future monitoring activities.
PL3012	Completely remove the ESP power cable B (2150m long).	Leaves a clear seabed free of potential snagging hazards. Avoids need for future monitoring activities.
PL3013	Completely remove the ESP power cable C (2135m long).	Leaves a clear seabed free of potential snagging hazards. Avoids need for future monitoring activities.
PL3014	Completely remove split gate valve (1m long) complete with pipe spool (4m long) and the 8in flowline (5134m long).	Leaves a clear seabed free of potential snagging hazards. Avoids need for future monitoring activities.
PLU3015	Completely remove the umbilical pipeline (5060m long) along with the umbilical jumper (8m long).	Leaves a clear seabed free of potential snagging hazards. Avoids need for future monitoring activities.
PL3016	Completely remove the ESP power cable (5050m long) and associated jumpers (2x8m long & 2x20m long respectively).	Leaves a clear seabed free of potential snagging hazards. Avoids need for future monitoring activities.

3.4 Pipeline Stabilisation Features

All concrete mattresses will be recovered to shore unless noted otherwise.

Table 3.4.1: Pipeline Stabilisation Features			
Stabilisation Features	Number	Description	Disposal Route (if applicable)
	113	PL3006, x9 at Alma	Recover the exposed concrete mattresses to shore
		PL3006, PL3007, PLU3009, PL3011,	

Table 3.4.1: Pipeline Stabilisation Features

Stabilisation Features	Number	Description	Disposal Route (if applicable)
Alma field related concrete mattresses		PL3012, PL3013 , x9 at Alma	for re-use, recycling or disposal.
		PL3008 , x12 at Alma x8 at FPSO	
		PLU3009 , x1 at Alma	
		PL3006JAP1 , x10	
		PL3006JAP2 , x11	
		PL3006JAP3 , x15	
		PL3006JAP4 , x11	
		PL3006JAP5 , x7	
		PL3006JAP6 , x9	
		PL3008JAW1 , x11	
Galia field related concrete mattresses	81	PL3014 , x21 (x10 at Alma and x11 at Galia)	Recover the exposed concrete mattresses to shore for re-use, recycling or disposal.
		PLU3015 , x35 (x10 at Alma and x25 at Galia)	
		PL3016 , x25 (x10 at Alma and x15 at Galia)	
Alma field grout bags (1Te Gabions)	66	PL3006 , x6	Recover exposed 1Te grout bags to shore for re-use, recycling or disposal
		PL3007 , x6	
		PL3006JAP1-6 , x26	
		PLU3009 , x4	
		PL3008JAW1, PL3009JAW1 , x12	
PL3011, PL3012, PL3013 , x12			
Galia field grout bags (1Te Gabions)	9.5	PL3014 , x6	Recover exposed 1Te grout bags to shore for re-use, recycling or disposal
		PLU3015 , x1.5	
		PL3016 , x2	
Alma grout bags (25kg)	240	PL3006JAP1-6, PLU3009JAP1-6, PL3011JAP1-6 , x240	Recover exposed grout bags to shore for re-use, recycling or disposal
Galia grout bags (25kg)	75	PLU3015 , x50	Recover exposed grout bags to shore for re-use, recycling or disposal
		PL3016 , x25	
Riser bases	14	PL3006, P3007, PL3008, PLU3009, PL3011, PL3012 and PL3013 , x2 per riser	Recover structures to shore for re-use, recycling or disposal.
Alma deposited rock	16,692Te	Interspersed along the Alma related pipeline routes	After dispersal following complete recovery of pipelines, umbilical pipelines and electrical power cables, leave <i>in situ</i>
Galia deposited rock	3,746Te	Interspersed along the Galia related pipeline routes	After dispersal following complete recovery of pipelines, umbilical pipelines

Table 3.4.1: Pipeline Stabilisation Features

Stabilisation Features	Number	Description	Disposal Route (if applicable)
			and electrical power cables, leave <i>in situ</i>

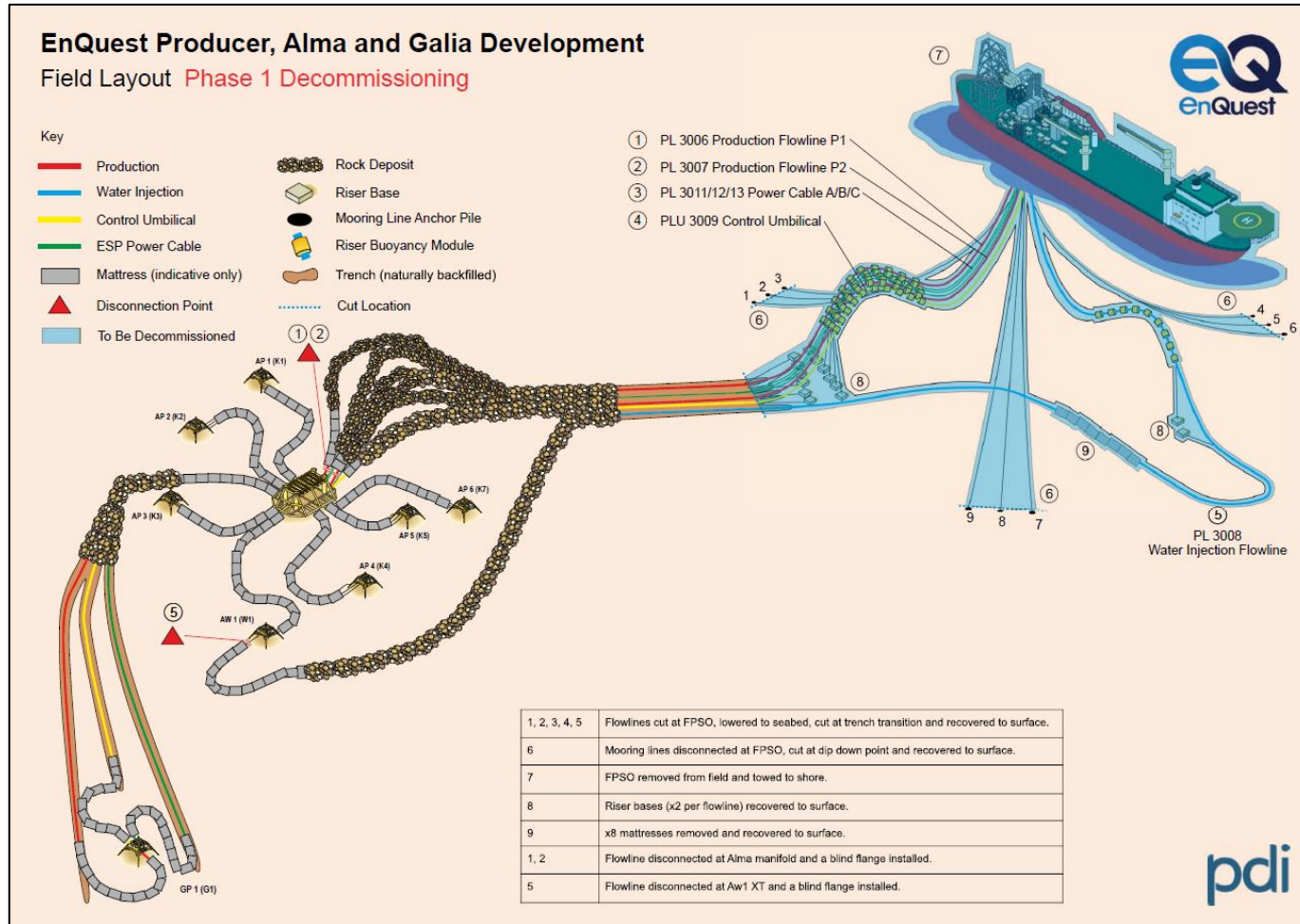


Figure 3.4.1: Overview of Alma & Galia Decommissioning Proposals (Phase 1)^{4 5}

⁴ The decommissioning works will be carried out in two phases. 1) FPSO sail away and 500m zone clean up; Phase 2) decommissioning of remaining installations and infrastructure;

⁵ The cut pipeline ends will meantime be protected using the mattresses recovered from the water injection flowline inside the 500m zone.

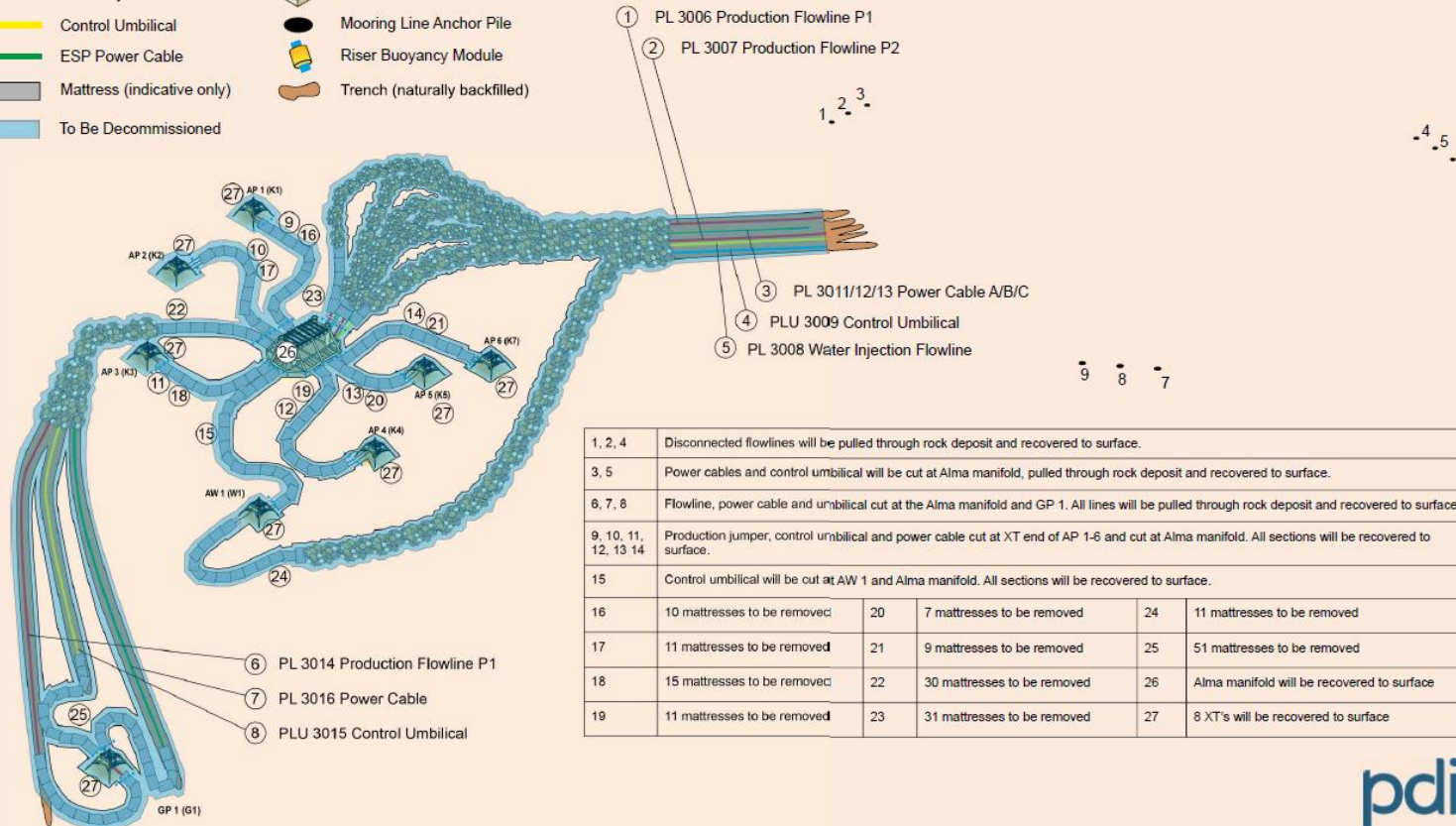
EnQuest Producer, Alma and Galia Development

Field Layout Phase 2 Decommissioning



Key

- Production
- Water Injection
- Control Umbilical
- ESP Power Cable
- Mattress (indicative only)
- To Be Decommissioned
- Rock Deposit
- Riser Base
- Mooring Line Anchor Pile
- Riser Buoyancy Module
- Trench (naturally backfilled)



1, 2, 4					Disconnected flowlines will be pulled through rock deposit and recovered to surface.				
3, 5					Power cables and control umbilical will be cut at Alma manifold, pulled through rock deposit and recovered to surface.				
6, 7, 8					Flowline, power cable and umbilical cut at the Alma manifold and GP 1. All lines will be pulled through rock deposit and recovered to surface.				
9, 10, 11, 12, 13 14					Production jumper, control umbilical and power cable cut at XT end of AP 1-6 and cut at Alma manifold. All sections will be recovered to surface.				
15					Control umbilical will be cut at AW 1 and Alma manifold. All sections will be recovered to surface.				
16		20		24		11 mattresses to be removed			
17		21		25		51 mattresses to be removed			
18		22		26		Alma manifold will be recovered to surface			
19		23		27		8 XT's will be recovered to surface			

Figure 3.4.2: Overview of Alma & Galia Decommissioning Proposals (Phase 2)



3.5 Well Decommissioning

Table 3.5.1: Well Decommissioning

The Alma and Galia fields host a total of eight production wells and one water injection well. (**Alma:** 30/24c-K1, K2, K3, K4, K5, K6, K7 and W1. **Galia:** 30/24c-G1). Well 30/24c-K6 has already been partially decommissioned. Except for K6, all the production wells contain ESPs, and so it is expected that a drilling rig will be required for Phase 1 of the well decommissioning activities. Theoretically, Phase 2 and Phase 3 of the well decommissioning could be done without using a drilling rig, but in view of the Phase 1 requirements, opportunities for cost savings will likely be limited. The wells will be decommissioned in accordance with latest version of the Oil & Gas UK Well Decommissioning Guidelines. A Master Application Template (MAT) and the supporting Supplementary Application Template (SAT) will be submitted in support of works carried out. A PON5 will also be submitted to OPRED for application to decommission the wells. Well decommissioning will be scheduled in accordance with the outline schedule presented in Section 6.3.

3.6 Waste Stream Management Methods

Table 3.6.1: Waste Stream Management Methods

Waste Stream	Removal and Disposal Method
Bulk liquids	Bulk hydrocarbons will be exported to tanker, with any residual hydrocarbons removed from the FPSO in accordance with contractual agreements with the vessel owner. Any associated bulk seawater from topsides will be cleaned and disposed overboard under permit. The production risers, pipelines and water injection flowlines will be flushed and left filled with seawater as appropriate prior to being disconnected at the ends. Any residual fluids from within these pipelines will be released to marine environment under permit prior to removal to shore. Further cleaning and decontamination will take place onshore prior to recycling / re-use or disposal.
Marine growth	Where necessary and practicable to allow access, some marine growth will be removed offshore. The remainder will be brought to shore and disposed of according to guidelines and company policies.
NORM	Based on production records to date, NORM is not expected. However, as a precaution tests for NORM will be undertaken offshore and any NORM encountered will be dealt with and disposed of in accordance with guidelines and company policies.
Asbestos	No asbestos is associated with the Alma and Galia installations or pipelines. However, any such material found will be dealt with and disposed of in accordance with guidelines and company policies.
Other hazardous wastes	Will be recovered to shore and disposed of according to guidelines and company policies and will also take place under appropriate permits.
Onshore Dismantling sites	Appropriate licensed sites will be selected. Dismantling site must demonstrate proven disposal track record and waste stream management throughout the deconstruction process and demonstrate their ability to deliver re-use and recycling options.

Table 3.6.2: Inventory Disposition			
Inventory	Total inventory (Te)	Planned to shore (Te)	Planned left <i>in situ</i> (Te)
FPSO	95,300	95,300	0
Mooring System	4,702	3,971	731
Alma Installations	600	586	14
Alma Pipelines	3,584	3,584	0
Alma Pipelines (Rock)	16,692	0	16,692
Galia Installations	56	56	0
Galia Pipelines	1,159	1,159	0
Galia Pipelines (Rock)	3,746	0	3,746
TOTAL:	125,839	104,656	21,183

Table 3.6.3: Re-use, Recycle & Disposal Aspirations for Recovered Material			
Inventory	Re-use	Recycle	Disposal (e.g. Landfill)
FPSO ¹	<5%	>95%	<5%
Alma Installations	<5%	>95%	<5%
Alma Pipelines	<5%	>95%	-
Galia Installations	<5%	>95%	<5%
Galia Pipelines	<5%	>95%	-
NOTE			
1. Preferred but subject to market conditions			

All recovered material will be transported onshore for re-use, recycling or disposal. The expectation is that any synthetic materials associated with the pipelines will be shredded and recycled. It is not possible to predict the market for re-usable materials with any confidence so the figures in Table 3.6.3 are aspirational. Refer to the Environmental Appraisal [2] for further details.

4. ENVIRONMENTAL APPRAISAL

4.1 Environmental Sensitivities

A summary of the environmental characteristics and sensitivities

Table 4.1.1: Summary of Environmental Characteristics and Sensitivities
Physical Environment <p>Water depths are between 73 and 80 metres, with shallower depths towards the SE of the area. Tidal currents have maximum rates of 0.5 knots for spring tides, with residual currents flowing towards the south. South westerly winds predominate, and mean sea surface temperatures range from 5.7°C in March to 15.5°C in August.</p>
Seabed Sediments and Contamination <p>Predominantly silty slightly shelly sands of between <1m and 4m thickness, underlain by firm to very stiff sandy gravelly clay. The east of the area is characterised by sand ripples whilst the west of the area is more homogenous, with a higher fines content. Seabed and linear depressions from historical oil and gas developments with legacy sediment contamination from historic oil-based mud discharges. Total hydrocarbon concentrations at Alma showed slightly elevated levels above background with no evidence of contamination at Galia. No discrete cuttings pile mounds present.</p>
Fish <p>Alma and Galia is in spawning grounds for mackerel (May to Aug), cod and Norway pout (Jan to Apr), whiting (Feb to Jun), sprat (May to Aug), sandeel (Nov to Feb) and plaice (Dec to Mar); and in nursery grounds for mackerel, cod, whiting, Norway pout, sandeel, plaice, haddock, spurdog, herring, blue whiting, ling, hake and anglerfish (throughout the year)</p>
Benthic Communities <p>A generally rich, evenly distributed faunal community dominated by polychaetes typical of North Sea sandy sediments. Some species considered tolerant to hydrocarbon contamination identified but abundance considered natural and representative of the wider area. 17 juvenile <i>Arctica Islandica</i> identified, primarily across the Alma site.</p>
Plankton <p>Plankton species found in the project area are typically temperate shelf sea species.</p>
Seabirds <p>The wider area is important for Auks, Kittiwake, Gannet, Fulmar, Herring Gull and Great Black-Backed Gull. However, the site is >279km offshore and has a low seabird vulnerability to surface pollution throughout the year except for the months of May and June where it increases to moderate in Block 30/25 and some adjacent Blocks.</p>
Marine Mammals <p>Atlantic white-sided dolphin, common dolphin, harbour porpoise, white-beaked dolphin and minke whale sited within the area. They are however likely to be present in very low numbers, as are grey and harbour seals which are usually restricted to 40-50km from their haul out site.</p>
Conservation Designations <p>The closest designated conservation sites to Alma and Galia are Fulmar MCZ (10.3km west of Galia), Dogger Bank SAC/SCI/MAP (77.9km to the south), Swallow Sands MCZ (86.1km west of Galia), and the East of Gannet and Montrose Fields MPA (104.4km to the north west).</p>
Commercial Fisheries <p>Commercial fishing activity within the vicinity of the project area is very low with no data for most of the year and undisclosed data in June. The project area lies with ICES rectangle 41F2. Landings are predominantly demersal species although live weight and value of fish and shellfish landings for recent years (2015-2018) were undisclosed.</p>

Table 4.1.1: Summary of Environmental Characteristics and Sensitivities

Shipping

Shipping density within the area is very low, with any traffic associated with oil and gas developments or cargo vessels.

Other Offshore Industries

Alma and Galia is at the southern end of the Central North Sea oil and gas development area. There are no other oil and gas developments in the Block.

Other Users of the Sea

There are no dredging or dumping sites or military training areas in the area. A lightly used recreational sailing route passes through the centre of Blocks 30/24 and 30/25, approximately five kilometres and six kilometres north-west of the Galia and Alma drill centres, respectively. Two degraded wrecks were identified 2.5km north east of Galia.

Environmental sensitivities are discussed in more detail in the Environmental Appraisal [2].

4.2 Potential Environmental Impacts and their Management

4.2.1 Overview

The significance of any environmental impacts and risks (potential impacts) associated with each element of the project activities were assessed. Each potential environmental impact was categorised to establish the environmental significance of any potential impact. Significance was established by combining the likelihood and consequence scores.

Most of the activities identified were ranked as low (green) environmental risk following standard mitigation and there were no activities ranked as high (orange) or very high (red) environmental risk. The impacts rated as low environmental risk were not assessed further. However, effects, controls and mitigation measures associated with these are outlined in the EA.

The activities evaluated in the ENVID as having a potential for medium environmental risk (yellow) that required further assessment were:

- Dredging and cutting of the mooring lines at the dip-down point;
- Potential exposure of pile tops and / or mooring chains beyond the dip-down point;
- Removal of pipelines, umbilicals and power cables;
- Potential use of a seabed excavator for removing sections of deposited rock;
- Excavation, disconnection and removal of seabed structures including dredging and cutting of manifold piles to 1m below seabed level.

The potential impacts associated with these planned or contingent activities that were identified as medium environmental risk requiring further assessment were related to disturbance of seabed sediments and benthic communities. More detail may be found in the Environmental Appraisal, but key control and mitigation measures are described in Table 4.2.1.

4.2.2 Key Control and Mitigation Measures

Table 4.2.1: Key Control and Mitigation Measures	
Underwater Noise	<ul style="list-style-type: none"> A SIMOPS plan for vessel activity in the field will be put in place Vessel, cutting and trenching operations will use standard methods and equipment. No explosives used.
Discharges to Sea	<ul style="list-style-type: none"> All contracted vessels will operate in line with IMO and MARPOL regulations Pipelines and spool are to be flushed, filled with inhibited seawater and isolated prior to disconnection All discharges will be permitted under applicable UK legislation
Accidental Events	<ul style="list-style-type: none"> All contracted vessels will have a ship-board oil pollution emergency plan (SOPEP) in place A Collision Risk Management Plan will be developed and implemented Agreed arrangements in place with oil spill response organisation for mobilising resources in event of a spill Existing field OPEP in place to reduce the likelihood of hydrocarbon release and define spill response in place Lifting operations will be planned to manage the risk Recovery of any dropped objects will take place Vessel contactors will have procedures for fuel bunkering that meet EnQuest's standard Where practicable, re-fuelling will take place during daylight hours only
Physical Presence of Infrastructure & Vessels	<ul style="list-style-type: none"> All vessels will comply with standard marking conditions and consent to locate conditions A SIMOPS plan for vessel activity in the field will be put in place All seabed infrastructure will be fully protected on the seabed in the interim period between Phase 1 & 2 If full seabed clearance of the FPSO 500m zone is not completed in Phase 1 a guard vessel will remain on site A survey will be undertaken over the mooring chain and pile areas to confirm full burial Remedial levelling of the seabed planned post excavation of mooring piles cutting pits and mooring chain cutting points No additional rock or protection material is planned to be added to the area Seabed clearance certificate issued post completion of activities, seabed debris and overtrawl surveys
Atmospheric Emissions & Energy Use	<ul style="list-style-type: none"> Time vessels spend in the field will be optimised, with a SIMOPS plan in place Reuse or recycling of materials will be the preferential option
Waste	<ul style="list-style-type: none"> Onshore treatment will take place at waste management site with appropriate permits and licenses UK waste disposal sites will be used where practicable
Seabed Disturbance	<ul style="list-style-type: none"> Activities which may lead to seabed disturbance planned, managed and implemented in such a way that disturbance is minimised Internal cutting of mooring piles will be used in preference where possible Natural backfill of the trenched areas, no planned mechanical backfill, or remedial seabed levelling of pipeline corridors Debris survey undertaken on completion of the activities and where possible resultant debris will be recovered Minimising disturbance to seabed from over-trawl through liaison with fishing organisations and regulator

Following the assessment undertaken during the EA process and implementation of additional control and mitigation measures where necessary, the level of environmental risk from the planned and unplanned decommissioning operations, is **low**. In addition, any cumulative impacts limited to seabed disturbance have been assessed and considered to be **low**. Therefore, the recommended options to decommission the Alma and Galia fields can be completed without causing significant impact to the environment.

In the unlikely event that the Decommissioning Programmes, there may be a requirement for a new Environmental Appraisal to be produced and submitted to OPRED. The approach will be discussed and agreed with OPRED at the time.

For further details please refer Environmental Appraisal [2].

5. INTERESTED PARTY CONSULTATIONS

5.1 General

Table 5.1.1: Summary of Stakeholder Comments		
Who	Comment	Response
INFORMAL CONSULTATIONS		
NFFO	The decommissioning proposals herein were sent via email to NFFO 11 September 2019	The NFFO had no adverse comment to make concerning the decommissioning proposals and were happy to use guidance from SFF
SFF	The decommissioning proposals herein were presented to SFF on 18 July 2019	The SFF had no adverse comment to make concerning the decommissioning proposals
STATUTORY CONSULTATIONS		
NFFO		
NIFPO		
SFF		
GMG		
Public		

6. PROGRAMME MANAGEMENT

6.1 Project Management and Verification

An EnQuest project management team will manage the operations of competent contractors selected for all decommissioning activities. The team will ensure the decommissioning is executed safely, in accordance with legislation and EnQuest Health and Safety principles. If required, changes to the Decommissioning Programmes will be discussed with OPRED with any necessary approvals sought.

6.2 Post-Decommissioning Debris Clearance and Verification

The FPSO, the Alma and Galia installation sites and respective 500m safety zones will be subject to clear seabed assessment when decommissioning activities have concluded.

Should disconnection of the FPSO and sailaway result in mooring systems and risers temporarily being left in place, the riser buoyancy modules will either be removed or the risers will be anchored so that they remain stable. A guard vessel will be used to protect local users of the sea in the area until a clear seabed has been established.

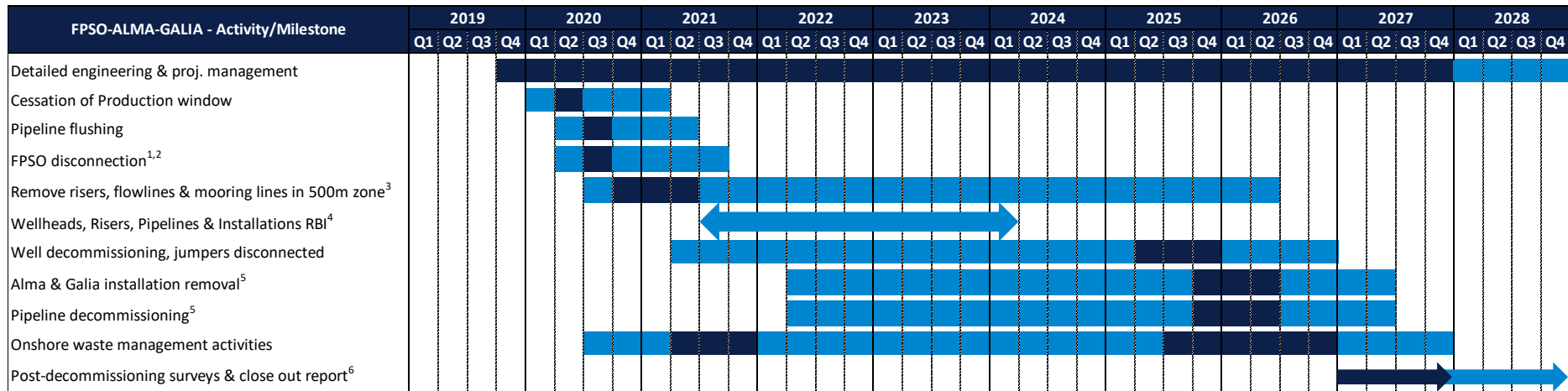
It is proposed that EnQuest will work with OPRED and SFF to investigate use of an evidence-based approach to establish an acceptable clear seabed for the anchor piles, pipelines, umbilical pipelines and power cables outside of the existing 500m safety zones and along a 100m wide corridor for all decommissioned pipelines. As the seabed is not in an environmentally sensitive area an overtrawl may be carried out to verify the condition of the seabed after decommissioning activities have been completed. In the unlikely event that an extensive amount of debris is found an overtrawl may be appropriate.

Any seabed oil and gas debris will be recovered for onshore disposal or recycling in line with existing disposal methods. Independent verification of the seabed will be obtained by surveying the FPSO 500m zone and 100m wide pipeline corridor. If an overtrawl is carried out this will be supported by a Certificate of Clearance. Evidence of a clear seabed will be included in the Close Out Report and sent to the Seabed Data Centre (Offshore Installations) at the Hydrographic Office.

6.3 Schedule

A proposed schedule is provided in Figure 6.3.1. The activities are subject to the acceptance of the Decommissioning Programmes presented in this document and any unavoidable constraints (e.g. vessel availability) that may be encountered while executing the decommissioning activities. Therefore, activity schedule windows have been included to account for this uncertainty.

The commencement of offshore decommissioning activities will depend on commercial agreements and commitments.



Notes / Key

Most likely period of activity

Activity window to allow commercial flexibility associated with well and infrastructure decommissioning activities

1. Current indications are that FPSO sailaway will be carried out Q3 2020;

2. An interim progress report will be submitted to OPRED following FPSO sailaway;

3. Removal of risers, surface laid flowlines and mooring lines within 500m zone will follow FPSO sailaway but may be deferred;

4. The Alma Galia wellheads, risers, pipelines, and installations will be subjected to a risk-based inspection regime in the intervening period between FPSO sailaway and decommissioning activities;

5. Removal of Alma & Galia installations and pipelines will be done at the same time or sometime after well decommissioning activities have been completed;

6. Post decommissioning surveys and close out reports will be prepared on completion of decommissioning activities.

Figure 6.3.1: Gantt Chart of Project Plan

6.4 Costs

Decommissioning costs will be provided separately to OPRED and OGA.

6.5 Close Out

In addition to seabed clearance verification surveys, environmental surveys may be required after decommissioning has been completed. The requirement and timing of these will be agreed with OPRED. The findings of any pipeline and stabilisation material status surveys and any environmental surveys will be completed with the findings being sent to OPRED in the Close Out report as required in the OPRED Guidance Notes. An interim progress report will be submitted after the 500m zone has been cleared. The reports will explain any variance from the Decommissioning Programmes.

6.6 Post-Decommissioning Monitoring and Evaluation

After decommissioning has been completed, pipeline status surveys will not be required, although the mooring anchor piles and chains will remain buried *in situ*. The frequency of future mooring pile status surveys after removal of the Alma and Galia installations will be agreed with OPRED and supported with risk assessments. Residual liability will remain with the Section 29 holders identified in Section 1.4, and Section 1.5. Unless agreed otherwise in advance with OPRED, EnQuest will remain the focal point for such matters, such as any change in ownership, for example.

The requirement for legacy and liability management will be described in more detail in the Close Out report.

7. SUPPORTING DOCUMENTS

- [1] EnQuest (2019) Alma-Galia Decommissioning Pipeline Comparative Assessment, M3523-PDI-ALG-EG-000-REP-0004;
- [2] EnQuest (2019) Alma-Galia Decommissioning Environmental Appraisal, M3523-PDI-ALG-EG-000-REP-0003;

APPENDIX A PUBLIC NOTICE & CONSULTEE CORRESPONDENCE

Appendix A.1 Public Notices

Appendix A.2 Correspondence with Individual Statutory Consultees