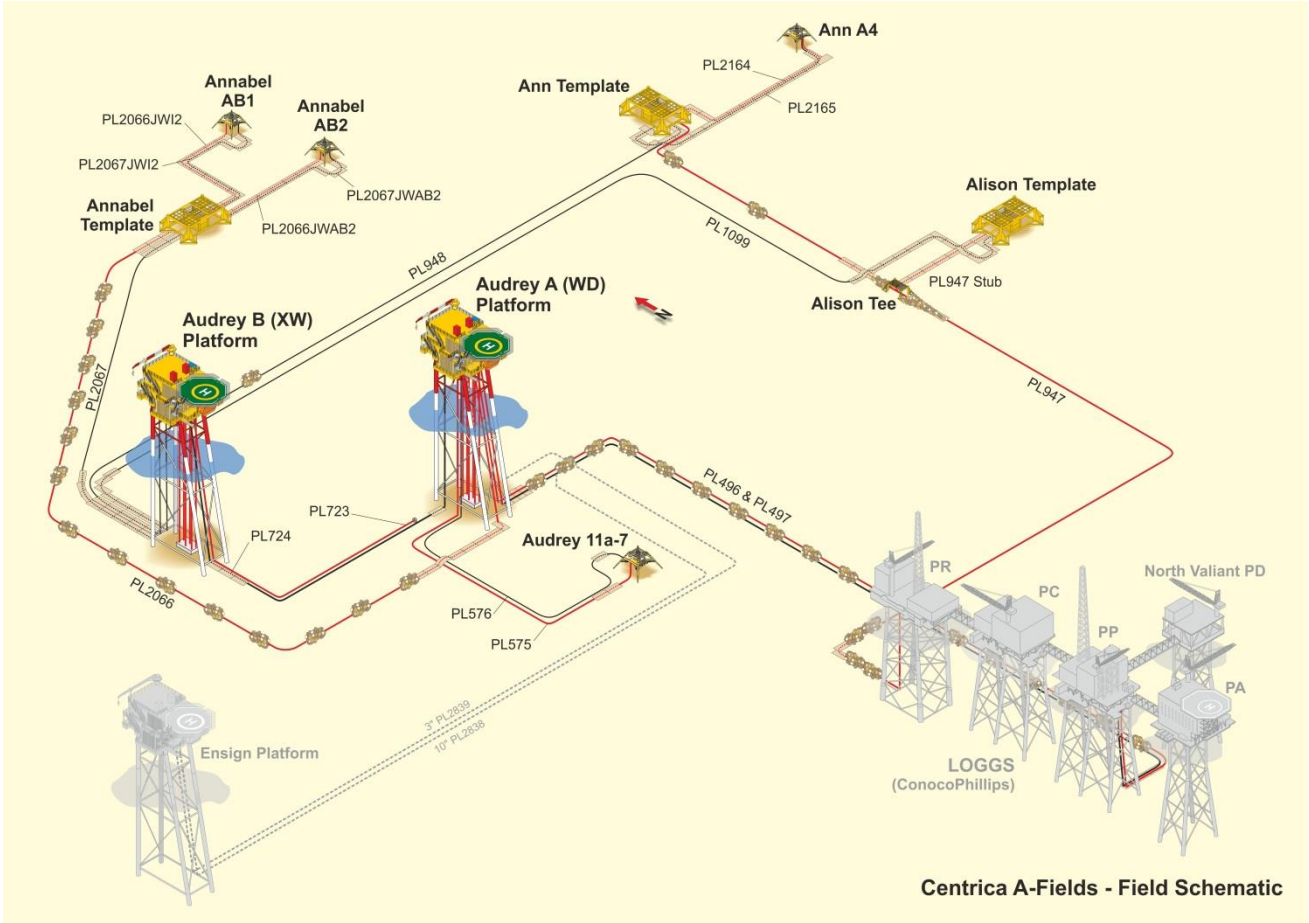
centrica

Saturn (Annabel)
Decommissioning Programmes



DOCUMENT CONTROL

Document ID:		CEU-DCM-SNS0096-REP-0014	
Document Classification:		PUBLIC	
Document Ownership:		Capital Projects	
Date of Document:	25/10/16	Signature	Date
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REVISION RECORD

Revision No.	Date of Revision	Reason for Issue
A1	21/04/17	Issued for review and comment
A2	05/05/17	Issued to BEIS for review and comment
A3	18/07/17	Re-issued to BEIS for review and comment
A4	01/09/17	Issued for Statutory Consultation

DISTRIBUTION LIST

Organisation	No. of copies
Department for Business, Energy and Industrial Strategy	1 electronic
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FIGURES AND TABLES

TABLE OF APPENDICES

TERMS AND ABBREVIATIONS

ABBREVIATION	EXPLANATION
Annabel	Two well subsea development tied back to Audrey A (WD) installation via PL2066. In official documentation such as Pipeline Works Authorisations, the "Annabel" development is often referred to as the "Saturn (Annabel)" development. For consistency the development is referred to simply as "Annabel" herein.
Audrey (A) (WD)	Four leg conventional piled steel jacket. Fixed normally unattended installation (NUI). Gas is exported to LOGGS PP via PL496.
Audrey (B) (XW)	Four leg conventional piled steel jacket. Fixed normally unattended installation, product was exported via PL723 to the Audrey A (WD) facility and via PL496 to the LOGGS complex.
BEIS	Department for Business, Energy and Industrial Strategy
BT	British Telecommunications
Centrica	Centrica North Sea Limited
CPUK	ConocoPhillips (U.K.) Limited
CSV	Construction Support Vessel
DCA	Decommissioning Operations (Master Application Template)
DOC	The blue line on the burial profiles shows the profile of cover. The area between the blue line (DOB) and maroon line (DOL) shows the backfill
DOL	Pipeline trench profile; depth of lowering (to top of pipe)
DSV	Diving Support Vessel
ea	Each
HSE	Health and Safety Executive
"	Inch; 25.4 millimetres
JNCC	Joint Nature Conservation Committee
km	Kilometre
KP	Kilometre Post (Distance along pipeline from point of origin)
LOGGS	Lincolnshire Offshore Gas Gathering System
LOGGS PP	LOGGS PP Production Platform
MAT, SAT	Master Application Template, Supplementary Application Template
MEG	Methanol and Glycol
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
NORM	Naturally Occurring Radioactive Material
OPEP	Oil Pollution Emergency Plan
OSPAR	Oslo-Paris Convention
Platform	Installation comprising topsides and jacket

ABBREVIATION	EXPLANATION
PL	Pipeline Identification Number
PLA	Pipeline Operations as defined in MAT Operation Types
PON	Petroleum Operations Notice
PTU	Platform Termination Unit
PWA	Pipeline Works Authorisation
SAC	Special Area of Conservation
SCI	Sites of Community Importance
SDU	Subsea Distribution Unit
SFF	Scottish Fishermen's Federation
SUTU	Subsea Umbilical Termination Unit
tba	To be arranged
TCM	Tree Control Module
Template	Structure through which drilling activities are conducted. It also protects wellheads, Christmas trees and piping manifold inside. For consistency, the Annabel structure is referred to as a "Template", although strictly the structure is not a template but just a protection structure.
TUTU	Topsides Umbilical Termination Unit
UK	United Kingdom
UKCS	United Kingdom Continental Shelf
WGS84	World Geodetic System 1984
WHPS	Wellhead Protection Structure

1. EXECUTIVE SUMMARY

1.1 Combined Decommissioning Programmes

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

- The Annabel installations, comprising:
  - Annabel installation (a 'manifold[1]' protection structure);
  - Annabel AB1 installation (a wellhead protection structure);
  - Annabel AB2 installation (a wellhead protection structure).
- The associated six pipelines.

Although decommissioning of the Annabel installations and pipelines is being treated in this document as a standalone project, the operational phase is being carried out as part of a wider decommissioning campaign in the A Fields area (Figure 1.6). We will also continue to explore cost saving synergies with other projects.

In official documentation such as Pipeline Works Authorisations, the "Annabel" development is often referred to as the "Saturn (Annabel)" development. For consistency the development is referred to simply as "Annabel" herein.

1.2 Requirement for Decommissioning Programmes

Installations: In accordance with the Petroleum Act 1998, Centrica North Sea Limited (Centrica) as operator of the Annabel field, and on behalf of the Section 29 notice holders (Table 1.2), is applying to the Department for Business, Energy and Industrial Strategy (BEIS) to obtain approval for decommissioning the installations detailed in Section 2 of this document.

Pipelines: In accordance with the Petroleum Act 1998, Centrica North Sea Limited as operator of the Annabel pipelines, and on behalf of the Section 29 notice holders (Table 1.4), is applying to BEIS to obtain approval for decommissioning the pipelines detailed in Section 2 of this document.

In conjunction with public, stakeholder and regulatory consultation, the Decommissioning Programmes are submitted in compliance with national and international regulations and BEIS guidance notes. The schedule outlined in this document is for a four to five-year period due to begin in 2018.

1.3 Introduction

The Annabel field lies within the main Southern North Sea (SNS) Gas Province approximately 95 miles due East of the mouth of the Humber and 55 miles North East of the North Norfolk coast in water depths of 24-30m.

The Annabel field is located in Block 48/10a in the Southern North Sea, approximately 18km North of Audrey A (WD) and 33km North of the Lincolnshire Offshore Gas Gathering System (LOGGS) platforms complex. The Annabel field was discovered in 2003 and the field achieved first production in 2005. The Annabel installations and pipelines are wholly owned by Centrica.

The Annabel installations comprise a 'template' structure with capacity for two wells, and two remote wellhead protection structures protecting Annabel AB1 and AB2. Inside the template Annabel incorporates a manifold that allows the commingling of gas (and lesser quantities of other produced fluids) from Annabel AB1 and AB2. The remote wellheads AB1 and AB2 are

[1]For consistency with illustrations and supporting documents, the Annabel installation is referred to as a 'template' herein, although strictly it is not a 'template', but a manifold protection structure.

connected to the Annabel manifold via short lengths of pipe spools and short chemical injection and control jumpers. Gas is exported via a 10” pipeline, 17.8km long, to the Audrey A (WD) installation.

A cessation of production justification for Annabel was approved by the Oil and Gas Authority on 25 August 2016.

Following public, stakeholder and regulatory consultation, the Decommissioning Programmes will be submitted without derogation and in full compliance with the BEIS guidance notes. The Decommissioning Programmes explain the principles of the removal activities and are supported by an environmental impact assessment. The Decommissioning Programme for the pipelines is also supported by a comparative assessment.

1.4 Overview of Installations/Pipelines Being Decommissioned

1.4.1 Installations

Table 1.1: Installations Being Decommissioned			
Field(s):	Annabel	**Production Type**	Gas
Water Depth (m)	Approx. 29m	**UKCS Block**	48/10a
Surface Installations			
Number	Type	Topsides Weight (Te)	Jacket Weight (Te)
n/a	n/a	n/a	n/a
Subsea Installations		**Number of Wells**	
Number	Type	Platform	Subsea
1	Template & Protection Structure	n/a	n/a
2	WHPS	n/a	2
Drill Cuttings piles		**Distance to median**	**Distance from nearest UK coastline**
Number of Piles	Total Estimated volume (m^3)	km	km
n/a	n/a	65	120

Table 1.2: Installation Section 29 Notice Holders Details		
Section 29 Notice Holder	**Registration Number**	**Equity Interest (%)**
Centrica North Sea Limited	04594558	100%
Centrica North Sea Gas Limited	SC182822	0%
Centrica Resources (UK) Limited	06791610	0%
GB Gas Holdings Limited	03186121	0%

1.4.2 Pipelines

Table 1.3: Pipelines Being Decommissioned		
Number of Pipelines / Umbilicals	6	See Table 2.3

Table 1.4: Pipelines Section 29 Notice Holders Details		
Section 29 Notice Holder	**Registration Number**	**Equity Interest (%)**
Centrica North Sea Limited	04594558	100%
Centrica North Sea Gas Limited	SC182822	0%
Centrica Resources (UK) Limited	06791610	0%
GB Gas Holdings Limited	03186121	0%

1.5 Summary of Proposed Decommissioning Programmes

Table 1.5: Summary of Decommissioning Programmes		
Selected Option	**Reason for Selection**	**Proposed Decommissioning Solution**
1. Topsides		
n/a	n/a	n/a
2. Jacket/Floating Facility (FPSO etc.)		
n/a	n/a	n/a
3. Subsea Installations		
Complete removal and recycling.	To comply with OSPAR requirements leaving unobstructed seabed. Removes a potential obstruction to fishing operations and maximises recycling of materials.	All three subsea installations will be completely removed from the seabed. The Annabel Template is gravity based while the others are attached to the wellhead. Any permit applications required for work associated with removal of the installations (DCA MAT) will be submitted.
4. Pipelines, Flowlines & Umbilicals		
PL2066 and PL2067 will be flushed and left buried *in situ*.	Outside the 500m safety zones the pipelines are already exposed to fishing activity. Both pipelines are sufficiently buried and stable, posing no hazard to marine users. Minimal seabed disturbance, lower energy usage, reduced risk to personnel engaged in the activity.	The pipelines will be left *in situ.* The pipeline ends will be excavated locally to the cut location to ensure that the ends remain buried. Surveys indicate that both pipelines will remain buried with flooding. Degradation will occur over a long period within the seabed sediment, not expected to represent a hazard to other users of the sea. Any permit applications required for work associated with pipeline pigging, flushing, cutting and removal (PLA MAT) will be submitted.
PL2066JW12, PL2066JWAB2, PL2067JW12 and PL2067JWAB2 will be completely removed	All pipelines are relatively short and are surface laid. As they are inside the 500m safety zone, historically these pipelines have not been exposed to fishing	All pipelines will be completely removed. Any permit applications required for work associated with pipeline pigging, flushing, cutting and removal (PLA MAT) will be submitted.

Table 1.5: Summary of Decommissioning Programmes		
Selected Option	**Reason for Selection**	**Proposed Decommissioning Solution**
	activities.	
5. Wells		
Wells will be plugged and abandoned to comply with HSE "Offshore Installations and Wells (Design and Construction, etc.) Regulations 1996" and in accordance with Oil & Gas UK Guidelines for the Abandonment of Wells (Issue 5, July 2015).	Meets the BEIS and HSE regulatory requirements.	The wells will be abandoned using a Jack Up Drilling Rig. A Master Application Template (MAT) and the supporting Subsidiary Application Template (SAT) will be submitted in support of activities carried out. A PON5 will also be submitted to the BEIS for application to abandon the wells.
6. Drill Cuttings		
No cuttings pile exists at Annabel.	Cuttings are widely dispersed and fall below OSPAR 2006/5 thresholds.	n/a
7. Interdependencies		
The whole of the Annabel template and two WHPS can be removed. Annabel is connected to both Audrey A (WD) and Audrey B (XW) platforms, both owned by Centrica. There are numerous third party pipeline crossings, but none of those outside of any 500m safety zone will be disturbed because of these decommissioning proposals. Pipeline stabilisation features such as concrete mattresses and grout bags will be removed as part of the pipeline decommissioning activities, but deposited rock will remain *in situ*.		

1.6 Field Location including Field Layout and Adjacent Facilities

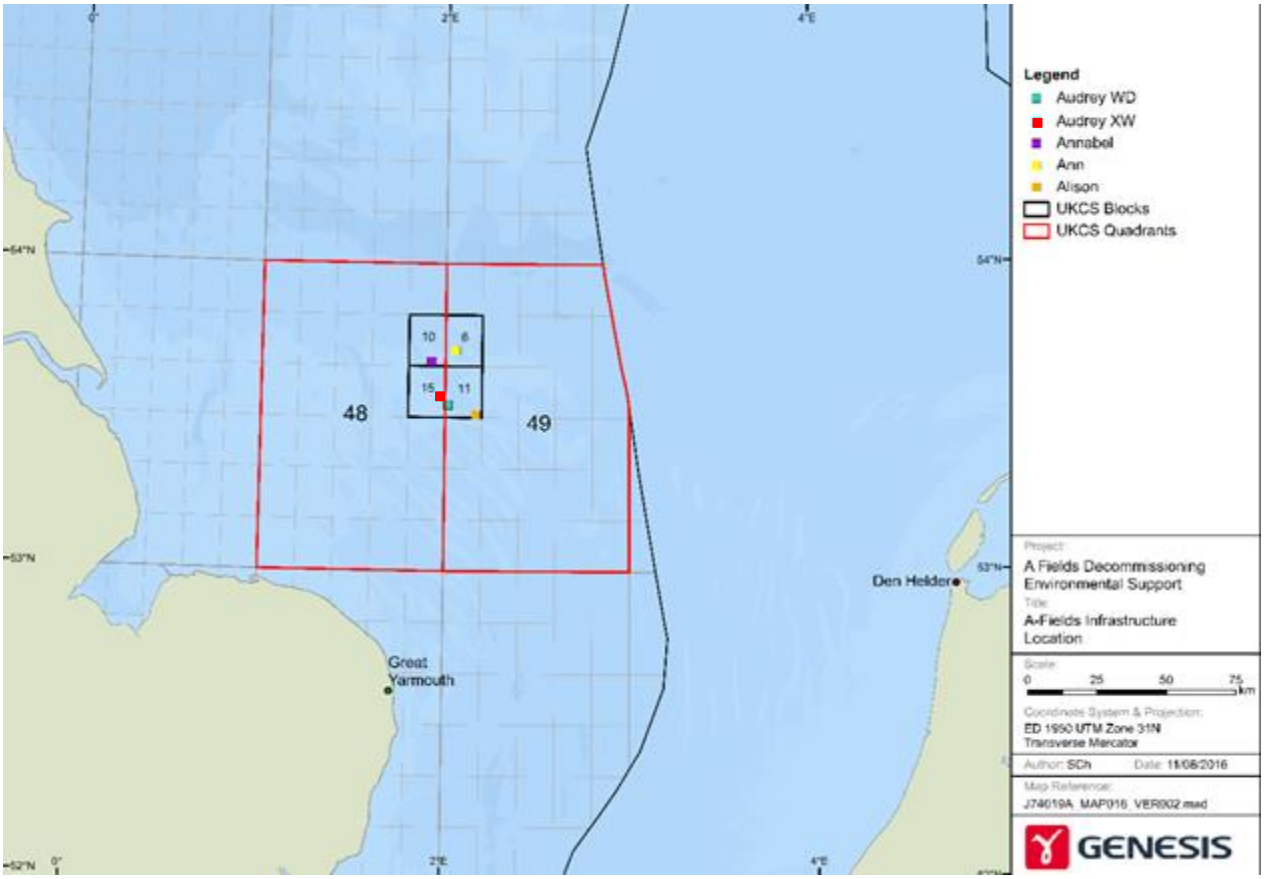


Figure 1.1: Field Location in UKCS

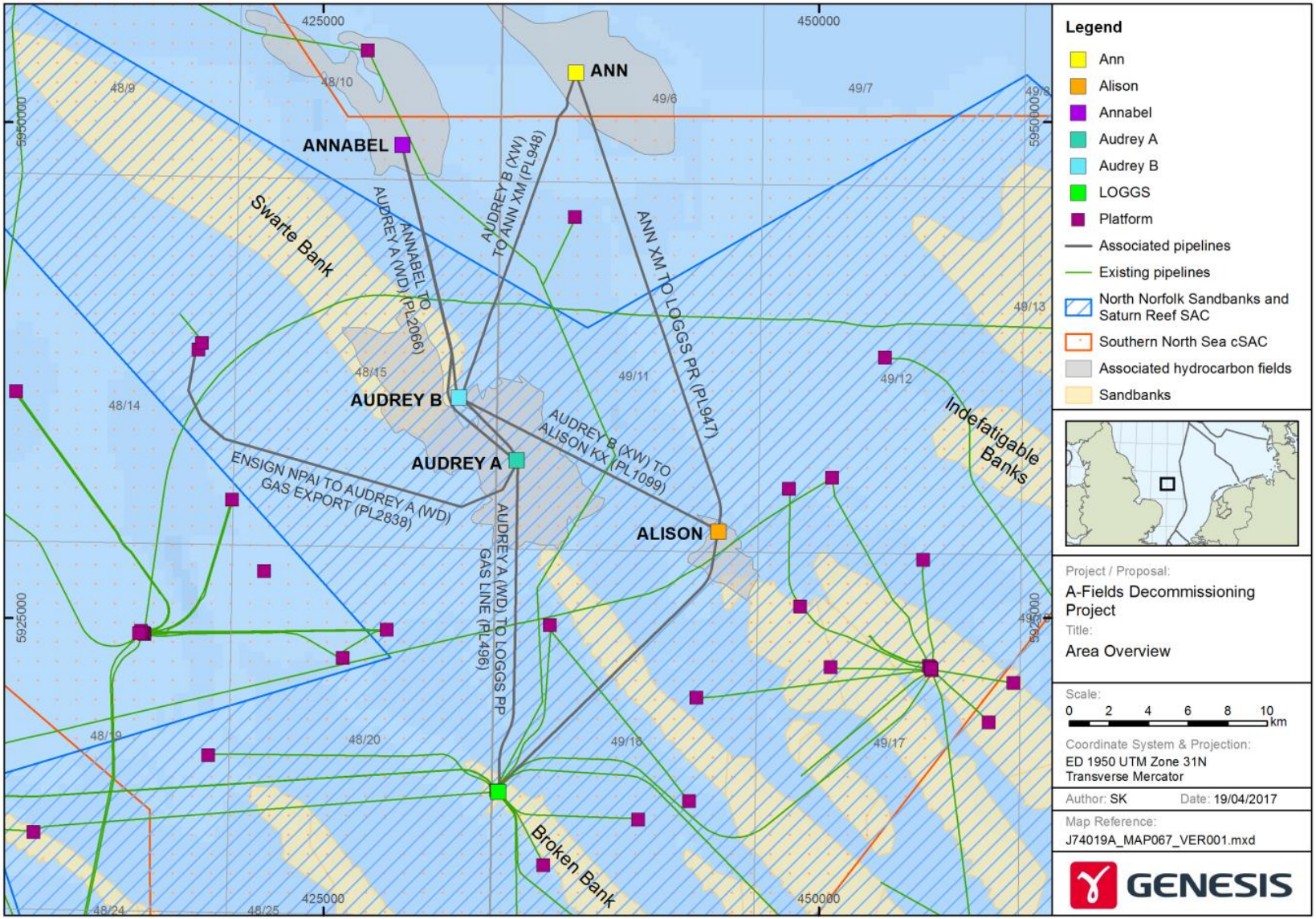


Figure 1.2: Annabel Adjacent Facilities

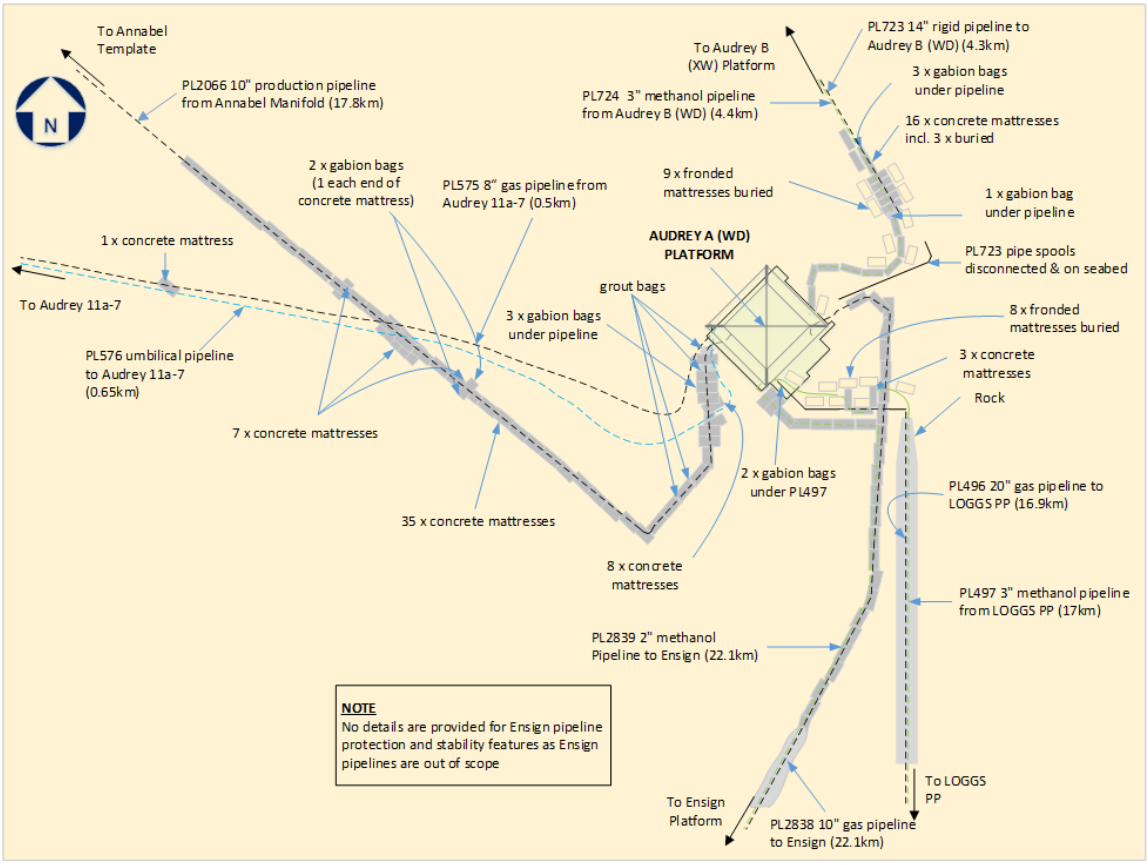


Figure 1.3: Overview of Audrey A (WD) Approaches

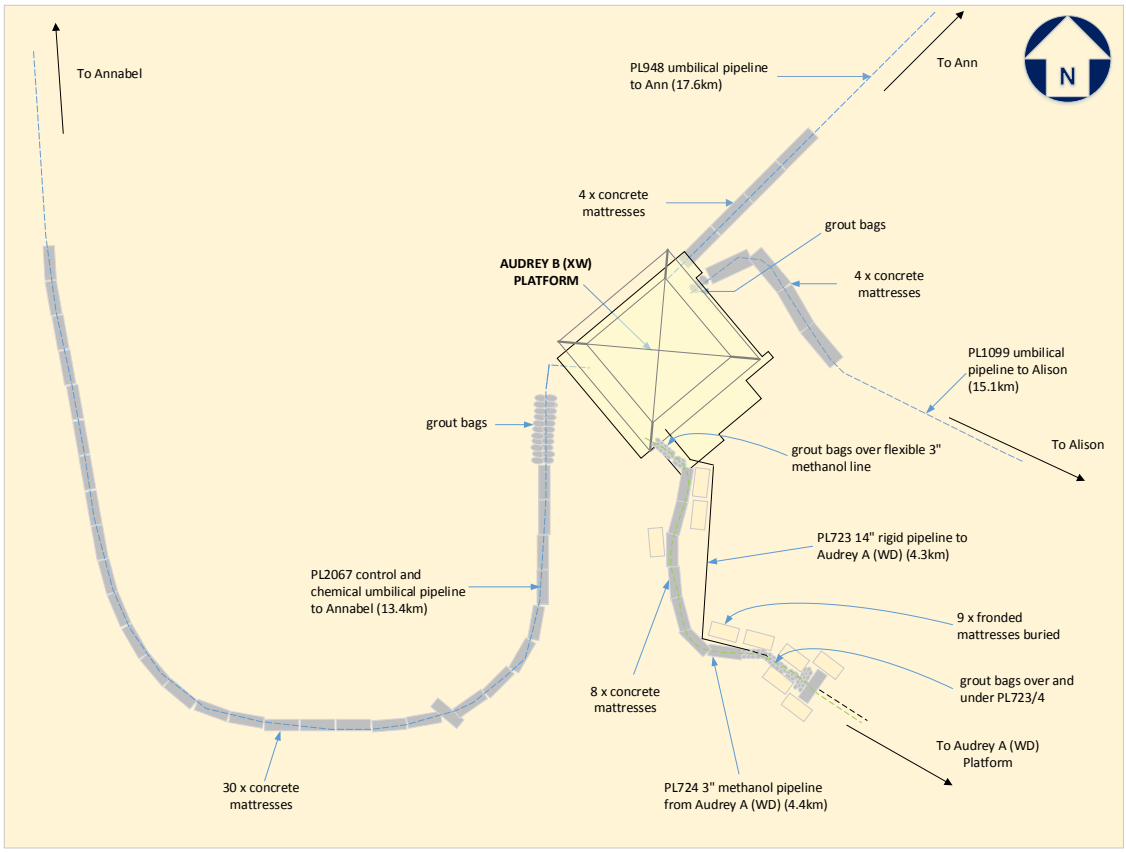


Figure 1.4: Overview of Audrey B (XW) Approaches

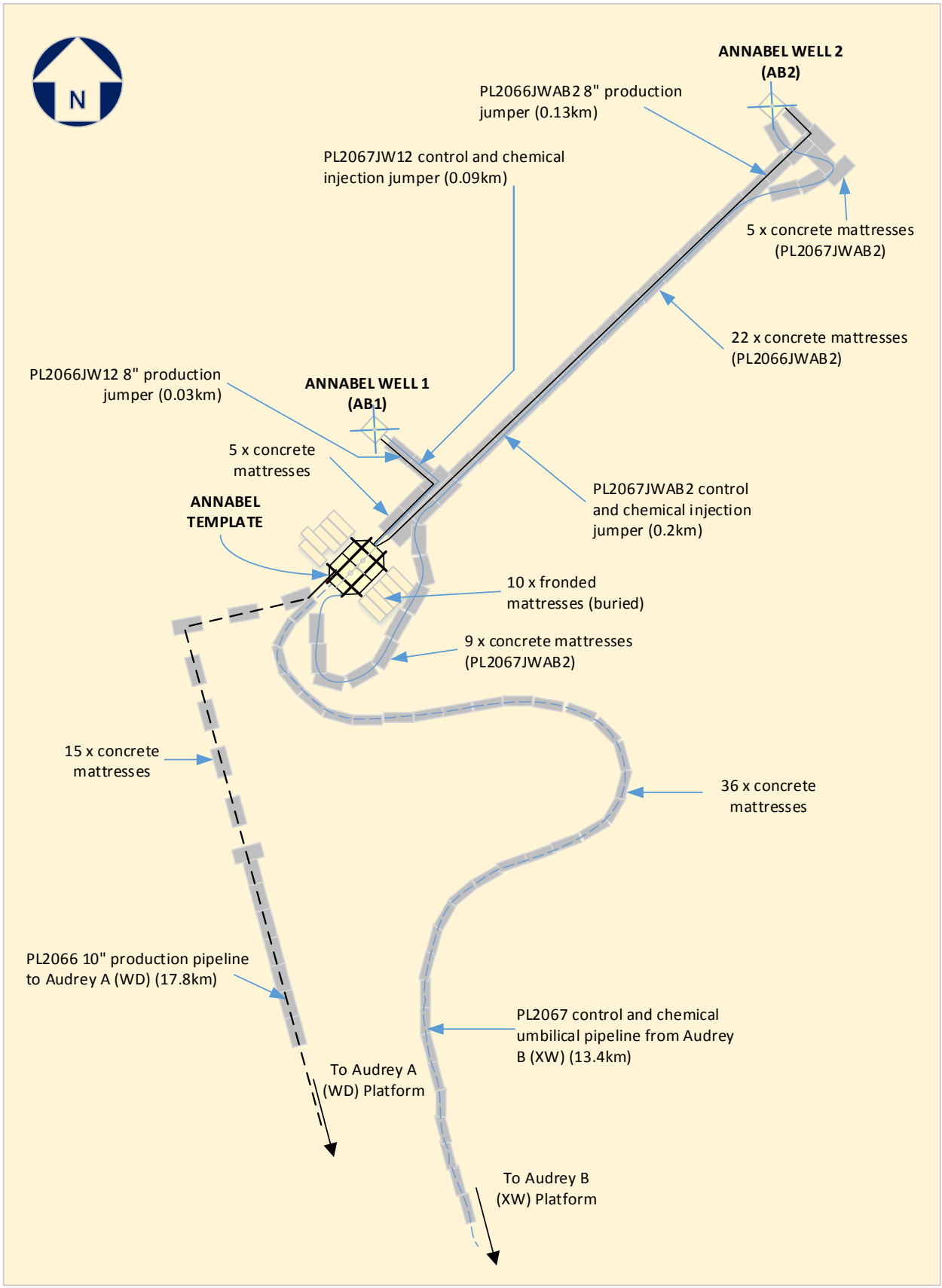


Figure 1.5: Overview of Annabel Approaches

Table 1.6: Adjacent Facilities					
Owner	**Name**	**Type**	**Distance/ Direction**	**Information**	**Status**
Centrica	PL575	8” gas pipeline	Audrey 11a-7 to Audrey A (WD)	Adjacent to PL2066 at Audrey A (WD)	Operational
Centrica	PL576	Umbilical pipeline	Audrey A (WD) to Audrey 11a-7	PL2066 crosses over PL576 (KP 17.65)	Operational
CPUK	PL1093	18” gas pipeline	Ganymede ZD to LOGGS	Crosses over PL496/7 (KP16.62)	Operational
CPUK	PL1094	3” methanol pipeline	LOGGS to Ganymede ZD		Operational
Shell U.K. Limited	PL1967	20” gas pipeline	Carrick QA to Clipper PR	PL2066 crosses over PL1967 (KP7.98) PL2067 crosses over PL1967 (KP5.2)	Operational
Shell U.K. Limited	PL1968	4” MEG pipeline	Clipper PR to Carrick QA	PL2066 crosses over PL1968 (KP7.98) PL2067 crosses over PL1968 (KP5.2)	Operational
BT	NSO-1	Fibre optic cable	Weybourne to ACMI MASTER	PL2066 crosses over NSO-1 (KP4.89) PL2067 crosses over NSO-1 (KP8.0)	Operational
Impacts of Decommissioning Proposals					
There are no direct impacts on adjacent facilities from the associated decommissioning works. Where crossings are overlain with rock, it is proposed to decommission the rock and the infrastructure beneath by leaving *in situ*. As part of the environmental assessment we have considered potential in combination or cumulative effect of activities in the area, including decommissioning and aggregate extraction. This has been done using data that are 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.					

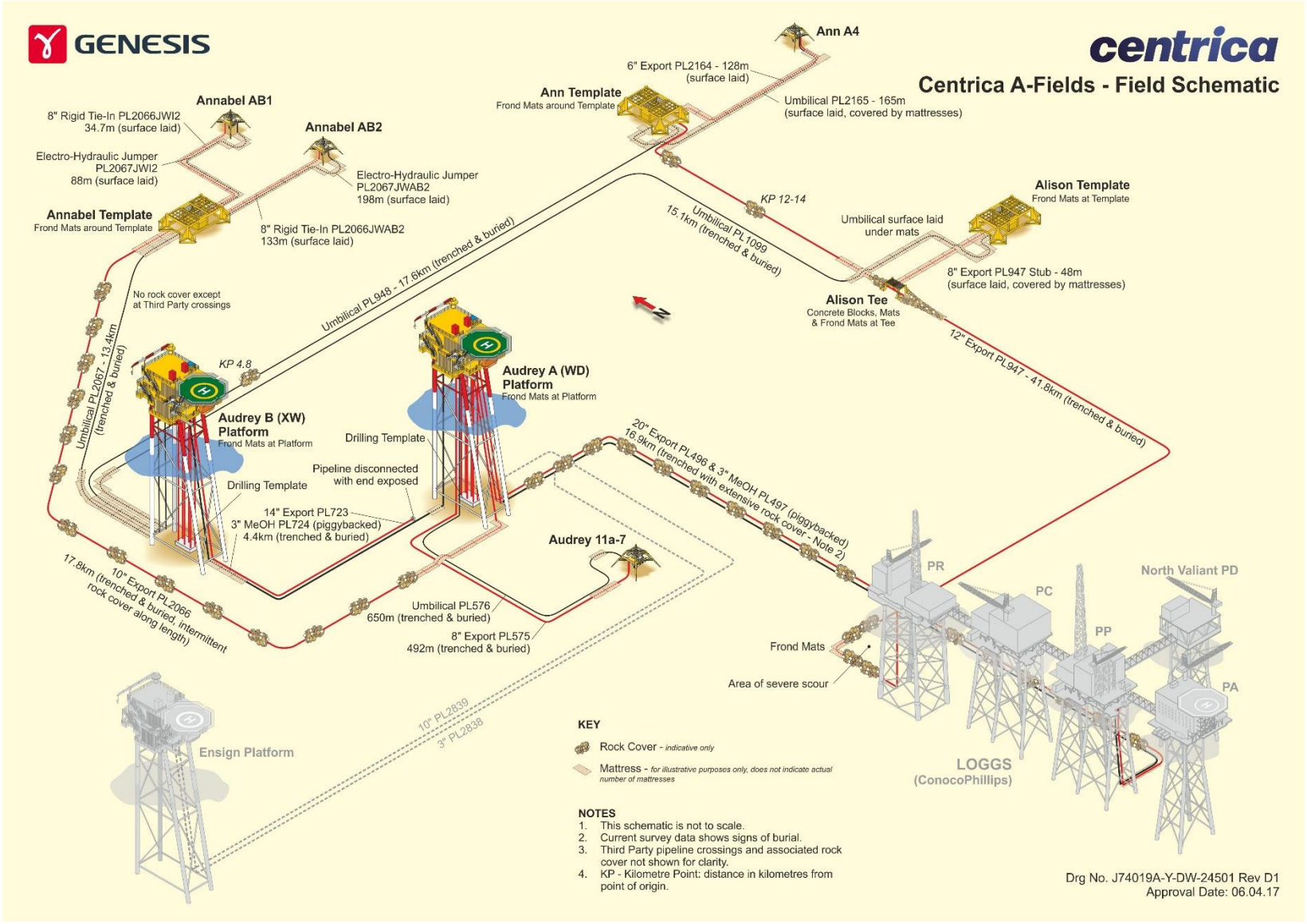


Figure 1.6: Annabel Adjacent Facilities

1.7 Industrial Implications

The two subsea well abandonments will be completed using a drilling rig. Some preparatory work for Annabel may be undertaken by a Diving Support Vessel (DSV) as they are subsea wells.

The activities to decommission the installations and pipelines will be completed using a Diving Support Vessel (DSV), Construction Support Vessel (CSV) or Multi Support Vessel (MSV).

It is Centrica's intention to develop a contract strategy 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. Centrica will also try to combine Annabel 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 Installation: Surface Facilities

Table 2.1: Surface Facilities Information									
Name	Facility Type	Location		Topsides/ Facilities		Jacket (if applicable)			
				Weight (Te)	No of modules	Weight (Te)	Number of legs	Number of piles	Weight of piles (Te)
n/a	n/a	WGS84 Decimal	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		WGS84 Decimal Minute	n/a						

2.2 Installations: Subsea including Stabilisation Features

Table 2.2: Installations: Subsea including Stabilisation Features					
Subsea installations including Stabilisation Features	Number	Size/ Weight (Te)	Location		Comments/Status
Wellhead AB1 (48/10a-12)	1	10	WGS84 Decimal	53.681633° N 01.923652° E	Well is shut in.
			WGS84 Decimal Minute	53° 40.89796" N 01° 55.41913" E	
Wellhead AB2 (48/10a-14)	1	10	WGS84 Decimal	53.682292° N 01.924819° E	Well is shut in.
			WGS84 Decimal Minute	53° 40.93752" N 01° 55.48914" E	
Trees	2	16.1ea	As per wellhead AB1 & AB2		Trees are located on top of wellheads.
WHPS	2	33.7ea	As per wellhead AB1 & AB2		WHPS are attached to wellheads and not piled.
Template	1	198.9	WGS84 Decimal	53.681363° N 01.923609° E	Gravity-based structure.
			WGS84 Decimal Minute	53° 40.88178" N 01° 55.41654" E	
Concrete mattresses	n/a	n/a	n/a		n/a
Grout bags	n/a	n/a	n/a		n/a
Formwork	n/a	n/a	n/a		n/a
Frond Mats	10	0.75ea	n/a		Buried.
Rock emplacement	n/a	n/a	n/a		n/a
Other (describe briefly)	n/a	n/a	n/a		n/a

2.3 Pipelines including stabilisation features

Table 2.3: Pipeline/Flowline/Umbilical Information									
Description	**Pipeline Number (as per PWA)**	**Diameter (NB) (inches)**	**Length (km)[1]**	**Description of Component Parts**	**Product Conveyed**	**From – To End Points[2]**	**Burial Status**	**Pipeline Status**	**Current Content**
Production pipeline	PL2066	10"	17.8	Fusion bonded epoxy coated steel pipeline	Natural gas, condensate, water	Annabel manifold to Audrey A (WD) platform riser tie-in flange	Trenched with deposited rock.	Operational	Natural gas, condensate, water
Chemical and control umbilical pipeline	PL2067	4.5”	13.4	Chemical injection and control umbilical pipeline	Methanol & corrosion inhibitor, hydraulic oil	Audrey B (XW) PTU to Annabel manifold SDU	Trenched with deposited rock	Operational	Methanol & corrosion inhibitor, hydraulic oil
Production jumper	PL2066JW12	8”	0.035	Fusion bonded epoxy coated steel pipeline	Natural gas, condensate, water	Well tie-in flange at 48/10a-12 to manifold tie-in flange	Surface laid	Operational	Natural gas, condensate, water
Chemical and control umbilical jumper	PL2067JW12	Bundle 4x19.05mm 3x12.7mm 3x6.35mm	0.088	Chemical injection and control umbilical jumper	Methanol & corrosion inhibitor, hydraulic oil	Annabel manifold SDU to 48/10a-12 AB1 TCM	Surface laid	Operational	Methanol & corrosion inhibitor, hydraulic oil
Production jumper	PL2066JWAB2	8”	0.133	Fusion bonded epoxy coated steel pipeline	Natural gas, condensate, water	Well tie-in flange at 48/10a-AB2 to manifold tie-in flange	Surface laid	Operational	Natural gas, condensate, water
Control and chemical injection jumper	PL2067JWAB2	Bundle 4x19.05mm 3x12.7mm 3x6.35mm	0.198	Chemical injection and control jumper	Methanol & corrosion inhibitor, hydraulic oil	Annabel manifold SDU to 48/10a-AB2 TCM	Surface laid	Operational	Methanol & corrosion inhibitor, hydraulic oil

Table 2.3: Pipeline/Flowline/Umbilical Information									
Description	**Pipeline Number (as per PWA)**	**Diameter (NB) (inches)**	**Length (km)[1]**	**Description of Component Parts**	**Product Conveyed**	**From – To End Points[2]**	**Burial Status**	**Pipeline Status**	**Current Content**

Notes

1. Different pipeline lengths are recorded in some of the original PWAs because these are based on 'design data'. The dimensions presented in this table are based on 'as-built' data. For completeness, according to the original PWAs the pipeline lengths are as follows PL2066 – 17.927km; PL2066JW12 - .075km; PL2066JWAB2 – 0.13km; PL2067 – 14.006km; PL2067JW12 – 0.088km; and PL2067JWAB2 – 0.191km.
2. Throughout the Decommissioning programme we refer to 'Template'. However in this table we refer to 'manifold' to be consistent with the PWA.

Table 2.4: Subsea Pipeline Stabilisation Features				
Stabilisation Feature	**Total Number[2]**	**Total Weight (Te)**	**Location(s)**	**Exposed/Buried/Condition**
Concrete mattresses	76	600.6	PL2066 15 in vicinity of Annabel template; PL2066 41 in vicinity of Audrey A (WD); PL2066 6 over BT telecoms cable crossing; PL2066 2 over PL1967 & PL1968 at pipeline crossing; PL2066 3 over PL1967 & PL1968 at pipeline crossing (plinths); PL2066 9 over PL575 at pipeline crossing near Audrey A (WD); Refer Figure 1.3 and Figure 1.5.	Survey data suggests that all mattresses are largely exposed, except for those buried under rock at pipeline or cable crossings as follows: PL1967, PL1968 and BT cable.
	5	27.7	PL2066JW12 5 between Annabel template and AB1; Refer Figure 1.5.	Survey data suggests that all mattresses are largely exposed.
	22	182.6	PL2066JWAB2 22 between Annabel template and AB2; Refer Figure 1.5.	Survey data suggests that all mattresses are largely exposed.
	66	365.2	PL2067 30 on approach to Audrey B (XW); PL2067 36 on approach to Annabel template; Refer Figure 1.4 and Figure 1.5.	Survey data suggests that all mattresses are largely exposed.
	14	116.2	PL2067JWAB2 14 (plus 22 shared with PL2066JWAB2) between Annabel template and AB2; Refer Figure 1.5.	Survey data suggests that all mattresses are largely exposed.
Grout bags	5x1Te 100x25kg	7.5	PL2066 100x25kg at Audrey A (WD); PL2066 2x1Te between PL575 crossing and Audrey A (WD) (Gabion bags); PL2066 3x1Te at Audrey A (WD) (Gabion bags); Refer Figure 1.3 and Figure 1.4.	We've assumed that their burial status is as per mattresses, which are exposed although no specific survey data is available.

[2] The number of grout bags has been estimated using available data including sketches, as-built drawings; and video footage. There is a degree of uncertainty associated with the exact numbers quoted

Table 2.4: Subsea Pipeline Stabilisation Features				
Stabilisation Feature	**Total Number[2]**	**Total Weight (Te)**	**Location(s)**	**Exposed/Buried/Condition**
	8x1Te	8.0	PL2067 8x1Te on approach to Annabel template; Refer Figure 1.5.	We've assumed that their burial status is as per mattresses, which are exposed although no specific survey data is available.
Rock emplacement	3,000Te 4,800Te	20,000	PL2066: BT Telecoms Cable crossing, approx. 200m long PL1967 & PL1968 pipeline crossing, approx. 180m long.	Largely exposed.
	12,200Te		PL2066: Intermittent along pipeline route.	Largely exposed.
Formwork	n/a	n/a	n/a	n/a
Frond Mats	n/a	n/a	n/a	n/a
Other (describe briefly)	n/a	n/a	n/a	n/a

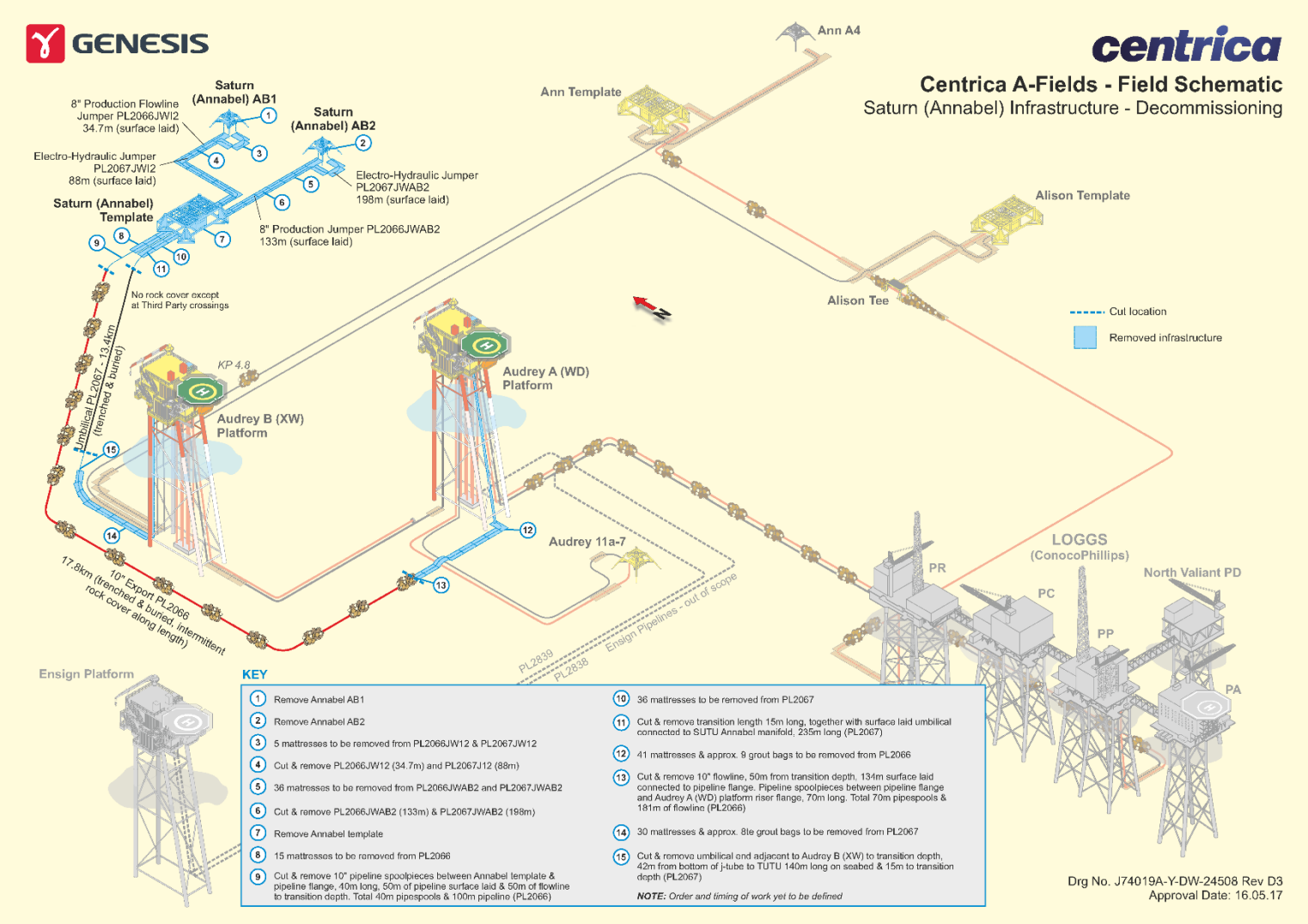


Figure 2.1: Overview of decommissioning proposals[3]

[3]Step 15 – 42m umbilical will be left inside J-tube for recovery with the jacket

2.4 Wells

Table 2.5: Well Information			
Well ID	**Designation**	**Status**	**Category of Well**
48/10a-12	Gas production	Shut in	SS 3-3-3
48/10a-14	Gas production	Shut in	SS 3-3-3

For details of well categorisation see the Oil & Gas UK Guidelines for the Abandonment of Wells. Issue 5, July 2015, Appendix D.

2.5 Drill Cuttings

Table 2.6: Drill Cuttings Pile Information		
Location of Pile Centre (Latitude/Longitude)	**Seabed Area (m^2)**	**Estimated volume of cuttings (m^3)**
n/a	n/a	n/a

Refer section 3.7 for further information

2.6 Inventory Estimates

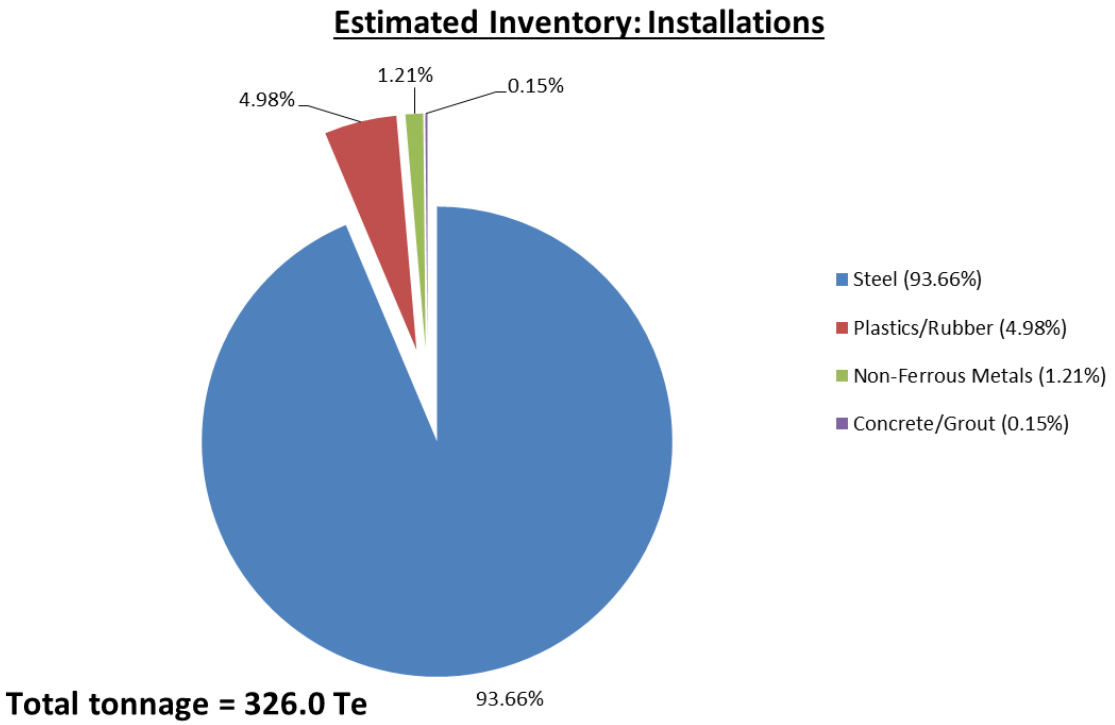


Figure 2.2: Pie chart of estimated installation inventories

Refer to section 6.6 of the Environmental Impact Assessment [4] for further details.

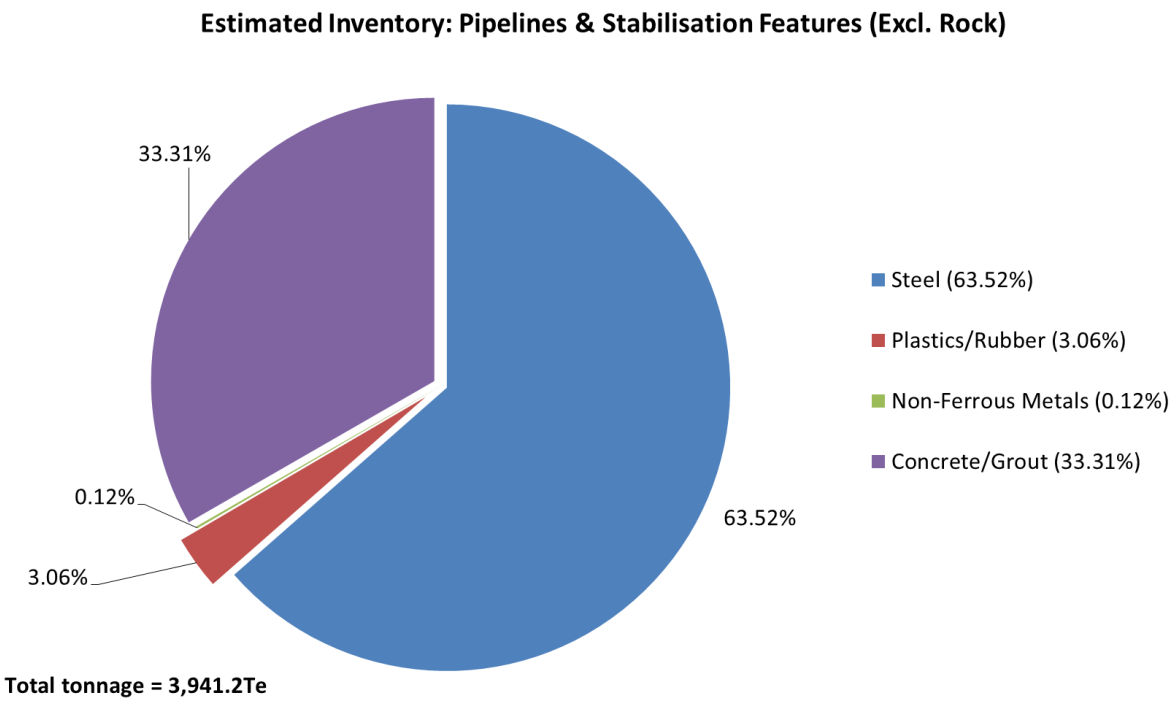


Figure 2.3: Pie chart of estimated pipeline inventory

Refer to section 6.6 of the Environmental Impact Assessment [4] for further details.

3. REMOVAL AND DISPOSAL METHODS

Waste will be dealt with in accordance with the Waste Framework Directive. The reuse of an installation or pipelines (or parts thereof) is first in the order of preferred decommissioning options. Options for the reuse of installations or pipelines (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 metal are estimated to account for the greatest proportion of the materials inventory. Refer to section 6.6 of the Environmental Impact Assessment [4] for further details concerning disposal of waste.

3.1 Topsides

n/a

3.2 Jacket

n/a

3.3 Subsea Installations and Stabilisation Features

Table 3.1: Subsea Installations and Stabilisation Features			
Subsea installations and stabilisation features	**Number**	**Option**	**Disposal Route (if applicable)**
Wellhead & tree	2ea	Complete removal as part of campaign to abandon the wells.	Return to UK onshore for re-use, unless the condition is found to preclude refurbishment when it will be recycled.

Table 3.1: Subsea Installations and Stabilisation Features			
Subsea installations and stabilisation features	**Number**	**Option**	**Disposal Route (if applicable)**
Template (incl. manifold)	1	Complete removal.	Return to UK onshore for re-use, unless the condition is found to preclude refurbishment when it will be recycled.
Wellhead protection structure	2	Complete removal	Return to UK onshore for re-use, unless the condition is found to preclude refurbishment when it will be recycled.
Concrete mattresses	n/a	n/a	n/a
Grout bags	n/a	n/a	n/a
Formwork	n/a	n/a	n/a
Frond mats	10	Leave *in situ*	n/a
Deposited rock	n/a	n/a	n/a
Other (describe briefly)	n/a	n/a	n/a

3.4 Pipelines

All surface laid pipelines including tie-in spool pieces and jumpers which 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. The pipelines as detailed in Table 3.2 have been considered for *in situ* decommissioning and as such have been subjected to a comparative assessment.

All pipeline transitions at the ends (namely at the Audrey A (WD) platform, Audrey B (XW) platform and at Annabel template) will be completely removed.

Decommissioning Options:

The following options considered (and identified in terms of applicability to the pipelines in Table 3.2) are:

1) Complete removal

2) Leave *in situ*, making pipeline ends safe

Table 3.2: Pipeline or Pipeline Groups Decommissioning Options			
Pipeline or Group (as per PWA)	**Condition of line/group (Surface laid/Trenched/ Buried/ Spanning)**	**Whole or part of pipeline/group**	**Decommissioning options considered**
PL2066	Trenched and buried with deposited rock	Whole 10” production pipeline	1 & 2
PL2066JW12 & PL2066JWAB2	Surface laid	Whole 8” production jumper	1
PL2067	Trenched and naturally backfilled	Whole control and chemical injection jumper and umbilical line	1 & 2
PL2067JW12 & PL2067JWAB2	Surface laid	Whole control and chemical injection jumper	1

3.4.1 Comparative Assessment Method

A comparative assessment of the decommissioning options was performed in accordance with the Centrica Guidance for Comparative Assessments for Decommissioning. Each decommissioning option was qualitatively assessed against Safety, Environment, Technical and Societal and Cost. Refer [3] for details.

3.4.2 Outcome of Comparative Assessment:

Table 3.3: Outcomes of Comparative Assessment

Pipeline or Group	Recommended Option	Justification
PL2066	Leave most of the pipeline *in situ*. At Annabel template, completely remove 10" pipeline spool pieces between the template and pipeline flange, 40m long, 50m of pipeline surface laid and 50m of flowline to transition depth. Total 40m pipespools and 100m pipeline. At Audrey A (WD) completely remove 10" flowline, 50m from transition depth, 131m surface laid connected to pipeline flange. Also, completely remove the pipeline spool pieces between pipeline flange and Audrey A (WD) platform riser flange, 70m long. Total 70m pipespools and 181m of pipeline.	The pipeline is trenched and buried underneath deposited rock for most of its length and is stable. Therefore, we propose to leave most of the pipeline *in situ* except for the exposed ends. This will result in minimal seabed disturbance, lower energy usage, reduced risk to personnel and lower cost, all of which contribute to the proposed recommendation. Refer Appendix A.1 for pipeline burial profile. No pipeline crossings outside of the 500m safety zone will be disturbed. Monitoring to confirm the pipeline remains buried will be completed to a schedule agreed with BEIS.
PL2066JW12	Complete removal.	This pipeline and associated stabilisation features are surface laid. We believe that to leave these elements *in situ* would render the pipeline and stabilisation features vulnerable to damage during fishing activities from beam trawls, requiring future remedial activities.
PL2066JWAB2	Complete removal.	Refer PL2066JW12.
PL2067	Leave most of the umbilical pipeline *in situ*. Completely remove umbilical end adjacent to Audrey B (XW) to transition depth, 42m from TUTU to bottom of J-tube, 140m long on seabed, and 15m to transition depth. Total length to be removed approx. 197m. 42m length inside J-tube will meantime be left for recovery with Audrey B (XW) jacket. At the Annabel template, completely remove transition length 15m long together with surface laid umbilical connected to SUTU at the manifold, 235m long. Total length to be removed approx. 250m.	The pipeline is trenched and buried for most of its length and is stable. Therefore, we propose to leave most of the pipeline *in situ* except for the exposed ends. This will result in minimal seabed disturbance, lower energy usage, reduced risk to personnel and lower cost, all of which contribute to the proposed recommendation. Refer Appendix A.2 for pipeline burial profile. No pipeline crossings outside of the 500m safety zone will be disturbed. Monitoring to confirm the pipeline

Table 3.3: Outcomes of Comparative Assessment		
Pipeline or Group	**Recommended Option**	**Justification**
		remains buried will be completed to a schedule agreed with BEIS.
PL2067JW12	Complete removal.	Refer PL2066JW12.
PL2067JWAB2	Complete removal.	Refer PL2066JW12.

3.5 Pipeline Stabilisation Features

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

Table 3.4: Pipeline Stabilisation Features			
Stabilisation features	**Number**	**Option**	**Disposal Route (if applicable)**
Concrete mattresses (underneath pipeline crossings, underneath or on top pipeline spools and over lengths of pipeline on seabed and pipeline transition sections)	Audrey A (WD): 50 Audrey B (XW) 30 Annabel: 92	Complete removal.	Recover back to UK for re-use, recycling or disposal.
	Pipeline crossings: 11	Leave *in situ*.	n/a
Grout bags, commonly placed adjacent to or over concrete mattresses	5x1Te 100x25kg	Complete removal.	Recover back to UK for re-use, recycling or disposal.
Deposited rock	20,000Te	Leave *in situ*.	n/a
Formwork	n/a	n/a	n/a
Frond Mats	n/a	n/a	n/a
Other (describe briefly)	n/a	n/a	n/a

3.6 Wells

Table 3.5: Well Plug and Abandonment
The Annabel development comprises of two production wells (49/10a-12 (AB1) & 49/10a-14 (AB2)). The wells listed in Section 2.4 (Table 2.5) will be abandoned in accordance with latest version of the Oil & Gas UK Guidelines for the Abandonment of Wells (Issue 5, July 2015). A Master Application Template (MAT) and the supporting Subsidiary Application Template (SAT) will be submitted in support of works carried out. A PON5 will also be submitted to BEIS for application to abandon the wells. Well abandonment is scheduled to occur ~2019.

3.7 Drill Cuttings

There are no drill cuttings piles associated with Annabel. This conclusion is supported by the 2016 survey data. The bathymetry data obtained from the 2016 survey showed no evidence of an accumulation of cuttings at the well locations. The level of barium (an indicator of the presence of contamination from drilling) at most survey stations was below published guidance levels in the immediate vicinity of the Annabel AB1 and AB2 with the exception of one outlier, but this seems to be more associated with natural variability of the sediment (Environmental Pre-Decommissioning Survey [5], section 2.9). Generally, though there is no evidence of anthropogenic disturbance related to historic drilling activity in the Annabel area ([5], section 3.0).

3.8 Waste Streams

Table 3.6: Waste Stream Management Methods	
Waste Stream	**Removal and Disposal method**
Bulk liquids	The various pipelines will be pigged, flushed and left filled with seawater. The corrosion inhibitor and methanol will be removed from the smaller methanol lines and umbilical pipelines prior to the start of the decommissioning activities. Any residual fluids from within these pipelines will be released to marine environment under permit prior to recovery to shore. Further cleaning and decontamination will take place onshore prior to re-use or recycling.
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	Tests for NORM will be undertaken offshore by the Radiation Protection Adviser and any NORM encountered will be dealt with and disposed of in accordance with guidelines and company policies and under appropriate permit.
Asbestos	No asbestos is expected. The final disposal route will depend on the quantities found, but 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 under appropriate permit.
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 innovative re-use and recycling options.

	Table 3.7: Inventory Disposition		
Inventory	**Total Inventory Tonnage**	**Planned tonnage to shore**	**Planned tonnage decommissioned *in situ***
Installations	326	318.5	7.5
Pipelines	3,941	1,248	2,693

All recovered material will be brought back to the UK for re-use, recycling or disposal. It is not possible to predict the market for reusable materials with any confidence; so, the figures in Table 3.8 are disposal aspirations.

Table 3.8: Re-use, Recycle & Disposal Aspirations for Recovered Material			
Inventory	**Re-use**	**Recycle**	**Disposal**
Installations	<5%	>95%	<5%
Pipelines	<5%	>95%	<5%

Refer to section 5.6 of the Environmental Impact Assessment [4] in section 7 for further details.

4. ENVIRONMENTAL IMPACT ASSESSMENT

4.1 Environmental Sensitivities

Table 4.1: Environmental Sensitivities [4]	
Environmental Receptor	**Main Features**
Conservation interests	No Annex I habitats have been identified in any surveys undertaken within or adjacent to Annabel or along the pipelines connected to Audrey A (WD) and Audrey B (XW). As the area is within a Harbour Porpoise Possible SAC, there is potential for a number of Annex II species to be present within the vicinity. However, the nature of the activities being undertaken is anticipated to have low impact significance upon these species. The infrastructure is within the North Norfolk Sandbanks SCI, however the activities are not anticipated to have any impacts upon the site due to the relatively small scale of the activities. In the event of a large hydrocarbon release, a proportion of the hydrocarbon could be captured within the seabed sediment. However, the possibility of such an event and the low concentrations that would be recorded within the sediment (comparable to background concentrations) mean the significance of the impact is considered low.
Seabed	The seabed at Annabel is predominantly rippled sand with gravel, pebbles and occasional cobbles. In general, the marine habitats and their associated species depend on the available substrate and sediment composition. Multivariate comparison of the survey data concluded that the macrofaunal community within the Annabel survey area were characterised mainly according to natural variation in sediment composition (rather than contaminants). The removal of subsea installations, pipe spools, pipeline ends and protection features from the seabed will impact the seabed. Sensitive marine habitats are likely to be damaged as a result of seabed disturbance and the temporary placement of materials on the seabed. In addition, there is potential for re-suspended sediment to settle on sensitive habitat and species smothering them. However, the extent of the disturbance is likely to be minimal in comparison to the area of available habitat. The habitat observed is not unique to the area and represents a small proportion to that available within the wider Southern North Sea. In the event of a large hydrocarbon release, it was found that a proportion of the hydrocarbon could be captured within the sediment. However, given the likelihood of such an event and the low concentrations that would be recorded within the sediment (comparable to background concentrations) the significance of the impact is considered low.
Atmosphere	In general, offshore meteorological conditions will lead to rapid dispersion and dilution of atmospheric emissions. Impacts arising because of emissions (largely comprising combustion gases) are therefore likely to be short-term and highly localised and are assessed as of low significance. The emission of combustion gases will contribute to global effects (e.g. global warming). However, given the relatively small volume of gases to be emitted and the control and mitigation measures that will be implemented the significance of the impact is low.
Birds	The greatest risk to birds from the activities would be the accidental occurrence of a large hydrocarbon release. The Annabel area has a very high vulnerability of seabirds to surface pollution (only April, September and December are of high vulnerability). Although birds

Table 4.1: Environmental Sensitivities [4]	
Environmental Receptor	**Main Features**
	could be affected by the diesel release, given the relatively short duration of the activities and the relatively short duration it would be expected to remain on the sea surface (therefore being available to oil birds' feathers) the potential impact is assessed as of low significance.
Fish	Fish populations in the area could be affected by seabed disturbance, the generation of underwater noise and chemical / hydrocarbon releases associated with activities. It is not anticipated that large amounts of turbidity will be generated which could impact fish themselves, however even a small amount of turbidity or disturbance of the seabed itself could have impacts to spawning and nursery grounds. Several species are known to use the seabed in the area around Annabel as spawning and nursery grounds. Different species spawn at different times; therefore, it is likely that whenever the activities are undertaken they could coincide with a spawning period. However, information regarding spawning grounds and nursery grounds covers large areas, the seabed is representative of the wider area and therefore the significance of any impact has been assessed as low. The same is the case for nursery grounds. The levels of noise generated are not anticipated to have any physiological impact to fish. It is likely that the activities will result in a startled response, moving fish away from the area.
Marine mammals	Given the existing background noise levels and the relatively short duration of the activities, the underwater noise levels generated by vessels are unlikely to lead to physiological damage to marine mammals. White beaked dolphin and harbour porpoise (an Annex II (Habitats Directive) species) have been recorded in the area. The locally resident or transiting populations of marine mammals may be disturbed by noise in the immediate vicinity, but any such disturbance is expected to be short-term and the impact has been assessed as of low significance.
Fishing industry	Impacts on fishing industry have been assessed as of low significance as the decommissioning activities will be relatively short-term and within the 500m exclusion zones around the installations. The area is predominantly targeted for demersal species.
Other Users of the Sea	There will be a relatively short period when vessels will be operating around the installations and there will be a higher than normal level of shipping activity. The associated effects will be short-term. There are no planned wind farm developments or aggregate extraction licenses at the site, although there is an aggregate area to the north of the site. The activities are not anticipated to impact on the aggregate area.
Onshore Communities	The impact of the disposal of waste on onshore communities would be slightly beneficial as it will contribute to the continuation of jobs. However this is expected to be small as the disposal sites already exist and the volume of waste is relatively small.

4.2 Potential Environmental Impacts and their Management

Environmental Impact Assessment Summary:

There will be some planned environmental impacts arising from decommissioning of the Annabel infrastructure (48/10a). Long-term environmental impacts from the decommissioning operations are expected to be low. Incremental cumulative impacts and trans-boundary effects associated with the planned decommissioning operations are also expected to be low. There will be a requirement for a new environmental management protection plan to be produced and submitted to BEIS should the Decommissioning Programmes change.

Overview:

Table 4.2: Environmental Impact Management [Reference [4] in Section 7]

Activity	Main Impacts	Management
Topsides removal	n/a	n/a
Jacket removal	n/a	n/a
Subsea installation removal	For decommissioning and removal of the installations the impacts are disturbance of the seabed by lifting, temporary placement on seabed if required, noise from vessels and cutting and operational discharges from vessels. Impacts are expected to be short-term and localised and of low significance.	Activities will be planned to be executed as efficiently as possible, minimising cutting and disturbance of the seabed in order to reduce the potential for impact on the area around the installations. Vessels will be managed to minimise the durations required and associated discharge. In addition, on board operational practices will address fuel efficiency, noise management and minimise waste.
Decommissioning pipelines	Decommissioning of the pipelines *in situ* will require activities such as local water-jetting of sediments, cutting and temporary placement of equipment or components. Any exposed pipeline ends will be cut back at the buried location. Removed components will be lifted from the seabed by DSV or MSV. Principal impacts will include • disturbance of the seabed from cutting and removal activities • noise from removal and cutting activities and operational support vessels • operational discharges from vessels • production of waste material These effects are expected to be short-term and localised. The seabed and associated ecosystem is expected to	Activities will be planned to be executed as efficiently as possible, minimising disturbance of the seabed in order to reduce the potential for impact on the area around the pipelines. Consideration will be given where equipment and/or components should be temporarily placed on the seabed prior to removal, seeking to minimise the requirement wherever possible. Vessels will be managed to minimise the durations required and associated discharges. In addition, on board operational practices will address fuel efficiency, noise management and minimise waste.

Table 4.2: Environmental Impact Management [Reference [4] in Section 7]		
Activity	**Main Impacts**	**Management**
	recover rapidly once activities cease.	
Decommissioning stabilisation features	The Decommissioning Programmes include the removal of existing concrete mattresses and sand bags. Mattresses and sand bags will be lifted from the seabed by DSV or MSV. Impacts will include disturbance of the seabed and noise from vessels. These effects are expected to be short-term and localised. The seabed and associated ecosystem is expected to recover rapidly once activities cease.	Activities will be planned to be executed as efficiently as possible, minimising disturbance of the seabed in order to reduce the potential for impact. Consideration will be given to how the work is to be conducted seeking to minimise the requirement wherever possible. Vessels will be managed to minimise the durations required and associated discharges. In addition on board operational practices will address fuel efficiency, noise management and minimise waste, in accordance with the marine assurance standard.
Decommissioning Drill Cuttings	n/a	n/a

5. INTERESTED PARTY CONSULTATIONS

Table 5.1: Summary of Stakeholder Comments		
Who	**Comment**	**Response**
INFORMAL CONSULTATIONS		
CPUK	We are in constant dialogue with CPUK in terms of examining collaboration opportunities for decommissioning operations in the LOGGS complex area.	
JNCC	We presented the decommissioning proposals for Annabel and Audrey (as well as Ann and Alison), including our proposals for limiting overtrawl sweeps to within 500m zones and any areas subject to physical decommissioning operations outside these areas in a meeting with two representatives from JNCC 02 May 2017.	The decommissioning proposals were acceptable. In particular, the following items were raised as the main discussion points. • Cumulative effects are of particular interest to JNCC and it was suggested that we take into account the marine aggregate industry within the EIA. • JNCC commented that rock dumping is a concern. However, none is planned for the Annabel decommissioning. • JNCC welcomed the proposals to curtail the overtrawl activities to areas within the 500m zones.
NFFO	We discussed the decommissioning proposals with NFFO via teleconference 27 June 2017. The NFFO have confirmed that to meet BEIS requirements they can only provide a Clear Seabed Certificate for areas that have been subject to over-trawl.	The decommissioning proposals were acceptable.
STATUTORY CONSULTATIONS		
National Federation of Fishermen's Organisation		
Scottish Fishermen's Federation		
Northern Irish Fish Producers Organisation		
Global Marine Systems		
Public		

6. PROGRAMME MANAGEMENT

6.1 Project Management and Verification

A Centrica project management team has been be appointed to 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 Centrica Health and Safety principles. Changes to the Decommissioning Programmes will be discussed with BEIS with any necessary approvals sought.

6.2 Post-Decommissioning Debris Clearance and Verification

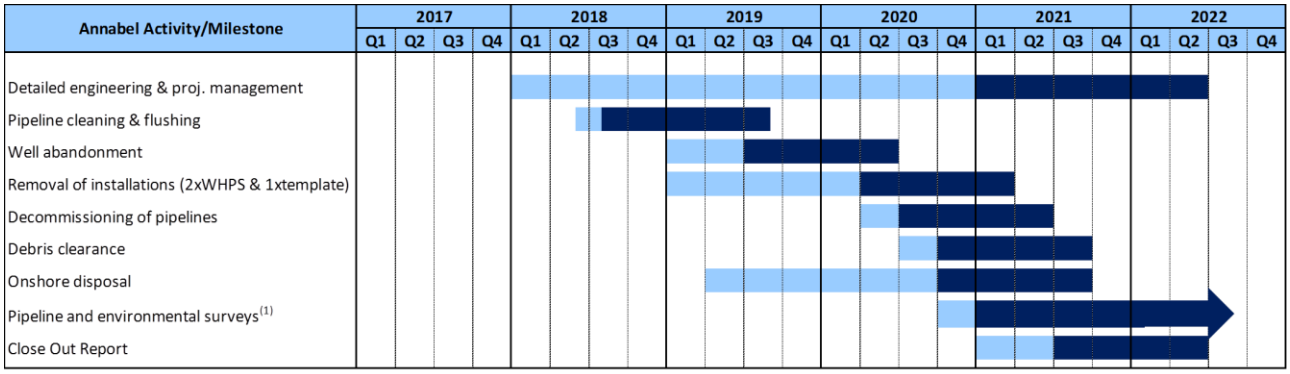
The Annabel installation sites and the 500m safety zone will be the subject of debris and trawlability surveys when decommissioning activities have concluded. Although obliged to carry out trawlability surveys along a 200m wide corridor along all decommissioned pipelines, due to the sensitive nature of the North Norfolk Sandbanks and surrounding area, we would prefer not to carry out trawlability surveys over pipeline areas that have not been subject to decommissioning activities. Given the burial status of the pipelines we would hope that we can agree a practical compromise that satisfies the requirements of the stakeholders concerned. Discussions are on-going with regards resolution of this issue.

Any seabed oil and gas debris will be recovered for onshore recycling or disposal in line with existing disposal methods. Independent verification of seabed state will be obtained by trawling the installation and pipeline areas and this will be supported by a Certificate of Clearance. This 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 6.1. 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

1. Earliest potential activity
2. Activity window to allow commercial flexibility associated with well abandonment, installation and pipeline decommissioning activities
3. First Decommissioning survey and environmental survey; timing of any future surveys to be agreed with BEIS
4. Decommissioning of pipelines will be subject to Comparative Assessment

Figure 6.1: Gantt Chart of Project Plan

6.4 Costs

Table 6.1: Provisional Decommissioning Programme Costs	
Item	**Estimated Cost (£mm)**
Operator project management	tba
Facility running/owner costs	tba
Well plugging and abandonment	tba
Facilities/pipelines making safe	tba
Topsides preparation	tba
Substructure removal (incl. subsea installations)	tba
Topsides and substructure onshore recycling	tba
Subsea infrastructure (pipelines, umbilical lines)	tba
Site remediation	tba
Monitoring	tba
TOTAL	**tba**

6.5 Close Out

A close out report will be submitted to BEIS within four months of the completion of the offshore work, including debris clearance and post-decommissioning surveys, as required in BEIS

guidelines. The report will explain any variance from the Decommissioning Programmes.

6.6 Post-Decommissioning Liability, Monitoring and Evaluation

After decommissioning has been completed, pipeline status surveys and environmental surveys will be completed with the findings being sent to BEIS in the Close Out report. The frequency of future surveys will be agreed with BEIS and supported with a risk assessment. Residual liability will remain with the Section 29 holders identified in Table 1.2 and Table 1.4. Unless agreed otherwise in advance with BEIS, Centrica North Sea Limited 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

Table 7.1: Supporting Documents

Item	Document Number	Document Title
[1]	CEU-DCM-SNS0096-REP-0001	Ann A4 Decommissioning Programme, Jan 2017
[2]	CEU-DCM-SNS0096-REP-0005	Ann & Alison Decommissioning Programmes, June 2017
[3]	CEU-DCM-SNS0096-REP-0008	Annabel & Audrey Decommissioning Comparative Assessment for Pipelines, April 2017
[4]	CEU-DCM-SNS0096-REP-0009	Audrey and Annabel Decommissioning Environmental Impact Assessment, April 2017
[5]	10786.3	Annabel Pre-Decommissioning Survey, Gardline, Geosurvey Limited, March 2017

Appendix A. Burial Profiles

Appendix A.1 PL2066 Burial Profile

PL2066 is the 10” gas export pipeline that is approximately 17.8km long and routed from the Annabel manifold inside the Annabel template through to Audrey A (WD). When installed in 2006 the pipeline was trenched and buried, but throughout its length the pipeline is intermittently protected by deposited rock. The approaches to both the Annabel template and the Audrey A (WD) platform are stabilised and protected with concrete mattresses, although the mattress cover on the approach to the Annabel template is not continuous.

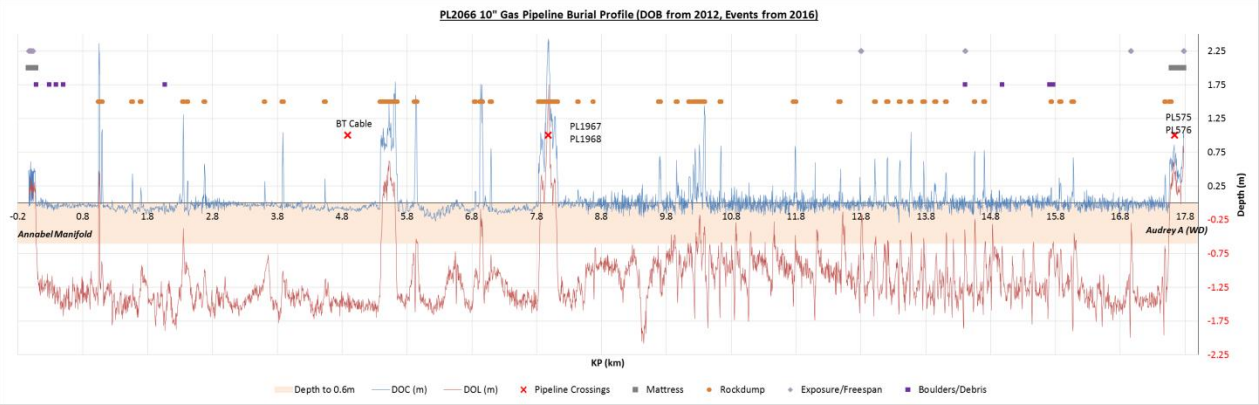


Figure A.1: PL2066 Burial Profile

Appendix A.2 PL2067 Burial Profile

The Annabel manifold valves and wellheads derive power, hydraulic fluids and chemicals from Audrey B (XW) via pipeline PL2067. This is an umbilical line. The pipeline is approximately 13.4km long and when installed in 2006 it was trenched and buried. The third-party pipeline crossings are protected by deposited rock. The approaches to both the Annabel template and the Audrey B (XW) platform are stabilised and protected with concrete mattresses.

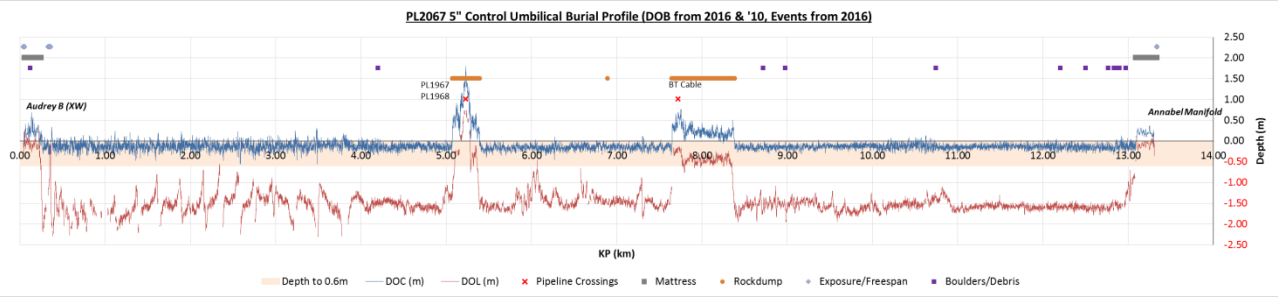


Figure A.2: PL2067 Burial Profile

Appendix B. PUBLIC NOTICE & CONSULTEE CORRESPONDENCE

Appendix B.1 Public Notices

HOLD

Appendix B.2 Correspondence

HOLD