Sean Field Decommissioning Programmes

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CONTENTS

Terms and Abbreviations

Abbreviation	Explanation
BEIS	Department for Business, Energy and Industrial Strategy
CA	Comparative Assessment
CO_2	Carbon Dioxide
COP	Cessation of Production
DP	Decommissioning Programme
DROPS	Dropped Objects Prevention Scheme
EA	Environmental Appraisal
EA	Environmental Agency
EMS	Environmental Management System
EMT	Environmental Management Team (OPRED)
ENE	East North East
ERW	Extended Reach Wells
EUNIS	European Nature Information System
HSE	Health and Safety Executive
HSEQ	Health, Safety, Environment and Quality
ICES	The International Council for the Exploration of the Sea
JNCC	Joint Nature Conservation Committee
km	Kilometer
km^2	Kilometer Square
KP	Kilometer Point
m^2	Meters Square
m^3	Meters Cube
MCDA	Multi Criteria Decision Analysis
MMO	Marine Management Organisation
NFFO	National Federation of Fishermen's Organisations
NORM	Naturally occurring radioactive material
ODU	Offshore Decommissioning Unit
OGA	Oil and Gas Authority
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OSPAR	Oslo and Paris Conventions
PL	Pipeline
PWA	Pipeline Works Authorisation
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SSE	South South East
SSSI	Site of Specific Scientific Interest
UKCS	United Kingdom Continental Shelf
WONS	Well Operations Notification System

Figures and Tables

1 EXECUTIVE SUMMARY

1.1 Decommissioning Programmes

This document contains two decommissioning programmes for the installations and pipelines associated with the Sean Field.

There is a decommissioning programme for each set of associated notices served under Section 29 of the Petroleum Act 1998, these programmes are included within this document. The decommissioning programmes are for:

1. Sean Section 29 Notice – Offshore Installations:
   - Three fixed steel platforms ('PD' bridge-linked to 'PP' and 'RD') including without limitation all associated subsea equipment. Note 1
2. Sean Section 29 Notice – Submarine Pipelines
   - PL310 Pipeline and any associated apparatus
   - PL311 Pipeline and any associated apparatus Note 2
   - S0813 SSIV Umbilical Note 3
   - S0803 Power Cable Note 3

Notes:

1. Sean East ERWs (1 from PD and 1 from RD) are not specifically stated within the Sean Section 29 Notice however they are included in the decommissioning scope of Sean Field Requirement for Decommissioning Programmes.
2. The onshore section of the PL311 pipeline from low water mark to Bacton Terminal is not covered by the Section 29 notice and is out of scope of this decommissioning programme.
3. The SSIV umbilical and power cable are part of the decommissioning programme but not covered by a Section 29 notice. An application to bring these into the PWA regime is in development and shall be submitted to the OGA consents team for approval.

1.1.1 Installations

In accordance with the Petroleum Act 1998, the Section 29 notice holders of the Sean Field Installations (see Table 1-2) are applying to the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) to obtain approval for decommissioning the installations detailed in Section 2.1 and 2.2 of this programme. (See also Section 8 - Partner Letter(s) of Support).

1.1.2 Pipelines

In accordance with the Petroleum Act 1998, the Section 29 notice holders of the Sean Field pipelines (see Table 1-4) are applying to the Offshore Petroleum Regulator for Environment & Decommissioning (OPRED) to obtain approval for decommissioning the pipelines detailed in Section 2.3 of this programme. (See also Section 8 – Partner Letter(s) of Support).

In conjunction with public, stakeholder and regulatory consultation, the Decommissioning Programmes are submitted in compliance with national and international regulations and OPRED guidelines. The schedule outlined in this document is for a six-year decommissioning project plan, see Section 6.3 for more detail.

1.1.2.1 Pipeline Onshore Elements

PL311, 30" Gas Export Pipeline runs from Sean PP (ONE-Dyas) to Bacton Terminal (Shell UK Limited). The onshore section of PL311 is to be decommissioned in situ, along with the rest of the pipeline. Should onshore sections of the pipeline become exposed in the future, these sections will be remediated / removed as appropriate to reduce any potential risk to recreational users and other receptors. Such decisions will be made following discussion with the North Norfolk District Council and consideration will be given to all stakeholders and receptors which may be potentially impacted by such activity.

The onshore pipeline infrastructure will be decommissioned and abandoned in accordance with the Pipelines Act 1962, Regulations 25, the Pipelines Safety Regulations 1996, and the BSI Code of Practice for steel pipelines on land PD 8010-1:2015+A1:2016. Although the pipeline is to be abandoned in-situ the exact abandonment plan for the onshore sections of the pipelines out to the MLWM (i.e., the final 0.6km) has not yet been fully defined. The pipeline will be flushed clean of hydrocarbons and inhibited with treated seawater prior to being disconnected and capped.

1.2 Introduction

The Sean Field is located in Block 49/25a (Licence P54) and consist of the following separate fields:

- East Sean
- North Sean
- South Sean

Within this document the fields shall be collectively referred to as the Sean Field.

The Sean field was discovered in 1969, the East Sean gas field was discovered in 1983. Development of the Sean Field began in 1984 with the installation of the PD Wellhead jacket and first gas was produced in 1986. The Sean Romeo (RD) installation was installed in 1984 with production start-up commencing in 1986.

The Sean Field comprises the Sean PP gas production platform, the bridge linked Sean PD wellhead platform and the Sean RD wellhead platform located in Block 49/25a of the Southern North Sea. The installations stand in 30 m of water approximately 109 km NE of Lowestoft. The Sean Papa (PD and PP) are normally attended installations (NAI), Sean RD is a not permanently attended installation (NPAI).

Sean PD currently has 10 well slots, 8 producing and Sean RD currently has 6 wells slots, 2 producing. Sean East was developed by way of 2 ERWs, 1 from PD and 1 from RD. A Cessation of Production (CoP) application was submitted to the Oil and Gas Authority (OGA) for review with confirmation subsequently received that there are no objections to ONE-Dyas UK Limited permanently ceasing production.

Sean PD includes a compression module to receive exported gas from Sean RD via a 20-in subsea pipeline (PL310). Gas is exported from Sean RD to PD via the 20" pipeline, and a 30" trunkline (PL311) runs from Sean to Bacton. The 30" trunkline has an SSIV 250 m from Sean PP, the SSIV is serviced by an umbilical running from Sean PP. An electrical cable runs from Sean PP to Sean RD.

From Sean PP to the Bacton Terminal the 30-in export pipeline passes through 5 SACs, refer to Section 4.1.

Following public, stakeholder and regulatory consultation, the Decommissioning Programmes are submitted without derogation and in full compliance with OPRED guidelines. The Decommissioning Programmes explain the principles of the removal activities and are supported by a Comparative Assessment (CA) of decommissioning options and an Environmental Appraisal (EA). However, removal methodologies have not yet been identified, once a removal methodology has been discussed and agreed, OPRED will be informed.

1.3 Overview of Installations/Pipelines Being Decommissioned

1.3.1 Installations

Table 1-1 Installation(s) being decommissioned			
Field:	Sean	**Production Type (Oil/Gas/Condensate)**	Gas
Water Depth (m)	30	**UKCS Block**	49/25a
Surface Installation(s)			
Number	Type	Topsides Weight (Te)	Jacket Weight (Te) Note 1
3	Production Platform PP	6,018	3,260
	Wellhead Platform PD	3,986	2,402
	PD - PP Bridge	181	-
	Wellhead Platform RD	2,216	2,297
Subsea Installation(s)		**Number of Wells**	
Number	Type	Platform	Subsea
1	SSIV Structure	Sean PD 10 Sean RD 6	0
Drill Cuttings pile(s)		**Distance to median**	**Distance from nearest UK coastline**
Number of Piles	Total Estimated volume (m^3)	km	km
0	0	15.056	93.72

Notes:

1. Jacket weights includes total weight of risers, caissons, piles and marine growth but does not include soil plug.

Table 1-2 Installations section 29 notice holders' details		
Section 29 Notice Holders	**Registration Number**	**Equity Interest (%)**
Arco British Limited, LLC	FC005677	-
Britoil Limited	SC077750	-
Esso Exploration and Production UK Limited	00207426	-
Shell U.K. Limited	00140141	-
ONE Dyas North Sea Limited	SC282771	-
ONE-Dyas UK Limited	03531783	50
Rockrose UKCS15 Limited	SC375371	50

1.3.2 Pipelines, Umbilicals and Power Cables

Table 1-3 Pipeline(s) being decommissioned		
Number of Pipelines	2	(See Table 2-3)
Number of Umbilicals	1	(See Table 2-3)
Number of Power Cables	1	(See Table 2-3)

Table 1-4 Pipelines section 29 notice holders' details			
Pipeline Number	**Section 29 Notice Holders**	**Registration Number**	**Equity Interest (%)**
PL310, PL311	Arco British Limited, LLC	FC005677	-
	Britoil Limited	SC077750	-
	Esso Exploration and Production UK Limited	00207426	-
	Shell U.K. Limited	00140141	-
	ONE-Dyas North Sea Limited	SC282771	-
	ONE-Dyas UK Limited	03531783	50
	Rockrose UKCS15 Limited	SC375371	50

1.4 Summary of Proposed Decommissioning Programmes

Table 1-5 Summary of Decommissioning Programmes	
Proposed Decommissioning Solution	**Reason for Selection**
1. Topsides	
Sean PP, Sean PD and Sean RD: Complete removal, onshore dismantling, recycling and disposal. Remove the topsides and transport ashore for dismantling. Cleaned equipment refurbished for re-use where possible. Equipment which cannot be re-used will be recycled or other disposal routes as appropriate.	Complies with requirements of OSPAR Decision 98/3 for complete removal and maximises recycling of materials.
2. Substructures	
Sean PP, Sean PD and Sean RD: Complete removal, onshore dismantling, recycling and disposal. Sub-structure piles shall be cut 3m below the mudline. Sub-structures shall be fully removed and transported ashore for dismantling. Materials will be recycled or other disposal routes as appropriate.	Complies with requirements of OSPAR Decision 98/3 for complete removal and maximises recycling of materials.
3. Subsea Installations	
PL311 SSIV Structure: Complete removal, onshore dismantling, recycling and disposal. Rock placed around the structure shall be excavated. Structure piles shall be cut 3.0 m below the mudline, the structure shall be removed and returned to shore for dismantling, re-use and recycling. Excavated rock shall be back filled into the resultant hollow.	Adheres to clear seabed policy for complete removal and maximises recycling of materials.
Mooring buoys: Complete removal. The two mooring buoys consist of surface buoys anchored via concrete blocks on the seabed. Both buoys, mooring and anchor blocks shall be removed to shore for disassembling and recycling / disposal.	Adheres to clear seabed policy for complete removal and maximises recycling of materials.
4. Pipelines, Flowlines & Umbilicals	
30-in Gas Export Pipeline PL311: Decommission *in situ* and remediate snag risk. The PL311 is suitably trenched and buried between KP 54.0 and Sean PP. From shore to KP 54.0, the pipeline was intentionally surface laid at the time of installation. The surface laid section has been stable for many years; however, in 2016, five locations were identified for placement of rock remediation between KP11.0 and 15.0. Recent survey data (DeepOcean, 2020) suggests several exposures have been generated by hydrographic sediment movement within and to the east of this previously remediated area (between KP14.0 and 17.0). These exposures will be investigated during the pre-decommissioning survey and will be remediated with rock protection prior to decommissioning in situ.	Findings from the CA evaluation process conducted found a preference for the Safety, Environment, Societal and Economic criteria and equally preferred for the Technical criterion to the next most preferred option.

Table 1-5 Summary of Decommissioning Programmes	
Proposed Decommissioning Solution	**Reason for Selection**
There are seven pipeline and seven umbilical/cable crossings associated with the pipeline, all of these are gravel protected except for the PL311 SSIV umbilical which has a mattress and the Tampnet cable which is exposed. There are five mattresses located over the pipeline. Only one of these is associated with a crossing, as mentioned, at KP 0.12. The remaining mattresses are located at KP 91.64, KP 91.68, KP 91.69 and KP 95.1. Mattresses are generally exposed, at KP 95.1 the mattress is partially buried with rock. Following pipeline flushing the pipeline will be filled with inhibited seawater to ensure that consideration of future re-use options are not precluded. The offshore end of the PL311 (20 m) will be cut and lifted (KP 106.48) with the open end being capped. Exposed sections of the pipeline will be remediated with rock placement in line with BEIS (2018) Guidance. The exposed end of the pipeline will be remediated with rock to minimising any residual snag hazard. The spans along the PL311 will be similarly remediated. Non-intrusive post-decommissioning surveys will occur to ensure that the PL311 is left in an acceptable condition. The pipeline shall be monitored on a regular basis and any future problematic areas shall be remediated.	
20-in Gas Export Pipeline PL310: Decommissioning *in situ* and remediate snag risk. PL310 is stably buried to an average depth of 0.72 m. There are no crossings associated with this pipeline. The end sections of the PL310 (113 m) will be cut and lifted. The exposed cut ends of the pipeline will be remediated with rock to minimising any residual snag hazard. Non-intrusive post-decommissioning surveys will occur to ensure that PL310 is left in an acceptable condition. The pipeline shall be monitored on a regular basis and any future problematic areas shall be remediated.	Findings from the CA evaluation process conducted found a preference for the Safety, Environment, Technical and Economic criteria and equally preferred for the Societal criterion to the full removal option.
1" Electrical Cable S0803: Full removal. The cable will be cut at each end, the buried length will be exposed and then recovered to a suitable vessel.	Findings from CA evaluation process conducted found that recycling value of copper was slightly preferred to the leave *in situ* option whereas the technical feasibility was greater for leave in situ, with all other criteria equally preferred.

Table 1-5 Summary of Decommissioning Programmes	
Proposed Decommissioning Solution	**Reason for Selection**
Riser Tie-In Spools: 20" Riser Tie-In Spool Sean RD to 20" Gas Export Pipeline PL310, there is a single exposed protection mattress over this tie-in spool; 20" Riser Tie-In Spool Sean PD from 20" Gas Export Pipeline PL310; 30" Riser Tie-In Spool Sean PP to 30" Gas Export Pipeline PL311. All tie-in spools shall be fully removed to shore for recycling.	Adheres to clear seabed policy for complete removal and maximises recycling of materials.
Risers PL310 and PL311: Complete removal with substructures to shore for recycling. As risers are an integral part of the platform sub-structures, once disconnected from the seabed tie-in spools they are effectively part of the sub-structure.	Risers will be removed as part of the sub-structures.
SSIV Control Umbilical: Complete removal. Remove to shore for disassembling / stripping and recycling / disposal.	Adheres to clear seabed policy for complete removal and maximises recycling of materials.
Protection, mattresses associated with third party crossings: Decommission *in situ* as part of a third party crossing.	Mattress associated with third party crossing.
Protection, mattresses associated with spool and umbilical protection. Complete removal for recycling / disposal onshore.	Equipment being protected is to be removed.
5. Wells	
Wells to be plugged & abandoned in accordance with Oil & Gas UK guidelines for the Suspension & Abandonment of Wells, Issue 6, June 2018. PD and RD wells to be plugged and abandoned from surface installations. A Master Application Template (MAT) and the supporting Subsidiary Application Template (SAT) shall be submitted in support of activities performed. A PON 5 will also be submitted to the OGA for application to abandon wells. Planned work shall be reviewed by a well examiner and submitted to the HSE for review.	Meets regulatory requirements
6. Interdependencies	
The Sean Field is stand-alone with its own tie-back to the Bacton Terminal, it has no direct interdependencies. There are six third party crossings over and two third party crossings under the 30" gas export pipeline, PL311, ref. Appendix B. A nominal clear distance of 100 metres shall be applied for decommissioning activities either side of each crossing to ensure no interaction with the third part infrastructure.	

1.5 Field Location Including Field Layout and Adjacent Facilities

Figure 1-1 Field Locations in UKCS

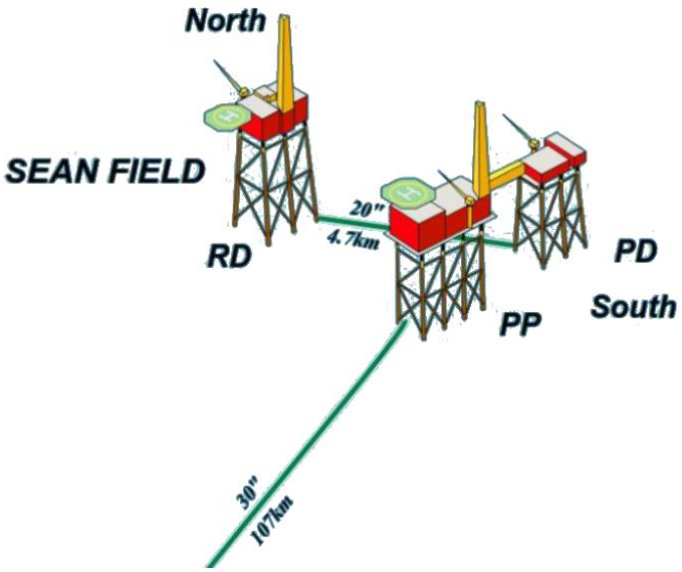


Figure 1-2 Field Layout

The table below shows the installations that are located around the infrastructure that is included in the scope of this DP.

Table 1-6 Adjacent facilities					
Operator	**Name**	**Type**	**Distance/ Direction**	**Information**	**Status**
Perenco	PL1053/PL1054 Davy to Inde-AT Gas Export Pipeline	Steel Pipeline	4.76 km (Sean PP) 4.87 km (Sean RD)	Davy to Inde 16" Gas Export Pipeline	Operational
Shell	Corvette CV	Steel Wellhead Platform	16.7 km (Sean PP) 13.6 km (Sean RD)	Gas exported to Leman A	Operational
Perenco	Inde CD/CP	Steel Drilling & Accommodation Platform / Steel Production Platform	23.7 km (Sean PP) 19.6 km (Sean RD)	Gas exported to Inde AT	Operational
Perenco	Inde AT/AC/AQ	Steel Terminal & Riser Platform / Steel Compression Platform / Steel Accommodation Platform	24.1 km (Sean PP) 20.2 km (Sean RD)	Gas exported to Leman BT	Operational
Perenco	Davy A	Steel Wellhead Platform	20.7 km (Sean PP) 25 km (Sean RD)	Gas exported to Inde AT	Operational
Perenco	Bessemer	Steel Wellhead Platform	26.9 km (Sean PP) 23.2 km (Sean RD)	Gas exported to Inde AT	Operational
Shell	Caravel QR	Steel Platform	27 km (Sean PP) 23.3 km (Sean RD)	Gas Exported to Corvette CV	Operational
Perenco	Inde D	Steel Wellhead Platform	27.3 km (Sean PP) 23.5 km (Sean RD)	Injection Wellhead	Operational
Perenco	Inde AD/AP	Steel Drilling & Accommodation Platform / Steel Production Platform	27.5 km (Sean PP) 23.1 km (Sean RD)	Gas exported to Inde AT	Operational
Shell	Brigantine BG	Steel Platform	27.5 km (Sean PP) 22.9 km (Sean RD)	Gas Exported to Corvette CV	Operational
Perenco	Inde BD/BP	Steel Drilling & Accommodation / Steel Production Platform	31.9 km (Sean PP) 27.6 km (Sean RD)	Gas exported to Inde AT	Operational
Perenco	Davy to Inde AT	6/4.5-in pipeline crossing PL311	KP 101.34	Gas/MEG	Operational

Table 1-6 Adjacent facilities					
Operator	**Name**	**Type**	**Distance/ Direction**	**Information**	**Status**
Tullow	Thames to Orwell	4-in umbilical crossing PL311	KP 84.34	Umbilical	Non-Operational
Tullow	Orwell to Thames	16-in pipeline crossing PL311	KP 84.25	Gas	Non-Operational
Perenco	Welland to Thames	16-in pipeline crossing PL311	KP 83.21	Gas	Non-Operational
Perenco	Thames to Yare C	4-in umbilical crossing PL311	KP 82.05	MEG	Non-Operational
Perenco	Yare C to Thames	8-in pipeline crossing PL311	KP 82.04	Gas	Non-Operational
Tullow	Horne to Thames	10/2-in pipeline crossing PL311	KP 81.95	Gas	Non-Operational
Perenco	Arthur to Thames	12-in pipeline crossing PL311	KP 81.88	Gas	Non-Operational
Perenco	Thames to Arthur	8-in pipeline crossing PL311	KP 81.84	Gas	Non-Operational
Tampnet	Draupner to Lowestoft	Cable crossing PL311	KP 69.71	Cable	Operational
Impacts of Decommissioning Proposals					
None of the adjacent facilities listed above are affected by this decommissioning programme. However, the operators of these installations will be contacted to investigate any benefits and cost savings available through co-operation and alignment of decommissioning activities. Future wind farm developments in the area shall also be taken into consideration. The nearby proposed Norfolk Vanguard Offshore Wind Farm has an associated export cable, which when installed, will run parallel with the PL311 for approximately 30 km; this area was surveyed and, in addition to S. spinulosa, sea stars, hermit crabs, edible crabs and gobies were also observed, amongst other species. It is likely these species are found along the trunkline.					

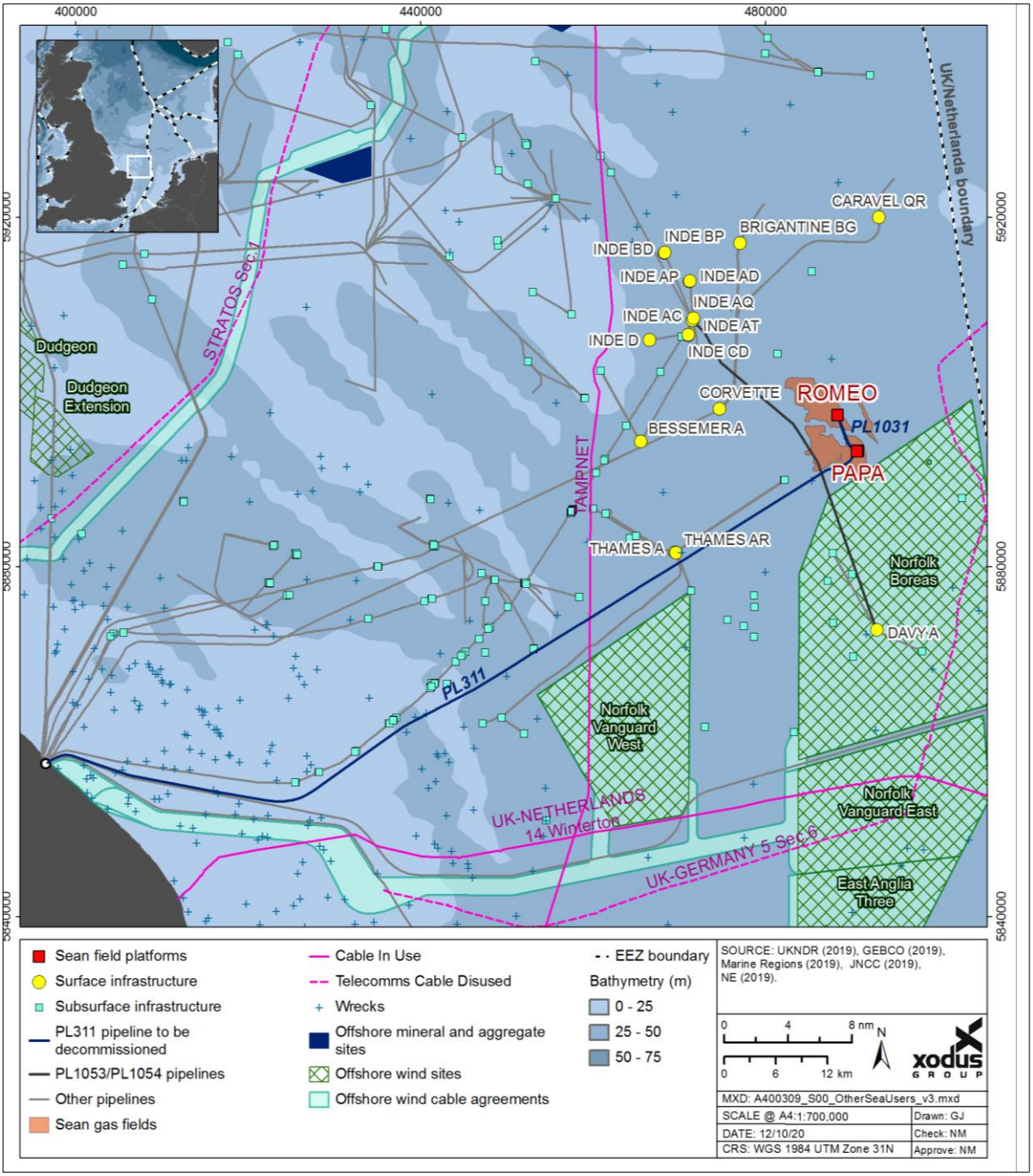


Figure 1-3 Adjacent Facilities

1.6 Industrial Implications

The Sean field decommissioning activities will be managed by ONE-Dyas in the Netherlands. All decommissioning activities will be planned to realise synergies and efficiencies in offshore execution.

A Supply Chain Action Plan (SCAP) will be produced for these Decommissioning Programmes in accordance with OGA guidance. The SCAP will be submitted to and approved by the OGA. ONE-Dyas have some pre-existing Master Service Agreements with specialist contractors, which were the result of previous tender exercises. These contractors will be asked to quote for services to support the decommissioning activity in the first instance. Other specialist services will be competitively tendered or novated. Suppliers' offers will be assessed along many criteria, among which are capacity to execute the work safely; the commercial offer and experience of carrying out this type of operation on the UKCS.

2 DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

2.1 Installation(s): Surface Facilities (Topsides/Jackets)

Table 2-1 Surface facilities information								
Name	Facility Type	Location (ED1950 Z31 N)	Topsides / Facilities		Jacket			
			Weight (Te)	No of modules	Weight (Te) Note 1	Number of legs	Number of piles	Weight of piles (Te)
Sean PP	Production Platform	53° 11' 21" N 02° 51' 42" E	6,018	6	1,374	8	8	1,832
Sean PD	Wellhead Platform	53° 11' 23" N 02° 51' 45" E	3,986	3	1,076	6	6	1,283
PP - PD	Bridge Link	-	181	1	-	-	-	-
Sean RD	Wellhead Platform	53° 13' 34" N 02° 49' 39" E	2,216	2	1,128	6	4	1,125

Notes:

1. Jacket weights presented do not include allowance for marine growth.

2.2 Installations: Subsea including Stabilisation Features

Table 2-2 Subsea installations and stabilisation feature					
Subsea installations incl. Stabilisation Features	Number	Size (m) / Weight (Te)	Location		Comments/Status
SSIV	1	14 m x 10 m x 7 m 110 Te	ED1950 Z31 N	53° 11'14.4" N 02° 51'28.4" E	Steel framed piled structure below level of surrounding seabed with proximity rock berm.
Mooring Buoy Concrete Anchor Blocks	2	4 m dia. x 2 m high 35 Te (each)	ED1950 Z31 N	53° 12' 9.0" N 02° 51' 8.0" E 53° 11' 5.0" N 02° 49' 1.0" E	Steel tubular concrete filled structures

2.3 Pipelines Including Stabilisation Features

Table 2-3 Pipeline / Flowline / Umbilical Information										
Description	**Pipeline No. (per PWA)**	**Dia. (in)**	**Length (km)**	**Description of component parts**	**Product Conveyed**	**End Points**		**Burial Status**	**Pipeline Status**	**Current Contents**
						From	**To**			
20-in Export Pipeline	PL310	20	4.858	Concrete Coated Duplex Steel Pipe	Gas	Sean RD	Sean PD	Trenched, backfilled	Operational	Hydrocarbon
30-in Export Pipeline	PL311	30	106.502	Concrete Coated Steel Pipe	Gas	Sean PP	Bacton Gas Terminal	Majority of the line is trenched and back filled with discrete areas rock covered. Some of the inshore pipeline is exposed on the surface.	Operational	Hydrocarbon
SSIV Umbilical	S0813	4	0.4	Hydraulic Cores, Steel Wire and Plastic	Hydraulic Fluid	Sean PP	SSIV	Line is trenched and back filled with ends mattresses and rock protecting the exposed ends	Operational	Hydraulic Fluid
Power Cable	S0803	3.5	4.892	Copper Cores, Steel Wire, Fibre Optic and Plastic	Power	Sean PP	Sean RD	Trenched, backfilled	Operational	N/A

Table 2-4 Subsea pipeline stabilisation features				
Stabilisation Feature	**Total Number**	**Weight (Te)**	**Locations**	**Exposed/Buried/Condition**
Concrete mattress	6 [Note 1]	28.296	470 129.07 E 5 880 713.55 N	Exposed
Rock cover	777 m [Note 2]	16,500	KP 11.3 – KP 106.5	Exposed

Notes:

1. Five mattresses on PL311 are located at KP 0.12, KP 91.64, KP 91.68, KP 91.69 and KP 95.1.

   One mattress on PL310 is located at the RD Platform riser tie-in spool.

2. Spot rock placed at 20 locations between KP 11.34 and KP 106.43

2.4 Wells

Table 2-5 Well information					
Location	**Platform Wells**	**Designation**	**License**	**Status**	**Category of Well**
Sean PD	49/25a-P3 (South Sean)	Gas	P54	Operating	2-2-2
Sean PD	49/25a-P9Z (South Sean)	Gas	P54	Operating	2-2-2
Sean PD	49/25a-P2 (South Sean)	Gas	P54	Injector	2-2-2
Sean PD	49/25a-P6Z (East Sean)	Gas	P54	Operating	2-2-2
Sean PD	49/25a-P10 (South Sean)	Gas	P54	Operating	2-2-2
Sean PD	49/25a-P4 (South Sean)	Gas	P54	Plugged	2-2-2
Sean PD	49/25a-P5 (South Sean)	Gas	P54	Operating	2-2-2
Sean PD	49/25a-P1 (South Sean)	Gas	P54	Operating	2-2-2
Sean PD	49/25a-P7 (South Sean)	Gas	P54	Operating	2-2-2
Sean PD	49/25a-P8 (South Sean)	Gas	P54	Operating	2-2-2
Sean RD	49/25a-R3 (North Sean)	Gas	P54	Shut-In	2-2-2
Sean RD	49/25a-R6 (East Sean)	Gas	P54	Shut-In	2-2-2
Sean RD	49/25a-R2 (North Sean)	Gas	P54	Operating	2-2-2
Sean RD	49/25a-R1 (North Sean)	Gas	P54	Shut-In	2-2-2
Sean RD	49/25a-R4 (North Sean)	Gas	P54	Shut-In	2-2-2
Sean RD	49/25a-R5 (North Sean)	Gas	P54	Operating	2-2-2

2.5 Inventory Estimates

The approximate amount of key materials used in the make-up of the Sean Field installations and pipelines has been evaluated. Further review of the inventories of materials will be conducted during the detailed engineering phase of decommissioning, summary plots of the material inventories are shown in Table 2-6 and Table 2-7 below. An inventory will be shared with the Environment Agency (EA) as part of the Active Waste Management Plan for decommissioning activities.

Table 2-6 Sean Field Installations Estimated Inventory		
Item	**Description**	**Weight (Te)**
Metals	Ferrous (steel - all grades)	18,401
	Non-Ferrous (copper, aluminium, nickel, etc.)	973
Concrete	Aggregates (concrete coating, etc.)	0
Plastic	Rubbers, polymers	261
Hazardous	Asbestos	2
	Residual fluids (hydrocarbons, chemicals, etc.)	16
	NORM scale	0
Other	Wood, GRP	568
	Marine Growth	141
	Total (Tonnes)	**20,361**

Figure 2-1 Pie chart of estimated installations inventory

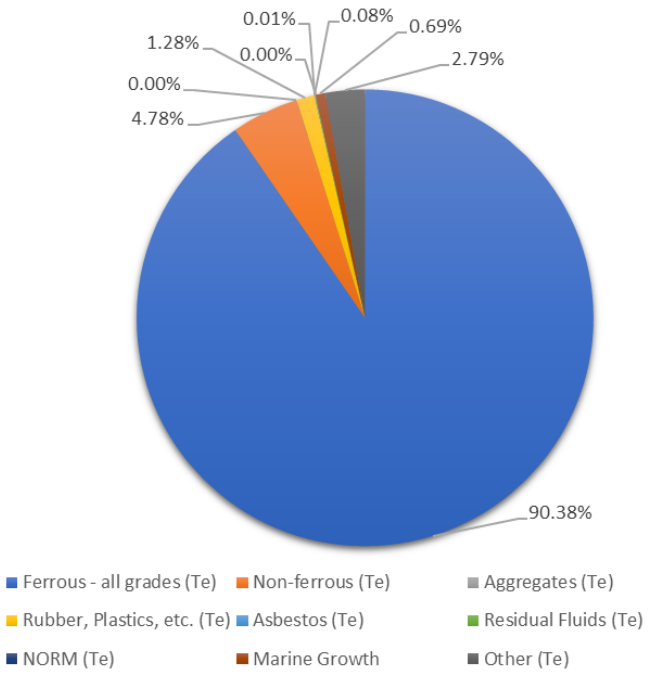
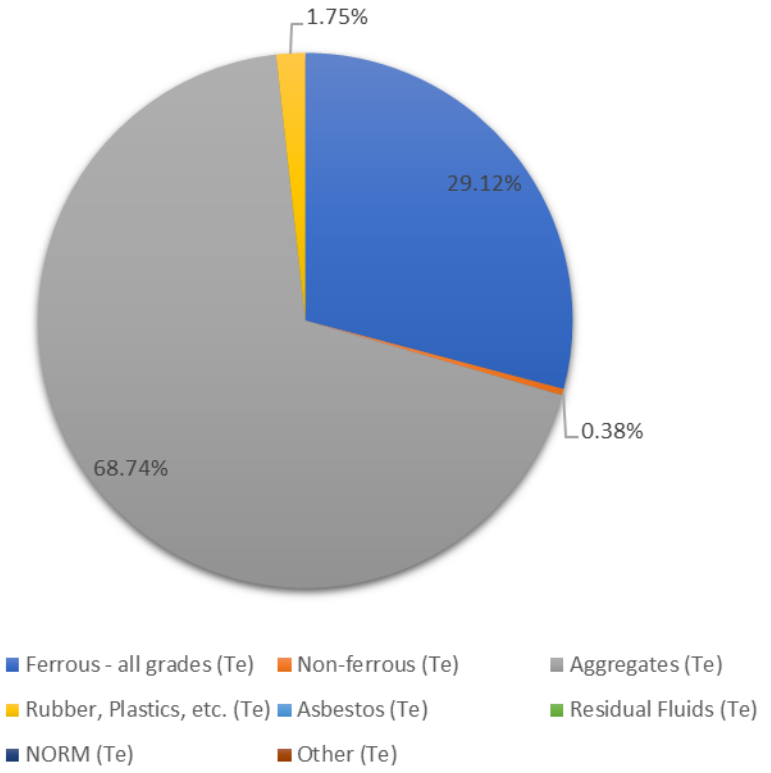


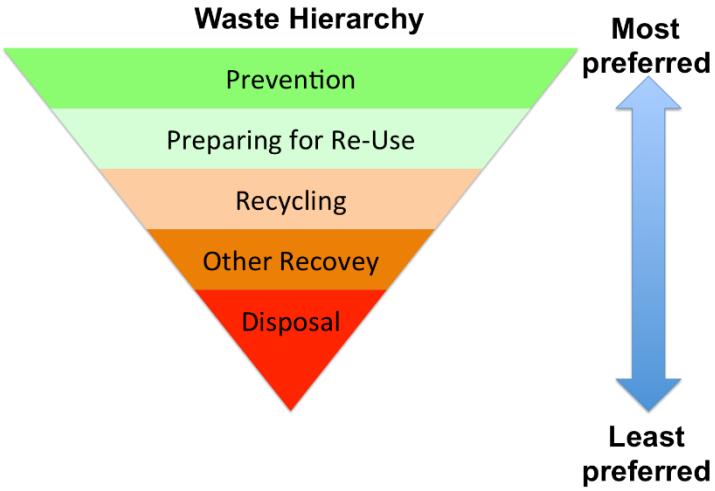
Table 2-7 Sean Field Pipelines and Subsea Estimated Inventory		
Item	**Description**	**Weight (Te)**
Metals	Ferrous (steel - all grades)	35,139
	Non-Ferrous (copper, aluminium	463
Concrete	Aggregates (concrete coating, mattresses, grout bags)	82,940
Plastic	Rubbers, polymers	2,110
Hazardous	Asbestos	0
	Residual fluids (hydrocarbons, chemicals)	0
	NORM scale	0
Other	(Glass filament, Silica)	0
	Total (Tonnes)	120,652

Figure 2-2 Pie chart of estimated pipelines and subsea inventory



3 REMOVAL AND DISPOSAL METHODS

Decommissioning of the Sean field will generate a quantity of waste. ONE-Dyas is committed to establishing and maintaining environmentally acceptable methods for managing wastes in line with the Waste Framework Directive and principles of the waste hierarchy:



In line with the waste hierarchy, ONE-Dyas have considered other potential reuse options for the Sean Field infrastructure.

Options to re-use the infrastructure *in situ* for future hydrocarbon developments were assessed, but none yielded a viable commercial opportunity, primarily due to the absence of remaining hydrocarbon reserves in the vicinity. A Cessation of Production (CoP) application was submitted to the Oil and Gas Authority (OGA) for review with confirmation subsequently received that there are no objections to ONE-Dyas UK Limited permanently ceasing production.

ONE-Dyas appreciates that the re-use of Oil and Gas infrastructure is in its infancy and as a result have committed to cap and inhibit the export pipeline contents post flushing in order to allow for the potential for re-use of this pipeline should a technology mature or a future re-use option present itself.

Recovered infrastructure will be returned to shore and transferred to a suitably licenced waste treatment facility. It is expected that the recovered infrastructure, i.e. topsides, jackets, anchor buoys, subsea structure, spools, cable and umbilical will be cleaned before being largely recycled.

Concrete mattresses and grout bags that are recovered, will be cleaned of marine growth if required, and either reused, recovered as aggregate for infrastructure projects or, as a worst case, if no other option is found to be suitable, disposed of in landfill sites.

An appropriately licensed disposal company and yard will be identified through a selection process that will ensure that the chosen facility demonstrates a proven track record of waste stream management throughout the deconstruction process, the ability to deliver innovative reuse / recycling options, and ensure the aims of the waste hierarchy are achieved.

Geographic locations of potential disposal yard options may require the consideration of Trans Frontier Shipment of Waste (TFSW), including hazardous materials. Early engagement with the regulatory authorities will ensure that any issues with TFSW are addressed. Once an appropriately licensed waste contractor has been selected OPRED will be informed.

ONE-Dyas will engage with other companies and industries to identify potential reuse opportunities. However, ONE-Dyas believes that such opportunities are best achieved through the tendering and selection of a waste management contractor with the expert knowledge and experience in this area.

3.1 Topsides

3.1.1 Sean PP Topsides

The Sean PP topsides consists of five decks and the living quarters supported upon a Module Support Frame (MSF). The five decks are: Cellar deck, Lower Deck, Mezzanine Deck, Roof deck and Helideck. The living quarters module consists of four levels, refer to Figure 3-1 and Figure 3-2 below.

Figure 3-1: Sean PP and Sean PD Topsides

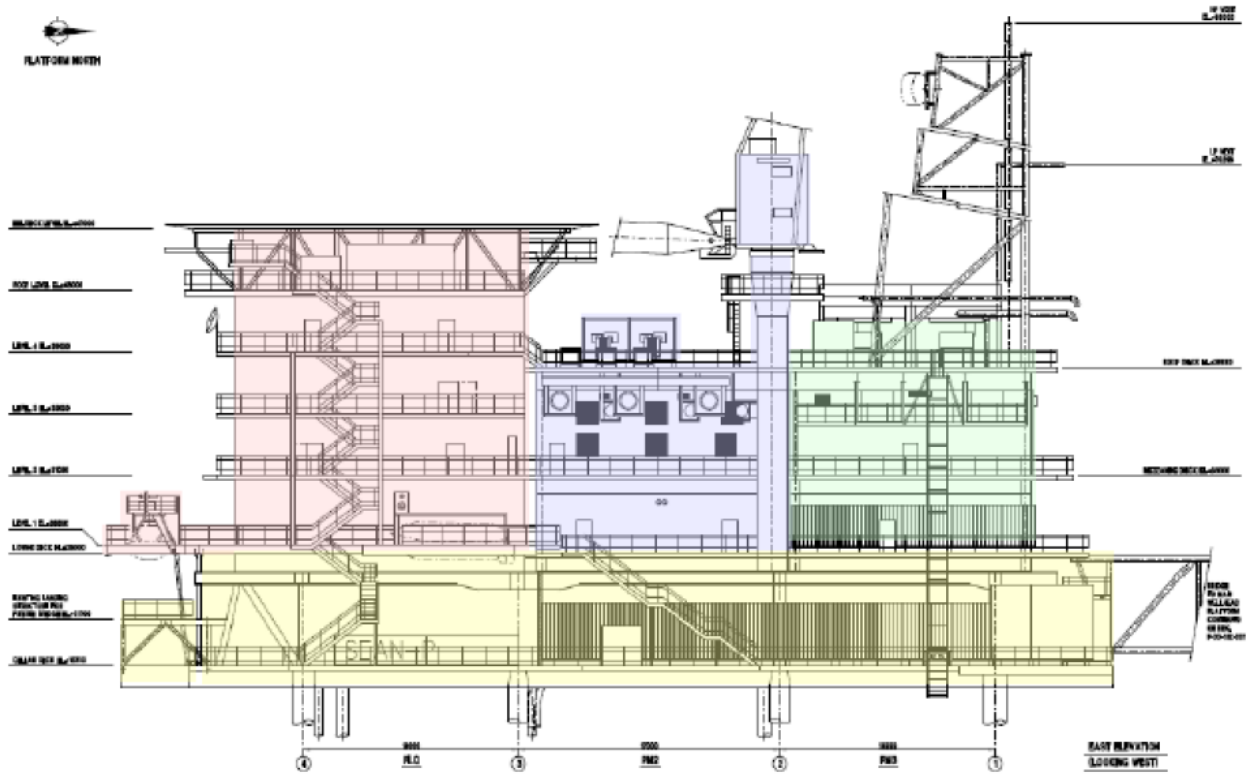
The PP modules, PM2, PM3 and PLQ are supported on PM1 the Module Support Frame (MSF).

- The PP Cellar Deck Module at elevation +18.7m mainly houses the fire pump, sphere launcher, TEG sump tank, vent knockout drum, metering runs, pump packages and workshops.
- The Lower Deck at elevation +26.0m supports process equipment, the crane pedestal, diesel storage tanks, switch room and TEMPSC Nos. 1, 2 and 3.
- The Mezzanine Deck at elevation +31.0m carries the generator turbines and process equipment, including TEG Regeneration Packages and Separator Vessels.
- The Roof Deck at elevation +38.0m supports the gas cooler package and vent stack.
- The Helideck at elevation +45.2m contains fire-fighting equipment and fuel dispenser

The PLQ module comprises four levels (1, 2, 3 and 4) and a roof level. Level 2 at elevation +31.03m, Level 3 at elevation +35.03m and Level 4 at elevation +39.03m are the domestic areas, plus control room and telecoms room. Level 1, at elevation +26.53m, houses battery and switchgear rooms, the potable water tank, HVAC plant and emergency generator room. The roof level at elevation +43.0m supports the aviation fuel tanks, deluge skid and oil store.

The vent tower is located on the North end of the platform. A pedestal crane is located at the East side of the platform.

Figure 3-2: Sean PP East Elevation



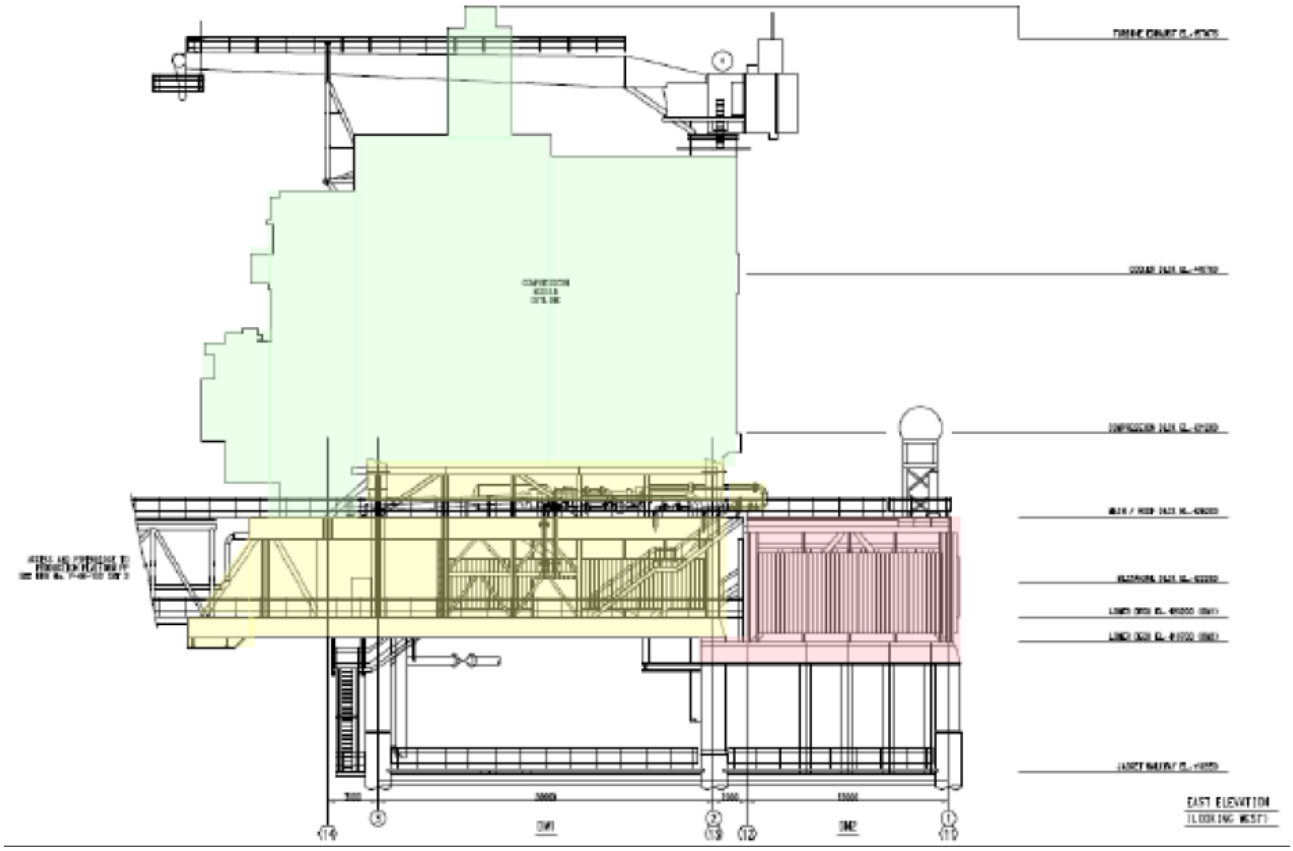
Sean PP and PD are bridge linked at the North end of PP (PM1 module) and South end of PD.

3.1.2 Sean PD Topsides

The Sean PD installation comprises a modular layout with a compression module and well bay, refer to Figure 3-1 above and Figure 3-3 below. The compression module sits upon module DM1 at the South end of the platform with the DM2 well bay module at the North end of the platform. DM1 includes the bridge link to Sean PP.
A pedestal crane is located on the West side of the platform.
The Sean PD topsides consist of five decks

- The lower split level deck at elevation +20.2m and +18.7m, houses the fire water pump diesel day tank, a foam tank, it supports the gas process equipment and the associated pipework.
- The Upper Deck at elevation +26.2m includes wellhead hatch covers and a multi-phase booster pump.
- The Compressor Deck at elevation +31.2m, which houses the gas compression package, the associated suction scrubbers and the fuel gas package. The PD crane is supported off this deck at its northwest corner.
- The Cooler Deck at elevation +40.7m, which contains the coolers associated with the gas compression package.

Figure 3-3: Sean PD East Elevation

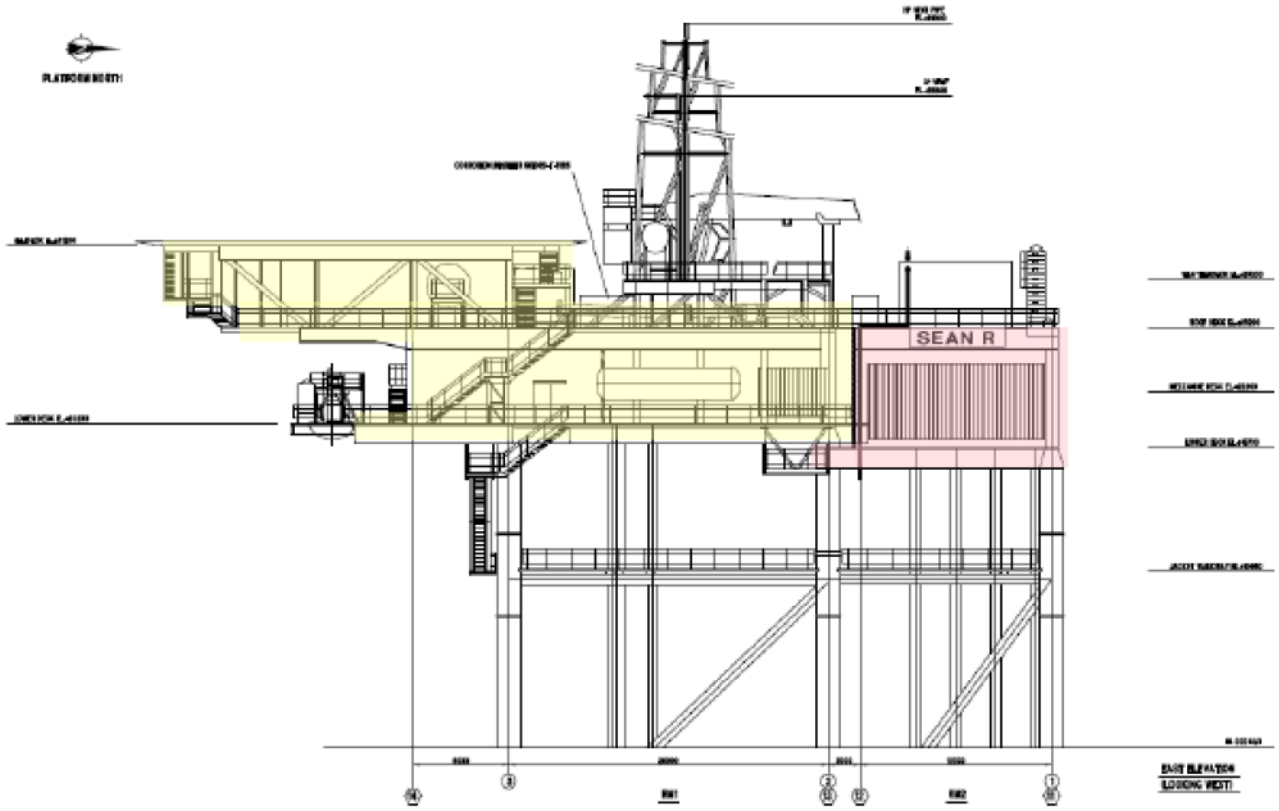


3.1.3 Sean RD Topsides

The Sean RD installation comprises a modular layout with an accommodation module, including helideck, at the South end and the well bay module at the North end of the platform. A vent stack is located on the East side of the platform and a pedestal crane is located on the West side of the platform. Refer to Figure 3-4 below.
The Sean RD topsides consists of two decks.

- Gas processing equipment and the well bay is located on the split level Lower Deck.
- The Upper Deck includes the heli-deck, crane, redundant vent stack and living quarters.

Figure 3-4: Sean RD East Elevation



3.1.4 Preparation / Cleaning

Table 3-1 Cleaning of Topsides for removal		
Waste Type	**Composition of Waste**	**Disposal Route (if Applicable)**
Onboard hydrocarbons	Hydrocarbons	Fluids will be drained and transported to shore for treatment as applicable. Residual hydrocarbons will be transported to shore with the installation and will be treated at the waste facility as applicable.
Other hazardous materials	NORM, any radioactive material, instruments containing heavy metals, batteries	NORM, if present, will be disposed of in accordance with the appropriate permit. Other hazardous materials will be transported ashore for re-use or disposal by appropriate methods.
Original paint coating	The presence of lead-based paints will be identified.	Painted items will be disposed of onshore with consideration given to any toxic components. Painted items deemed hazardous will be treated as appropriate at the waste facility.
Asbestos	Asbestos and Ceramic Fibre	Asbestos shall be disposed of via an appropriately licenced waste management contractor.

3.1.5 Topsides Removal Methods

Table 3-2 Topsides Removal Methods	
1)HLV ☑ 2) SLV ☐ 3) Piece small ☐ 4) Other	
Method	**Description**
Reverse Installation using HLV	Removal of separated topsides modules by HLV for transportation to onshore facility using transport barges for deconstruction. Selected equipment to be re-used, and deconstructed material to be recovered for recycling and/or disposal.

3.2 Jackets/Substructures

3.2.1 Sean PP Substructure

The Sean PP substructure extents from the mudline at EL (-) 32.300 m to the stabbing points for the MSF at EL (+) 12.000 m and is formed of hollow section members. The PP sub-structure is an 8 legged non-battered jacket. Jacket footprint is 45.0 m x 20.0 m. The jacket is fixed to the seabed via through leg piles, the piles are not grouted to the jacket legs. Piles are 54-inch diameter, 50mm wall thickness and 46.0 m long.

3.2.2 Sean PD Substructure

The Sean PD substructure extents from the mudline at EL (-) 32.300 m to the stabbing points for the MSF at EL (+) 12.000 m and is formed of hollow section members. The PD sub-structure is an 6 legged jacket. The East and

West sides of the jacket are battered to an angle of 82.8°. Jacket is 34.0 m x 17.0 m at the top of steel and 34.0 m x 29.2 m at the seabed. The jacket is fixed to the seabed via through leg piles run, the piles are not grouted to the jacket legs. Piles are 54-inch diameter, 50mm wall thickness and 46.0 m long.

3.2.3 Sean RD Substructure

The Sean RD substructure extents from the mudline at EL (-) 32.300 m to the stabbing points for the MSF at EL (+) 12.000 m and is formed of hollow section members. The RD sub-structure is an 6 legged jacket. The East and West sides of the jacket are battered to an angle of 82.8°. Jacket is 34.0 m x 17.0 m at the top of steel and 34.0 m x 29.2 m at the seabed. The jacket is fixed to the seabed via through leg piles run, the piles are not grouted to the jacket legs. Piles are 54-inch diameter, 50mm wall thickness and 46.0 m long.

Table 3-3 Jacket Removal Methods

1)HLV ☑ 2) SLV ☐ 3) Piece small ☐ 4) Other

Method	Description
Reverse Installation using HLV	Piles excavated and internally cut 3 m below seabed using abrasive water jet. Lifting points installed on to jacket upper tubulars from work platforms Jackets are lifted in a single section to preinstalled seafastening on suitable transport barges and returned to shore for deconstruction and recycling.

3.3 Subsea Installations and Stabilisation Features

3.3.1 Sean Subsea Infrastructure

The Sean export pipeline to Bacton was retro-fitted with a SSIV in the early 1990s. To minimise impact to the pipeline the seabed was excavated to facilitate installation of the SSIV at pipeline level. The SSIV is a piled steel tubular framed protection structure incorporating two valves controlled from the Sean PP installation via an electro-hydraulic umbilical.

Mooring buoy anchor blocks are located in the field. They are constructed from a steel frame with concrete ballast.

Table 3-4 Subsea installation and stabilisation features

Subsea Installations and Stabilisation Features	Number	Option	Disposal Route (if Applicable)
SSIV Protection Structure	1	Full Removal	Remove to shore for re-use, recycling or disposal [Note 1].
Mooring Buoy Concrete Blocks	2	Full Removal	Remove to shore for re-use, recycling or disposal.
Concrete Mattresses	14	Full Removal	Remove to shore for re-use, recycling or disposal.
Grout Bags	95	Full Removal	Remove to shore for re-use, recycling or disposal.
Rock Cover	EST. 12,000 Te	Leave In Situ	N/A

Notes:

1. The SSIV structure is piled and protected with a perimeter rock berm which shall be excavated to gain access to the structure. Thereafter the piles shall be cut internally 3m below the level of the mudline. The connecting pipework shall be cut and the SSIV umbilical cut and removed. The SSIV shall be recovered using a suitable construction vessel.

3.4 Pipelines

3.4.1 Decommissioning Options

Key to Options:

1) Re-Use
2a) Cut and Lift with Deburial
2b) Reverse Installation (S-lay) without Deburial
2c) Reverse Installation (S-lay) with Deburial
3a) Rock Placement over Entire Line
3b) Retrench and Bury Entire Line
4a) Rock Placement over areas of Spans/Exposures/Shallow Burial
4b) Trench & Bury areas of Spans/Exposures/Shallow Burial
4c) Remove areas of Spans/Exposures/Shallow Burial
4d) Accelerated Decomposition
5) Remove Ends & Remediate Snag Risk
6) Leave As-is

At each workshop, each decommissioning option for each infrastructure grouping was assessed against each of the assessment criteria utilising a pairwise comparison system. The relative importance of each of the criteria was assessed in a qualitative way, supported by quantification where appropriate.

The process provides for differentiation between decommissioning options in each infrastructure group taking account of stakeholder views.

Table 3-5 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
PL310	Fully trenched and buried, areas of rock cover.	Whole Pipeline	2A, 5
PL311	Partially trenched and buried, discrete areas of rock cover.	Whole Pipeline	2A, 4A, 4C, 5
S0803	Fully trenched and buried.	Whole Cable	2C, 5
S0813	Fully trenched and buried, ends mattress and rock protected.	Whole Umbilical	2B, 2C

3.4.2 Comparative Assessment Methodology:

Comparative Assessment is integral to the overall planning and approval of decommissioning options.
ONE-Dyas' strategy for the CA process is aligned with the Oil & Gas UK Guidelines for Comparative Assessment in Decommissioning Programmes and OPRED Guidance Notes for the Decommissioning of Offshore Oil and Gas Installations and Pipelines.
There are three lines under consideration in this CA. All feasible decommissioning options for the infrastructure have been identified, assessed, ranked and screened, utilising the OPRED Guidance Notes: Decommissioning of Offshore Oil and Gas Installations and Pipelines to carry forward credible decommissioning options to be assessed through the CA process.
The CA process uses five assessment criteria, which are; Safety, Environment, Technical, Societal and Economic to compare the relative merits of each credible decommissioning option for the infrastructure. The assessment criteria are equally weighted to present a balanced assessment and represent the views of each of the stakeholders.
An independent consultancy utilising its bespoke Multi Criteria Decision Analysis (MCDA) process was employed to facilitate the Comparative Assessment workshops. The workshops were attended by specialists from the Operator and representatives from key stakeholders namely:

- Marine Management Organisation (MMO)
- Joint Nature Conservation Council (JNCC)
- Natural England (NE)
- Offshore Petroleum Regulator for Environment and Decommissioning (OPRED)
- North Norfolk District Council (NNDC)
- Crown Estates
- Health and Safety Executive (HSE)

The following stakeholders were invited but did not attend:

- National Federation of Fishermen's Organisations (NFFO)
- Environment Agency (EA)

At the workshop, each decommissioning option for the infrastructure was assessed against each of the assessment criteria utilising a pairwise comparison system. The relative importance of each of the criteria was assessed in a qualitative way, supported by quantification where appropriate.
The process provides for differentiation between decommissioning options in each infrastructure group taking account of stakeholder views, the workshop also allowed for sensitivities to be run adjusting the relationship between different options across the five main criteria.

3.4.3 Outcome of the Comparative Assessment

Table 3-6 Outcomes of Comparative Assessment		
Pipeline or Group	**Recommended Option**	**Justification**
Group 1 – 30-in Gas Export Pipeline	5 Decommission In Situ and Minimal Remediation Note 1	Option 5 was selected through a CA process. Option 5 was found to be preferred from a Safety, Environmental, Technical, Societal and Economic perspective. Refer to the Comparative Assessment Report for more details.
Group 6 – 20-in Gas Export Pipeline	5 Decommission In Situ and Minimal Remediation	Option 5 was selected through a CA process. Option 5 was found to be preferred from a Safety, Environmental, Technical and Economic perspective, and was equally preferred with Option 2A from a Societal perspective. Refer to the Comparative Assessment Report for more details.
Group 7 – 1-in Electrical Cable	2C Full Removal	Option 2C was selected through a CA process. Option 2C and Option 5 were equally preferred from a Safety, Environmental and Economic perspective. Option 5 was preferred from a Technical perspective and Option 2C was preferred from a Societal perspective. Refer to the Comparative Assessment Report for more details. Note 2

Notes:

1. Offshore end of PL311 will be capped and the pipeline will be left flooded with inhibited seawater to ensure that consideration of future re-use options are not precluded.
2. Removal of the electrical cable shall be attempted without de-burial to minimise seabed disturbance, however, if this is not possible the line shall require to be de-buried prior to removal. The seabed shall be remediated thereafter.

A Comparative Assessment report has also been produced to accompany this DP and provide further information regarding the CA process and the emerging recommended option for decommissioning is presented.

3.5 Pipeline Stabilisation Features

Table 3-7 Pipeline stabilisation features			
Stabilisation Features	**Number**	**Option**	**Disposal Route (if Applicable)**
Concrete Mattresses	4	Full Removal	Removal to shore for reuse, recycling or disposal.
Concrete Mattresses (associated with third party crossings)	2	Leave In Situ	N/A
Rock Cover	16,500 Te	Leave In Situ	N/A

3.6 Wells

Table 3-8 Well plug and abandonment
Sean Papa (PD) and Romeo (RD) consists of 10 wells (8 producing) and 6 wells (2 producing) respectively. These wells (captured in Table 2.5) will be plugged and abandoned in accordance with the latest version of the Oil & Gas UK Wells Decommissioning Guidelines (Issue 6, June 2018). A Master Application Template (MAT) and the supporting Subsidiary Application Template (SAT) will be submitted in support of the works carried out. A Well Operations Notification System (WONS) application will also be submitted to the OGA to apply to abandon the wells.

3.7 Waste Streams

The waste management plan will be developed once the contract has been awarded during the project execution phase. The plans shall adhere to the waste stream licensee conditions and controlled accordingly. Discussion with the regulator will ensure that all relevant permits and consents are in place.

Table 3-9 Waste stream management methods	
Waste Stream	**Removal and Disposal method**
Bulk liquids	Residual hydrocarbons will be removed from the topsides and transported to shore. Vessels, pipework and sumps will be drained prior to removal to shore and shipped in accordance with maritime transportation guidelines. Further cleaning and decontamination will take place onshore prior to recycling / re-use. All pipelines will be flushed, cleaned and filled with seawater prior to decommissioning activities taking place.
Marine growth	Some marine growth may be removed offshore. There is estimated to be 141 tonnes of marine growth in place across the three sub-structures. Onshore disposal will be managed by the selected waste management contractor.
NORM/LSA Scale	NORM contaminated material may be removed and discharged offshore under appropriate permit or returned to shore to be disposed of by the selected onshore waste management contractor.
Asbestos	Asbestos is known to be present on the PP and PD platforms, potential locations where asbestos could be present are provided within the Asbestos Management Plan. The final disposal route will depend on the quantities found but will be dealt with and disposed of under an appropriate permit.
Other hazardous wastes	Any such materials shall be recovered onshore and will be managed by the selected waste management contractor and disposed of under an appropriate permit.
Onshore Dismantling sites	Appropriate licenced contractor and sites will be selected. The facility selected must demonstrate competence and a proven disposal track record and waste stream management & traceability throughout the deconstruction process and (preferably) demonstrate their ability to deliver innovative recycling options.

Table 3-10 Inventory Disposition			
	Total Inventory Tonnage (Te)	**Planned tonnage to shore (Te)**	**Planned left *in situ* (Te)**
Installation – Sean PP Topsides	6,018	6,018	0
Installation – Sean PD Topsides	3,986	3,986	0
PP – PD Bridge	181	181	0
Installation – Sean RD Topsides	2,216	2,216	0

Table 3-10 Inventory Disposition			
	Total Inventory Tonnage (Te)	**Planned tonnage to shore (Te)**	**Planned left *in situ* (Te)**
Installation – Sean PP Substructure	3,260	2,028	1,232
Installation – Sean PD Substructure	2,402	1,569	833
Installation – Sean RD Substructure	2,297	1,622	675
Pipelines	120,239	272	119,967
Subsea Umbilical & Cable	138.4	138.4	0
Subsea Installations	180	180	0
Mattresses & Grout Bags	91.2	45.6	45.6

All recovered material will be brought onshore 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 3-11 are disposal aspirations. For a full breakdown of the materials inventory and the emissions associated with the waste material see Section 5 within the Environmental Appraisal report.

Table 3-11 Recovered inventory reuse, recycle, disposal aspirations			
	Reuse (Te)	**Recycle (Te)**	**Disposal (Te)**
Pipelines	0	69	203
Subsea Umbilical & Cable	0	118.4	20
Subsea Installations	136	44	0
Mattresses & Grout Bags	0	45.6	0

Refer to Section 5 of the Environmental Assessment for further details.

4 ENVIRONMENTAL APPRAISAL OVERVIEW

4.1 Summary of Environmental Sensitivities

Table 4-1 Environmental Sensitivities	
Environmental Receptor	**Main Features**
Conservation Interests	The Sean Field is located outside of any conservation sites however the associated PL311 trunk line passes through five. These sites are designated for a variety of features: > Southern North Sea SAC (~5 km from the Sean Field) – designated for harbour porpoise; > North Norfolk Sandbanks and Saturn Reef SAC – designated for Annex I features 'Sandbanks which are slightly covered by sea water all the time' and 'Reefs'; > Haisborough, Hammond and Winterton SAC – designated for Annex I features 'Sandbanks which are slightly covered by sea water all the time' and 'Reefs'; > Cromer Shoal Chalk Beds MCZ – designated for high and moderate energy circalittoral rock, high and moderate energy infralittoral rock, North Norfolk coast (subtidal), peat and clay exposures, subtidal chalk, subtidal coarse sediments, subtidal mixed sediments and subtidal sands; and > Greater Wash SPA – designated for red-throated diver, common scoter, little gull, sandwich tern, common tern, and little tern (Natural England, 2016b). Surveys around the Sean PP platform did not find any bedforms consistent with sand banks or Ross worm *Sabellaria spinulosa* biogenic reef habitat. No other potentially sensitive habitats (e.g. potential Annex I Habitats) were identified from photographic data acquired in the Sean PP site. Annex I features have however been identified in surveys close to the PL311 in the nearshore area. Sandbanks were present in close proximity to the PL311 and *S. spinulosa* were similarly distributed nearby, visibly associated with the more heterogenous substrate towards the shore.
Seabed Habitats and Fauna	According to data by the British Geological Society, the Sean Field is situated in an area of medium and fine sands. The majority of the PL311 pipeline also passes through areas of fine sands. The EUNIS habitat complex in the immediate area surrounding the Sean Field is classified as A5.27 'Deep circalittoral sand'. Stations sampled around the Sean Field platforms were predominantly comprised of medium and fine sands, with a low proportion of fine (silt and clay) material and minimal coarse (gravel and pebble) sediment. The PL311 pipeline also passes through EUNIS habitat A5.15 'Deep circalittoral coarse sediments', A5.44 'Circalittoral mixed sediments', and small areas of either A5.25 'Circalittoral fine sands' or A5.26 'Circalittoral muddy sand'.

Table 4-1 Environmental Sensitivities	
	The dominant taxa in the Sean Field were bivalve (*Angulus fabula*), amphipod (*Bathyporeia elegans*) and polychaete (*Spiophanes bombyx*). Though the Sean Field is likely to provide a suitable habitat for ocean quahog (*Arcitca islandica*), no ocean quahog aggregations were found either in the Field or along the trunkline. Additional assessments surrounding the PL311 pipeline show that the epifaunal community were dominated by a variety of fauna including hermit crabs (*Pagurus bernhardus*), calcareous worm tubes and faunal turf growing on the more stable areas of the biotope. S. spinulosa was found in relatively high numbers in various surveyed areas around the PL311. It is reasonable to assume it is found along the PL311.
Fish	The Sean Field is located within a high-density spawning ground for plaice (*Pleuronectes platessa*) and low density spawning grounds for cod (*Gadus morhua*), whiting (*Merlangius merlangus*), sandeel (*Ammodytidae spp*.), mackerel (*Scomber scombrus*), sprat (*Sprattus sprattus*), and Norway lobster (*Nephrops norvegicus*). The PL311 pipeline is located within a high-density spawning ground for plaice, low-density spawning grounds for cod, sole (*Solea solea*), herring (*Clupea harengus*), sandeel, and whiting. Additionally, the pipeline is located within a spawning ground of undetermined intensity for lemon sole (*Microstomus kitt*) and sprat. The following species have nursery grounds in the Sean Field: cod, herring, mackerel, tope shark (*Galeorhinus galeus*), whiting, sprat and Norway lobster. The PL311 pipeline route passes through areas known to be nursery grounds for: cod, herring, mackerel, plaice, sandeel, sole, lemon sole, sprat, tope shark, thornback ray (*Raja clavata*) and whiting. The probability of juvenile mackerel aggregations occurring in the project area is low-moderate. The probability of juvenile herring, horse mackerel, and sprat occurring in aggregations within the project area is moderate. Only the probability of juvenile whiting occurring in an aggregation was high within the project area.
Commercial Fisheries	The Sean Field and PL311 trunkline are located in International Council for the Exploration of the Seas (ICES) rectangles 34F1, 34F2 and 35F2. Demersal species have consistently dominated the catch by weight and value in rectangles 34F2 and 35F2. Conversely fisheries within 34F1 have predominantly targeted shellfish species. Fishing effort by UK vessels in 34F1, 34F2 and 35F2 was low year round (<50 days per annum). Fishing intensity is generally low for all gear types around the platforms and pipeline PL310. There is no data available for the southwest portion of the PL311 pipeline. Fishing effort increases to the northeast of the pipeline for demersal and mobile gears and decreases again near to the Sean Field platforms. Dutch fishing effort is comparatively higher in the Sean Field, particularly with regards to the use of beam trawl gear (50 – 100 days per annum). Dutch vessels are not able to fish within the UK 12 nm limit therefore fishing effort decreases with proximity to shore.
Marine Mammals	Pinnipeds are not expected to be present in the Sean Field in significant numbers, with densities estimated at approximately 0-1 individuals per 25 km2 for both harbour (*Phoca vitulina*) and grey seals (*Halichoerus grypus*). However, as the trunkline approaches the shore higher numbers are expected. Harbour porpoise, minke whale and white-beaked dolphin have previously been recorded in the project area. In particular, harbour porpoise are likely to be seen in the decommissioning area in very high abundance, particularly during summer.
Seabirds	The following species have been recorded within the area of proposed operations: northern fulmar (*Fulmarus glacialis*), Manx shearwater (*Puffinus puffinus*), northern gannet (*Morus bassanus*), pomarine skua (*Stercorarius pomarinus*), Arctic skua (*Stercorarius parasiticus*), great skua (*Stercorarius skua*), black-

Table 4-1 Environmental Sensitivities	
	legged kittiwake (*Rissa tridactyla*), great black-backed gull (*Larus marinus*), lesser black-backed gull (*Larus fuscus*), herring gull (*Larus argentatus*), common guillemot (*Uria aalge*), razorbill (*Alca torda*), little auk (*Alle alle*) and Atlantic puffin (*Fratercula arctica*). In Blocks 49/25, 49/27, 49/28, 49/30, 52/5, 53/1 and 53/2 the sensitivity of seabirds to oil pollution, is high to extremely high for the majority of the Blocks from November to February. It is comparatively lower across the rest of the year.
Onshore Communities	The recycling and disposal of wastes are covered by the ONE-Dyas' Waste Management Plan (WMP), which is compliant with relevant regulations relating to the handling of waste offshore, transfer of controlled, hazardous and special waste, and TFSW. The WMP is also guided by ONE-Dyas' HSEQ Policy and commitments to best practice in waste management. This includes the mapping and documenting of waste management arrangements for each phase of the decommissioning activities in individual WMP and ongoing monitoring of waste procedures and performance review against national and international standards and those held within ONE-Dyas' Environmental Management Plan. Wastes will be treated using the principles of the waste hierarchy, focusing on the reuse and recycling of wastes where possible. Raw materials will be returned to shore with the expectation to recycle the majority of the returned material. There may be instances where infrastructure returned to shore is contaminated (e.g. by Naturally Occurring Radioactive Material (NORM), hazardous, and / or special wastes) and cannot be recycled. In these instances, the materials will require disposal. However, the weight and/or volume of such material is not expected to result in substantial landfill use. Only existing disposal yards will be utilised for the material removed as a result of the decommissioning. Only licenced contractors which can demonstrate they are capable of handling and processing the material to be brought ashore will be considered for onshore activities and this will form an integral part of the commercial tendering process. The requirement of an onshore dismantling yard necessitates an environmental audit (including a site visit).
Other Users of the Sea	Shipping activity is considered very high in Blocks 52/5 and 53/1, high in Bocks 49/25, 49/27, 49/28, 49/29 and 53/2, and moderate in Block 49/30. Blocks 49/25, 49/29 and 49/30 are additionally located within deep water routes. There are 21 surface structures within 40 km of the Sean Field, the closest being the Shell operated Corvette platform. The closest telecommunication cable is the disused telecom UK-Germany BT cable (11.1 km ENE of the Sean PD platform). There are no military restrictions on Blocks 49/25, 49/27, 49/28, 49/29, 49/30, 53/1 and 53/2. However, Block 52/5 is of concern to the MoD as it lies within a training ground. There are four wrecks within 20 km of the Sean Field Platforms. Three wrecks are considered dangerous wrecks, of which the closest is 6.3 km WSW of the Sean PP platform.
Atmosphere	The majority of atmospheric emissions for the decommissioning of the Sean Field and associated flowlines relates to vessel use or are associated with the recycling of material returned to shore. The estimated CO2 emissions to be generated by the selected decommissioning options will be approximately 32,761 Te. This equates to 0.4% of the total UKCS vessel emissions, excluding fishing vessels, in 2017 (7,800,000 Te; BEIS, 2019).

4.2 Potential Environmental Impacts and their Management

4.2.1 Environmental Impact Assessment Summary:

The EA addresses potential environmental and societal impacts by characterising the likelihood and significance of interactions between the proposed decommissioning activities and the local environment, whilst considering stakeholder response. The EA also details mitigation measures designed to abate potential impacts in accordance with ONE-Dyas; Environmental Management System (EMS) and Health, Safety, Environment and Quality (HSEQ) Policy.

Key potential environmental and societal impacts which were considered to be 'potentially significant', and thus requiring further assessment, were identified through an environmental issues identification (ENVID) workshop; they include: seabed impacts and impacts to commercial fisheries. These potential impacts have undergone detailed assessment within the EA. The following environmental and societal impacts were screened out from further assessment due to existing controls limiting the likelihood of potential significant impacts:

- gaseous emissions;
- disturbance to seabed;
- physical presence of vessels and infrastructure decommissioned in situ;
- discharges to environment;
- underwater noise;
- artificial light;
- disturbance or destruction of seabird nests;
- resource use (onshore and offshore);
- onshore dismantling activities;
- waste; and
- unplanned events.

The justifications for screening out these impact pathways are detailed in the accompanying EA.

- The EA concludes that the recommended options to decommission the Sean Field infrastructure can be completed without causing significant impact to environmental or societal receptors.

4.2.2 Overview

Table 4-2 describes the potential impact pathways identified from the relevant infrastructure to be decommissioned, alongside the proposed management measures in place to mitigate against them.

Table 4-2 Environmental impact management		
Activity	**Main Impacts**	**Management**
Removal of surface installations	Seabed impacts from: > jacket removal; and > mooring lines and anchors associated with HLV (in a worst-case vessel scenario). Impacts to commercial fisheries from project activities excluding access to fishing grounds.	Vessel use will be optimised / minimised for the decommissioning activities and managed per ONE-Dyas' existing vessel management procedures. Use of established contractors with appropriate capability, licences and maintenance procedures will be selected and audited. Other sea users will be notified in advance of activities occurring. The 500 m safety exclusion zones will remain in operation during the decommissioning activities reducing risk of non-project related vessels entering into the area where decommissioning activities are taking place. This safety exclusion zones will be removed following the completion of the relevant decommissioning activities enabling fisheries to regain access to grounds. Fishing activities have the potential to increase in the area once the 500 m safety zones surrounding the existing substructures are re-assessed. A DROPS survey will be conducted post-topside removal. In addition, a clear seabed verification survey will be conducted post-decommissioning. This will be done in the first instance using non-intrusive methods, but should the results be inconclusive a more traditional method of survey will be used, namely overtrawling. As much of the decommissioning activity and the structures will be located within the 500 m safety zones then these areas are most liable for overtrawl. The Sean Field infrastructure is currently shown on Admiralty Charts, within the UK National Data Repository (NDR), and on the FishSafe system. When decommissioning activity has been completed, updated information will be made available to update the aforementioned systems.[1]
Removal of subsea installations (including stabilisation / protection features)	Seabed impacts from: > excavation of buried infrastructure and stabilisation materials; > cutting of jacket piles below the seabed;	Vessel use will be optimised / minimised for the decommissioning activities and managed per ONE-Dyas' existing vessel management procedures. Use of established contractors with appropriate capability, licences and maintenance procedures will be selected and audited. Other sea users will be notified in advance of activities occurring. The 500 m safety exclusion zones will remain in operation during the decommissioning activities reducing risk of non-project related vessels entering into the area where decommissioning activities are

[1] It is noted that under Section 21 of the Petroleum Act 1987, safety zones are automatically established around every oil and gas installation which projects above the sea surface at any state of the tide. Once any installations are below sea surface at any state of the tide, the 500m safety zone for that installation automatically falls away. In this instance, although topsides and jacket removals are currently scheduled to take place within the same window it is acknowledged that navigational aids and/or a guard vessel may be required to mitigate collision hazards for other users of the sea in instances where the 500m safety zone is no longer in place and potential navigational hazards remain. Detailed removals plans have not yet been established however ONE-Dyas shall ensure that admiralty notices to mariners and charts are updated and engagement is maintained with HSE and Trinity house to ensure appropriate mitigation measures are agreed and put in place.

Table 4-2 Environmental impact management		
Activity	**Main Impacts**	**Management**
	> removal of grout bags and stabilisation materials; > recovery of infrastructure; and > overtrawling of 500 m zones. Impacts to commercial fisheries from project activities excluding access to fishing grounds.	taking place. This safety exclusion zones will be removed following the completion of the relevant decommissioning activities enabling fisheries to regain access to grounds. Fishing activities have the potential to increase in the area once the 500 m safety zones surrounding the existing substructures are re-assessed. A DROPS survey will be conducted post-topside removal. In addition, a clear seabed verification survey will be conducted post-decommissioning. This will be done in the first instance using non-intrusive methods, but should the results be inconclusive a more traditional method of survey will be used, namely overtrawling. As much of the decommissioning activity and the structures will be located within the 500 m safety zones then these areas are most liable for overtrawl. The Sean Field infrastructure is currently shown on Admiralty Charts, within the UK National Data Repository (NDR), and on the FishSafe system. When decommissioning activity has been completed, updated information will be made available to update the aforementioned systems.
Decommissioning *in situ* of rigid flowlines and associated remediation	Seabed impacts from: > cutting ends and recovery of end lengths of flowlines; > deposition of new rock armour to protect ends and spans; and Impacts to commercial fisheries from snagging risk associated with pipelines decommissioned *in situ*.	Operations will be conducted as carefully as possible to minimise sediment disturbance, avoiding dragging of items on the seabed where possible. Rock placement will be carefully managed, through use of a fall pipe thereby reducing unnecessary spreading, to ensure no snagging hazards remain. The Sean Field infrastructure is currently shown on Admiralty Charts, within the UK National Data Repository (NDR), and on the FishSafe system. When decommissioning activity has been completed, updated information will be made available to update the aforementioned systems. Any snagging risk to other sea users will be minimised by continual monitoring of degrading structures decommissioned in situ for the identification of exposures or spans. ONE-Dyas recognise their commitment to undertake post-decommissioning monitoring of infrastructure left in situ. After the post-decommissioning survey reports have been submitted to OPRED and reviewed, a post-decommissioning monitoring survey regime, scope and frequency, will be agreed with OPRED.
Decommissioning of flexible flowlines (umbilical and cable)	Seabed impacts from: > MFE of cable and subsequent reverse-reeling > reverse reeling of umbilical; and	Vessel use will be optimised / minimised for the decommissioning activities and managed per ONE-Dyas' existing vessel management procedures. Use of established contractors with appropriate capability, licences and maintenance procedures will be selected and audited. Other sea users will be notified in advance of activities occurring. The 500 m safety exclusion zones will remain in operation during the decommissioning activities reducing risk of non-project related vessels entering into the area where decommissioning activities are

Table 4-2 Environmental impact management		
Activity	**Main Impacts**	**Management**
	> removal of associated stabilisation features. Impacts to commercial fisheries from project activities excluding access to fishing grounds.	taking place. This safety exclusion zones will be removed following the completion of the relevant decommissioning activities enabling fisheries to regain access to grounds. Fishing activities have the potential to increase in the area once the 500 m safety zones surrounding the existing substructures are re-assessed. A DROPS survey will be conducted post-topside removal. In addition, a clear seabed verification survey will be conducted post-decommissioning. This will be done in the first instance using non-intrusive methods, but should the results be inconclusive a more traditional method of survey will be used, namely overtrawling. As much of the decommissioning activity and the structures will be located within the 500 m safety zones then these areas are most liable for overtrawl. The Sean Field infrastructure is currently shown on Admiralty Charts, within the UK National Data Repository (NDR), and on the FishSafe system. When decommissioning activity has been competed, updated information will be made available to update the aforementioned systems.

5 INTERESTED PARTY CONSULTATIONS

5.1 Consultations Summary

The stakeholder consultation for the decommissioning of the Sean infrastructure has been largely based on sharing project expectations, approach and specific considerations with key stakeholders including:

- Health and Safety Executive (HSE)
- OPRED Environmental Management Team (EMT)
- OPRED Offshore Decommissioning Unit (ODU)
- Joint Nature Conservation Committee (JNCC)

The results of the consultations are summarised in .

Table 5-1 Summary of stakeholder comments

Relevant Party	Comment/Concerns Raised	Response
Statutory Consultations		
The National Federation of Fisherman's Organisations	Response Received 04/02/21: The Federation would like to comment and request a post decommissioning trawl survey is carried out prior to the 500m safety zones are removed to ensure that the area is safe to be opened to commercial fishing operations with no snagging hazards left in situ.	A clear seabed verification survey will be conducted post-decommissioning. This will be done in the first instance using non-intrusive methods, but should the results be inconclusive a more traditional method of survey will be used, namely overtrawling.
Scottish Fisherman's Federation	Response Received 18/02/21: Given the locality of this particular Field, the SFF had no comment in lieu of response from National Federation of Fishermen's Organisations (NFFO).	N/A
Northern Irish Fish Producer's Organisation Limited	None	N/A
Global Marine Systems.	Response received 24/02/21 stating that as there are no existing active telecommunication cables in the region there were no further comments. Further comment was made that in the event that the decom program changes, and seabed invasive operations are to occur near existing telecom infrastructure, it will be important to notify any nearby cable owners of any upcoming operations.	N/A
Informal Consultations		

Table 5-1 Summary of stakeholder comments		
Relevant Party	**Comment/Concerns Raised**	**Response**
OPRED	The use of rock placement in certain areas is likely to be opposed therefore it may prudent to take a closer look at the proposed remediation in specific areas.	Indicative locations of proposed remediation have been established from recently acquired 2020 pipeline survey data. The potential impact of remediation at these locations has been assessed within Sean EA Report, Section 6.1.
	The trunkline had been identified by OPRED as a potential candidate for the development of carbon capture, usage and storage (CCUS). What re-use options have been considered for the 30" Export Pipeline?	Re-use options were considered and discounted for a number of reasons (see Sean EA Report Section 2.1.2). ONE-Dyas appreciates that the re-use of Oil and Gas infrastructure is in its infancy and as a result have committed to cap and inhibit the export pipeline contents post flushing in order to allow for the potential for re-use of this pipeline should a technology mature or a future re-use option present itself.
JNCC	The review should consider the specific impact of each option on site specific locations i.e. per Marine Protected Area (MPA).	The impacts of the chosen CA options were scoped in / out in Sean EA Report Section 5.1. For impacts on specific receptors which were scoped in, the potential impact on protected areas was assessed where relevant (Sean EA Report Section 6.1.5).
MMO	The features of each MPA are considered for each flowline and options under consideration.	The impacts of the chosen CA options were scoped in / out in Sean EA Report Section 5.1. For impacts on specific receptors which were scoped in, the potential impact on protected areas was assessed where relevant (Sean EA Report Section 6.1.5).
Public Consultations		
	*** To be populated following consultation****	

6 PROGRAMME MANAGEMENT

6.1 Project Management and Verification

A Project Management team will be appointed to manage suitable contractors for the decommissioning of the Sean infrastructure. Standard procedures for operational control and hazard identification and management will be used. The Project Management team will monitor and track the process of consents and the consultations required as part of this process. Any changes in detail to the offshore decommissioning programme will be controlled by ONE-Dyas' Management of Change processes and discussed and agreed with OPRED.

6.2 Post-Decommissioning Debris Clearance and Verification

During site clearance activities, reasonable endeavours will be made to recover any dropped objects and items subject to any outstanding Petroleum Operations Notices. All recovered seabed debris related to offshore oil and gas activities will be returned for onshore disposal or recycling in line with existing disposal arrangements. A post decommissioning site survey, to verify decommissioning activities have been completed, will be carried out around the 500m radius of installation sites and along a 100m corridor (50m either side) over the entire pipeline lengths.
The proposed method for clear seabed validation of the pipeline is through non-intrusive methodologies such as Side Scan Sonar / ROV. A post decommissioning over-trawl sweep is proposed to be performed around the 500m radius of installation sites to identify any potential snag risks. The methods used will be discussed and finalised with OPRED.
Following decommissioning, any remaining reportable spans shall be discussed with OPRED to agree the most appropriate means of remediation.

6.3 Schedule

The high-level Gantt chart Figure 6-1 provides the overall schedule for the Sean programme of decommissioning activities.

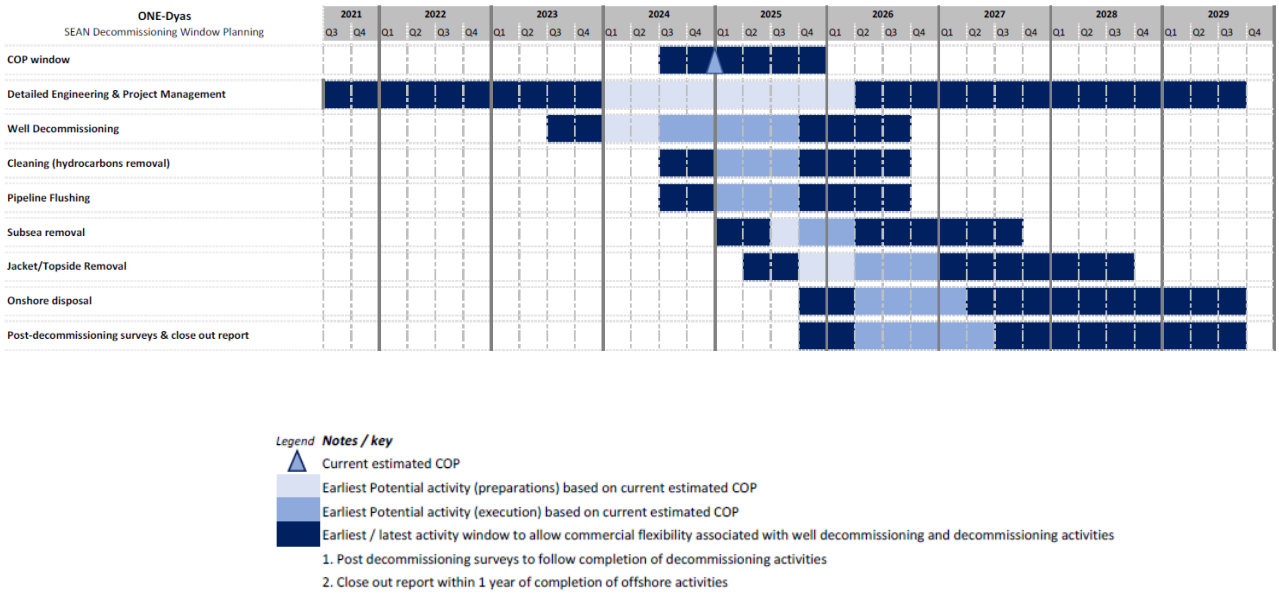


Figure 6-1 High level schedule for the Sean decommissioning project

6.4 Costs

An overall cost estimate following UK Oil & Gas Guidelines on Decommissioning Cost Estimation (Issue 3, October 2013) is issued to the OGA on an annual basis. A copy will be provided to OPRED.

6.5 Close Out

In accordance with the OPRED Guideline Notes, a close out report will be submitted to OPRED and posted on the ONE-Dyas website reconciling any variations from the Decommissioning Programme within one year of the completion of the offshore decommissioning scope. This will include debris removal, where applicable independent verification of seabed clearance and the first post-decommissioning environmental survey.

6.6 Post-Decommissioning Monitoring and Evaluation

The pipeline routes will be subject to oilfield debris clearance and a non-invasive as-left verification survey when decommissioning activity has concluded.

The main risk from infrastructure remaining *in situ* is the potential for interaction with other users of the sea, specifically from fishing related activities.

The infrastructure is currently shown on Admiralty Charts and the FishSafe system. When decommissioning activity has been completed, information will be made available to update Admiralty Charts and the FishSafe system.

The licence holders recognise their commitment to undertake post-decommissioning monitoring of infrastructure left *in situ*. After the post-decommissioning survey reports have been submitted to OPRED and reviewed, a post-decommissioning monitoring survey regime, scope and frequency, will be agreed with OPRED.

7 SUPPORTING DOCUMENTS

Table 7-1 Supporting documents	
Document Number	Title
A-400309-S00-REPT-002	Comparative Assessment
A-400309-S00-REPT-003	Environmental Appraisal

8 PARTNER LETTER OF SUPPORT

[*To be included in subsequent revision of this document*]

Appendix A Pipeline Depth of Burial

2020 pipeline inspection surveys (DeepOcean, 2020) have confirmed the burial status of these pipelines ref. Appendix A.1 and 0 and summarised below. The KP points in the following figures are ordered from KP 0.0 at the Sean PP platform, increasing to shore. This is in contrast to discussions throughout this DP (which treat the shore as KP 0.0) and align with historical installation schematics.

PL 310 Burial Events Summary					
Category	Number of events	Min. Length (m)	Max. Length (m)	Total Length (m)	Percentage of Survey Length
Free Spans	0	-	-	-	0
Exposures	2	38	69	N/A	N/A
Depth of Burial	N/A	-0.87	2.02	N/A	N/A

PL310 is stably buried to an average depth of 0.72 m. The pipeline was exposed for 38m adjacent to Sean RD Platform and the pipeline/spool exposed for 69m adjacent to Sean PD Platform. The exposed sections are proposed to be recovered as part of the tie-in spool recovery. The pipeline/spool were found to be well supported on the seabed and no freespans were observed.

PL 311 Burial Events Summary					
Category	Number of events	Min. Length (m)	Max. Length (m)	Total Length (m)	Percentage of Survey Length
Free Spans	73	1	40	779	0.7
Exposures	971	1	1110	30263	28.9
Depth of Burial	N/A	-3.85	3.37	N/A	N/A

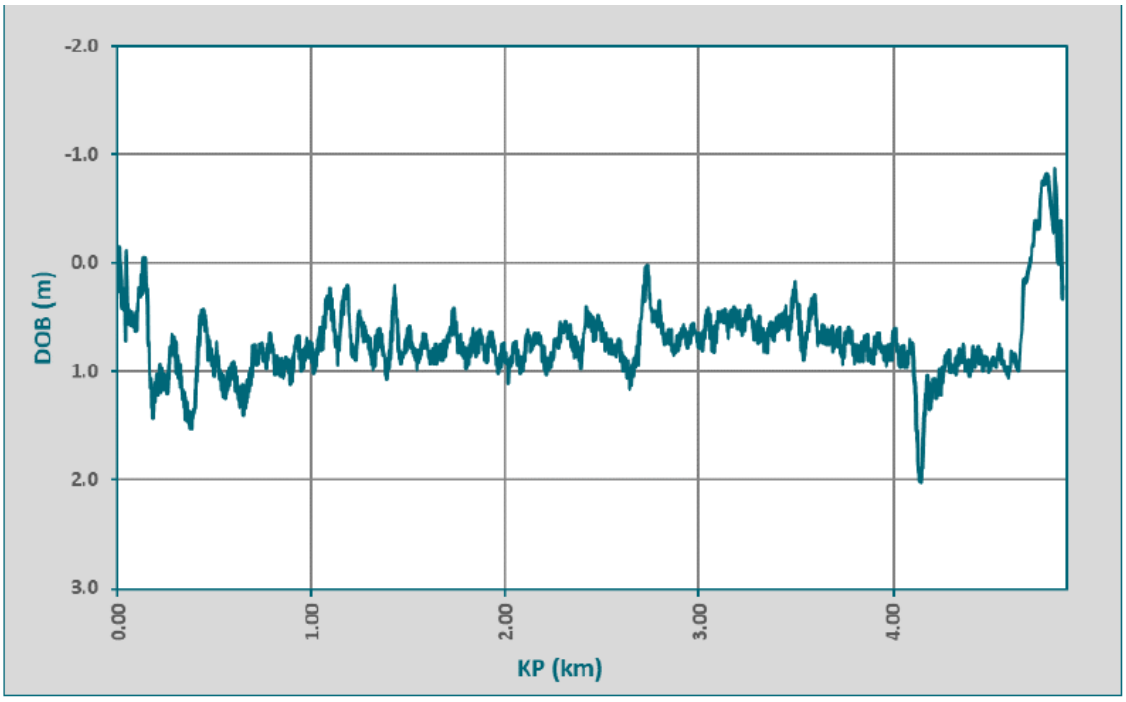
PL311 was intentionally surface laid from the shore to KP 54.0 at the time of installation, with exception of a 7 km section between KP 1.0 and KP 8.0 which is suitably trenched and naturally buried. From KP 54.0 and to Sean PP the pipeline is also suitably trenched and naturally buried. The surface laid sections have been stable for many years; however, in 2016, five locations were identified for placement of rock remediation between KP11.0 and 15.0. Recent survey data (DeepOcean, 2020) suggests further exposures have been generated by hydrographic sediment movement within and to the east of this previously remediated area (between KP14.0 and 17.0). A remediation scope of work and deposit consent request has been prepared to remediate 20 spans along PL311 [Note 1], of these six are of a size considered to be in exceedance of FishSafe[Note 2]criteria and shall be remediated as a priority. Presence of further spans or exposures will be investigated during the pre-decommissioning survey and will be remediated following discussion and agreement from OPRED prior to decommissioning.

Note 1: Remediation of all 20 locations has now been successfully achieved as part of a June 2021 Rock Remediation Campaign

Note 2: FishSafe spans are defined as spans in excess of 0.8 m in height from the top of the pipeline and ≥10 m in length which therefore present a potential hazard to fishing activity.

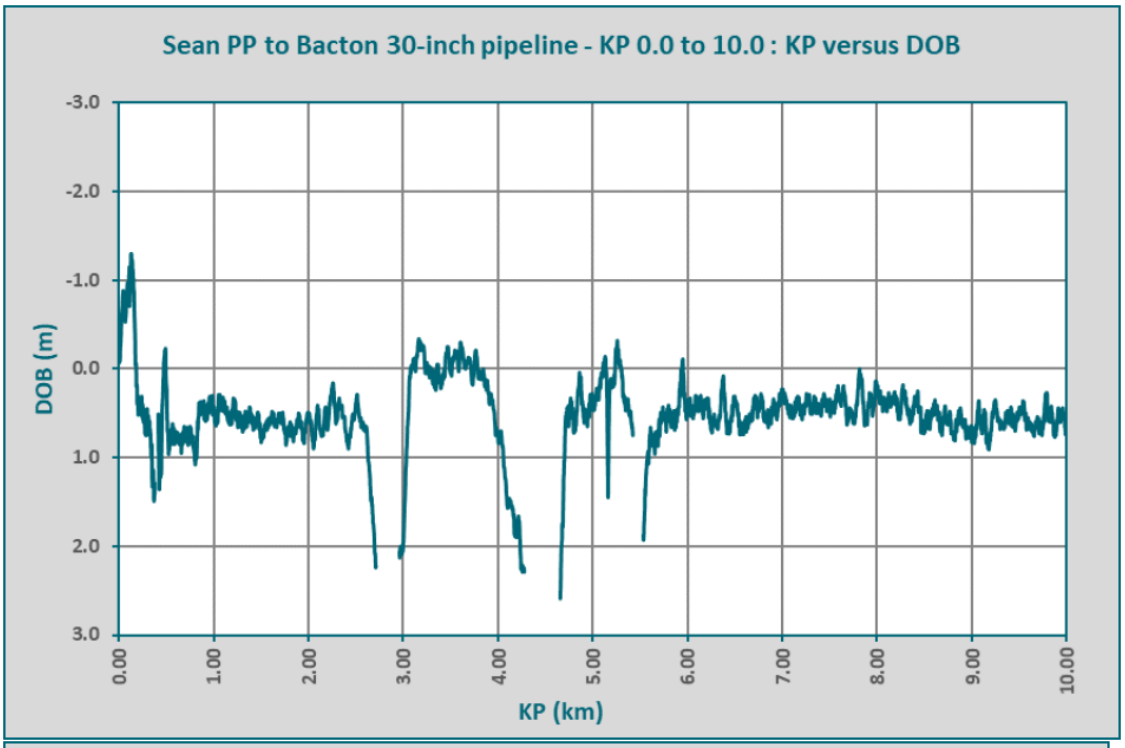
Appendix A.1 PL310 20-in Pipeline

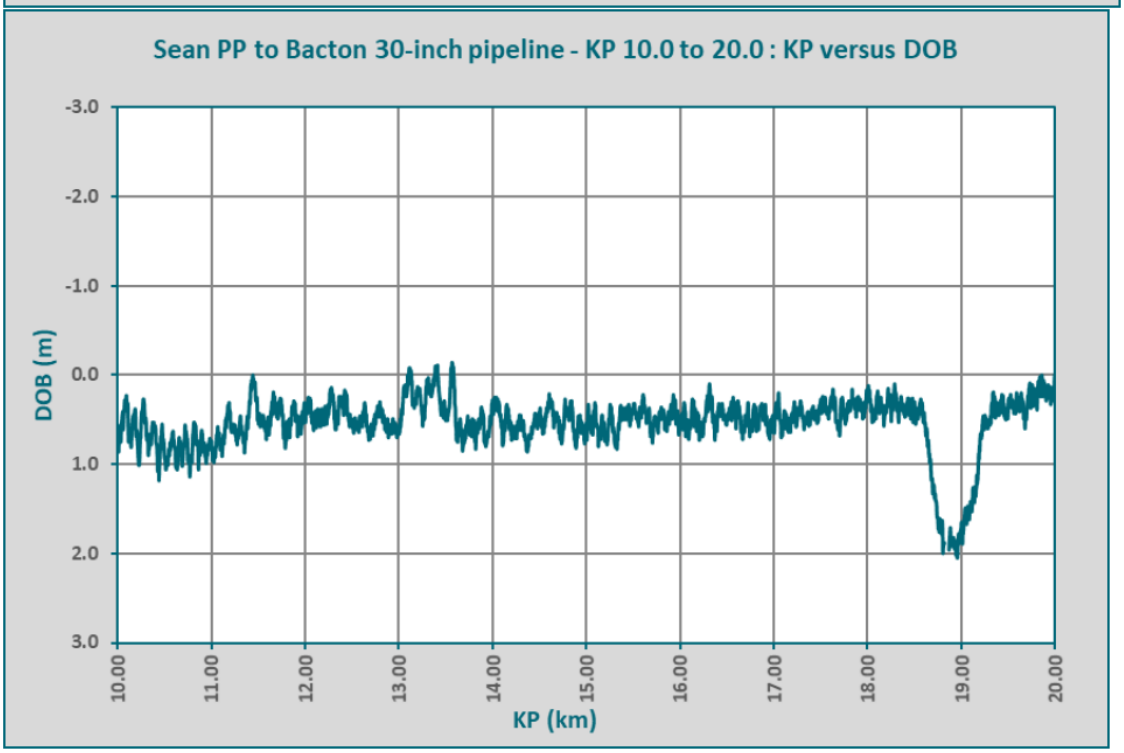
The following DoB profile has been taken from the DeepOcean (2020) pipeline inspection report.

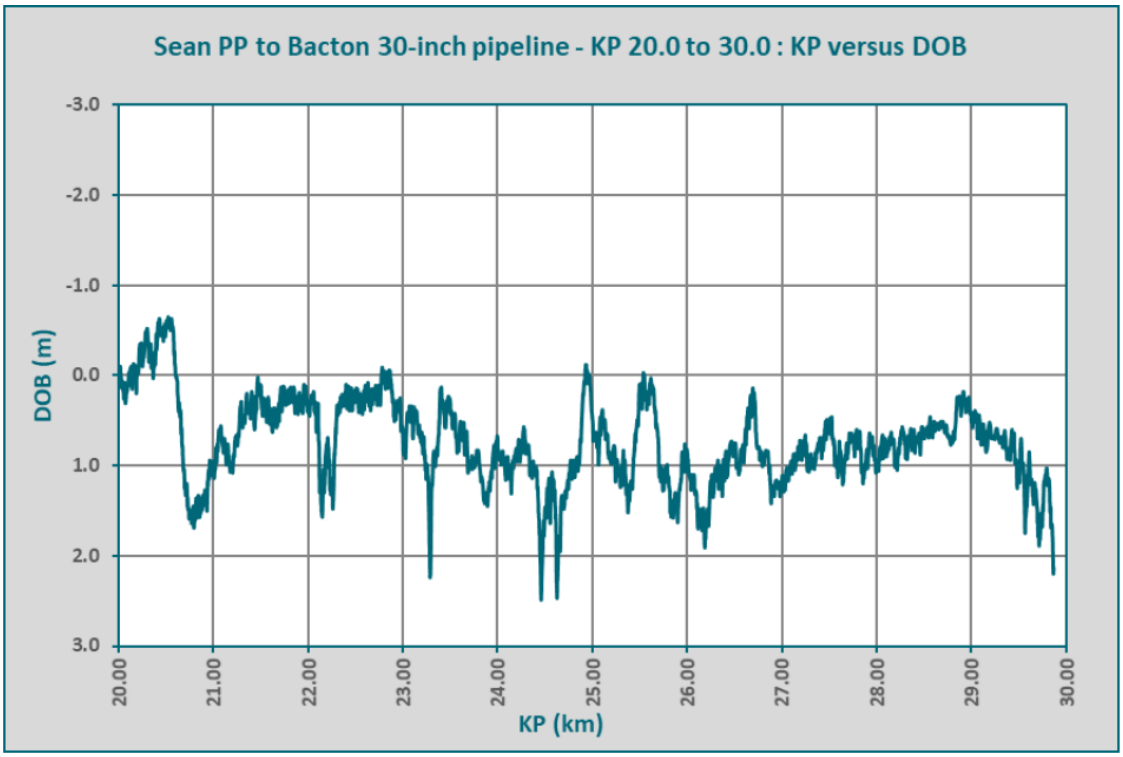


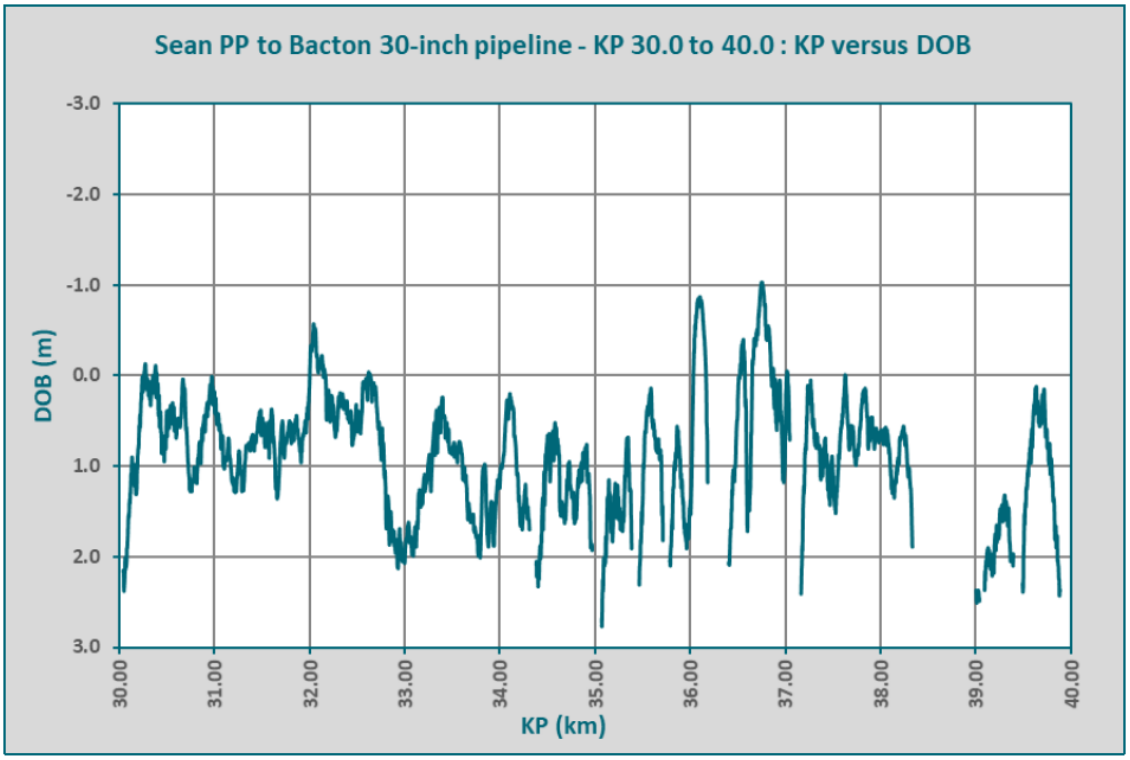
Appendix A.2 PL311 30-in Export Pipeline

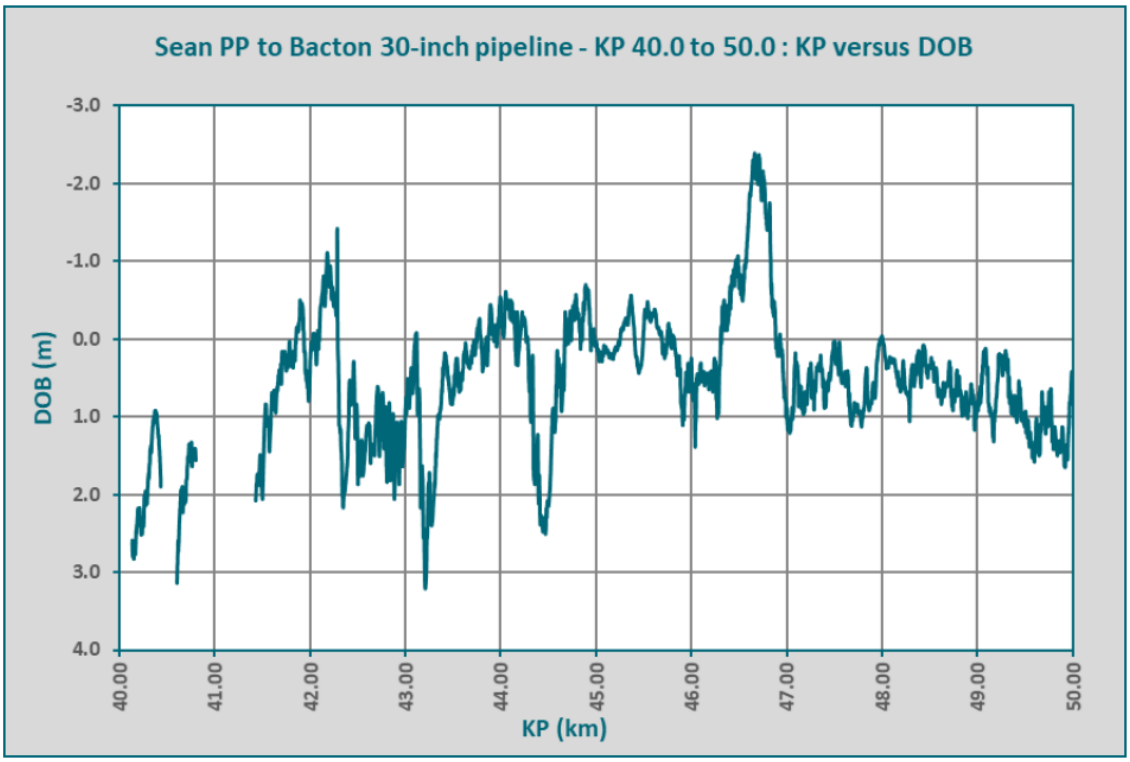
The following DoB profiles have been taken from the DeepOcean (2020) pipeline inspection report. The KP points in the following figures are ordered from KP 0.0 at the Sean PP platform, increasing to shore. This is in contrast to the figures discussed throughout this EA (which treat the shore as KP 0.0). A DoB profile is presented for every 10 km stretch of the PL311, starting at the Sean PP platform:

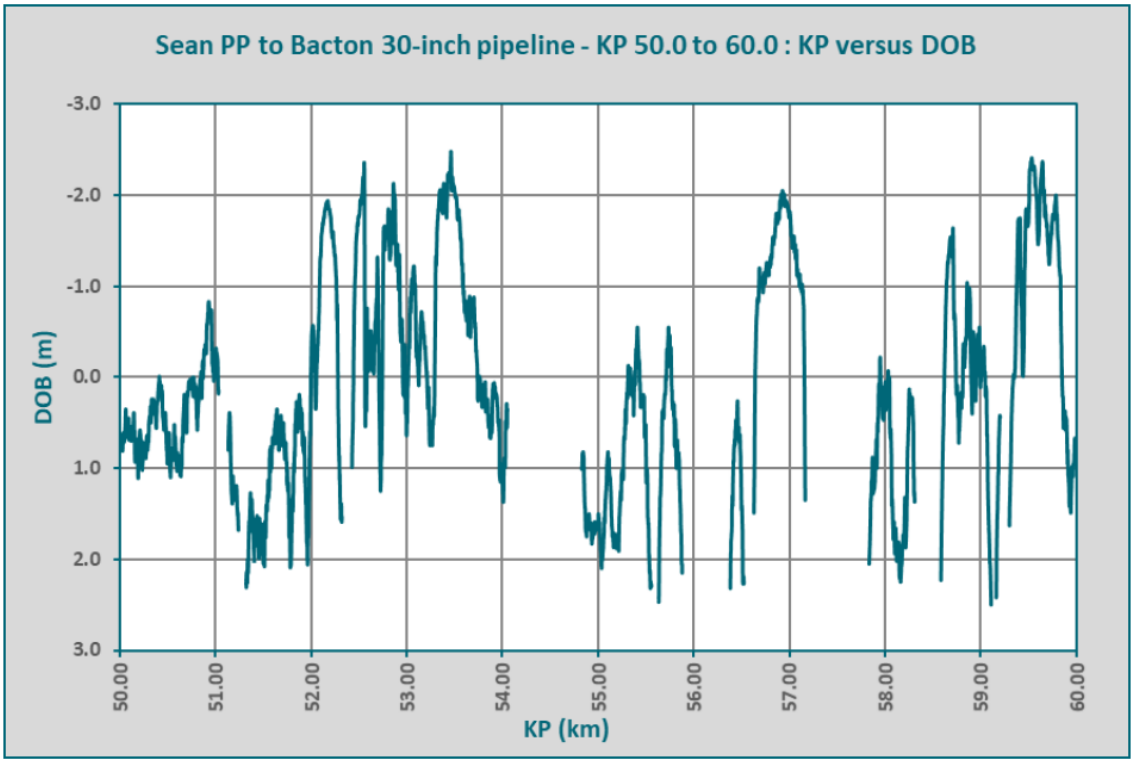


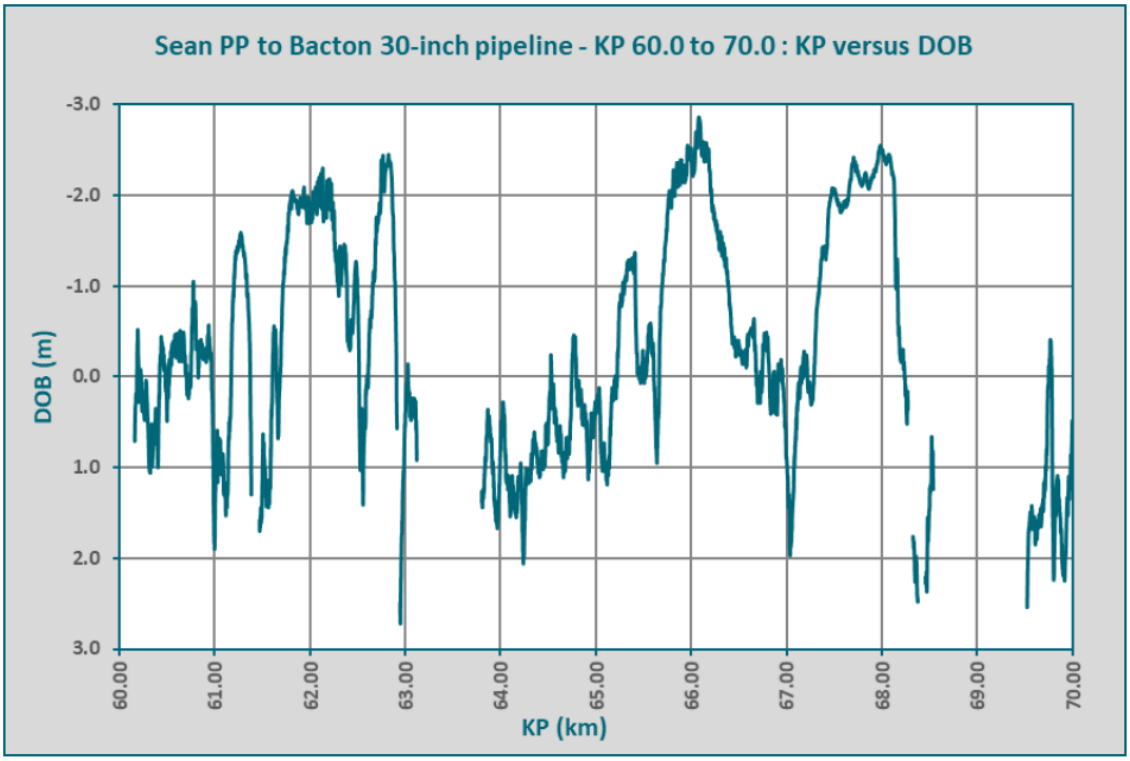


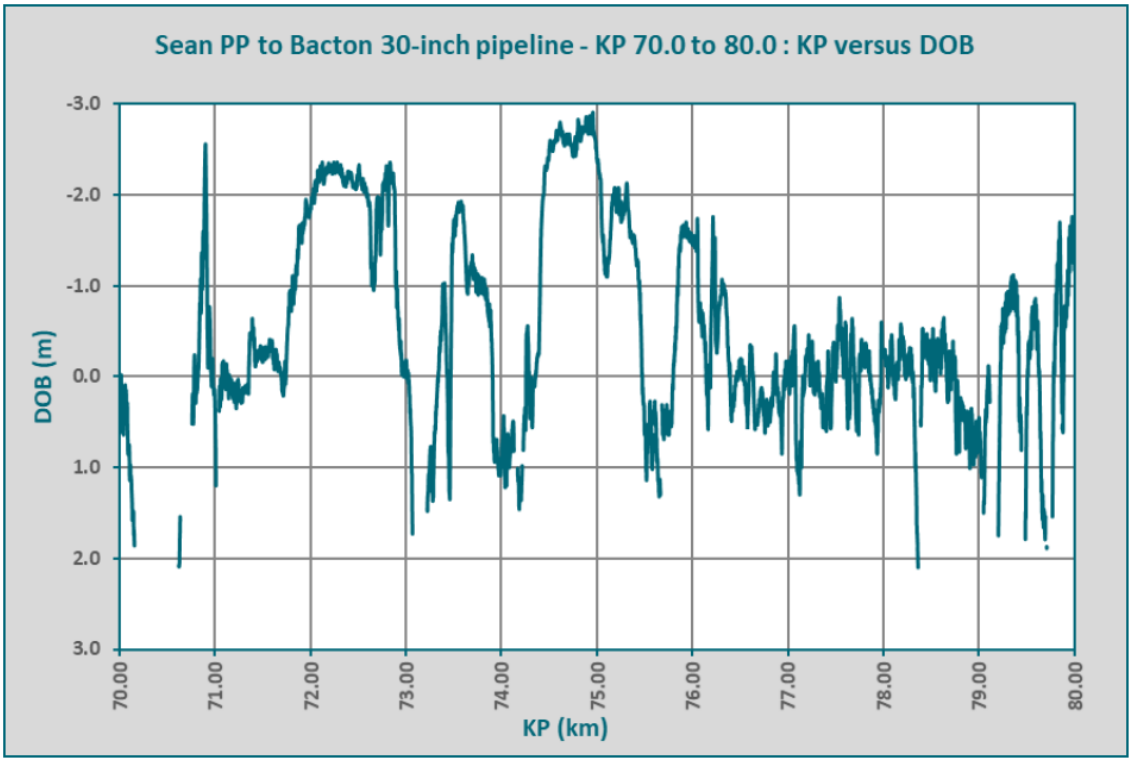

Sean PP to Bacton 30-inch pipeline - KP 20.0 to 30.0 : KP versus DOB
DOB (m)
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
20.00
21.00
22.00
23.00
24.00
25.00
26.00
27.00
28.00
29.00
30.00
KP (km)

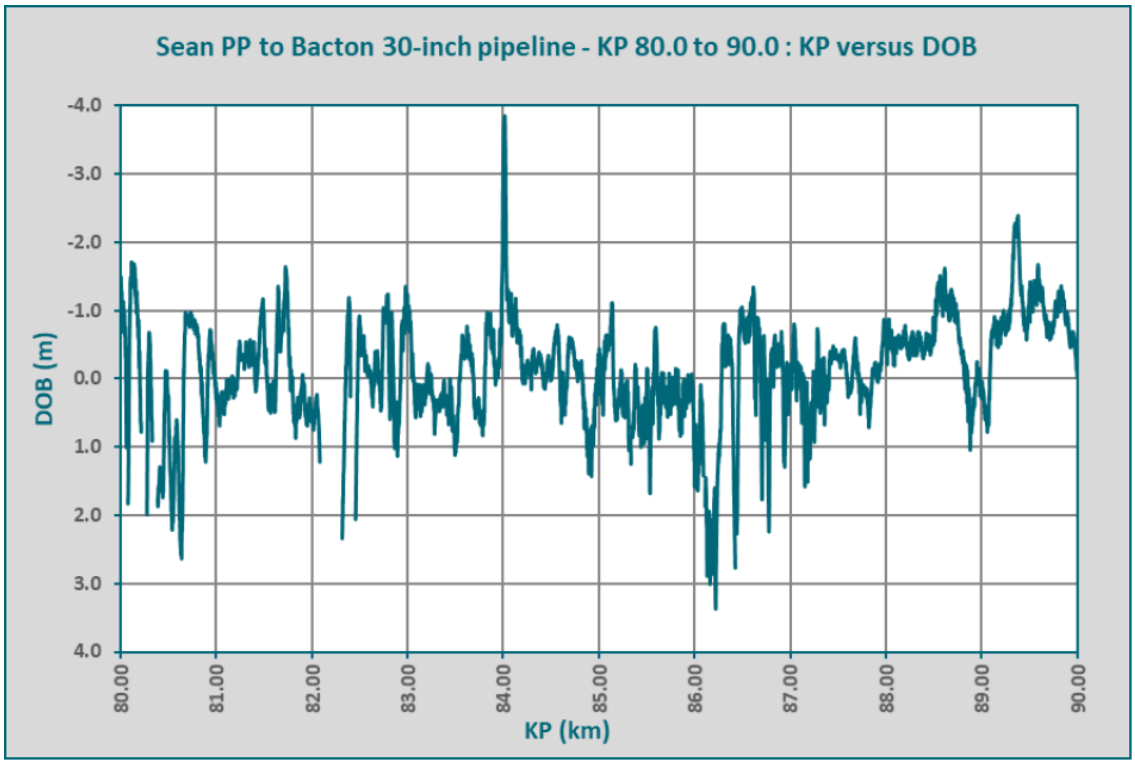

Sean PP to Bacton 30-inch pipeline - KP 30.0 to 40.0 : KP versus DOB
DOB (m)
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
30.00
31.00
32.00
33.00
34.00
35.00
36.00
37.00
38.00
39.00
40.00
KP (km)

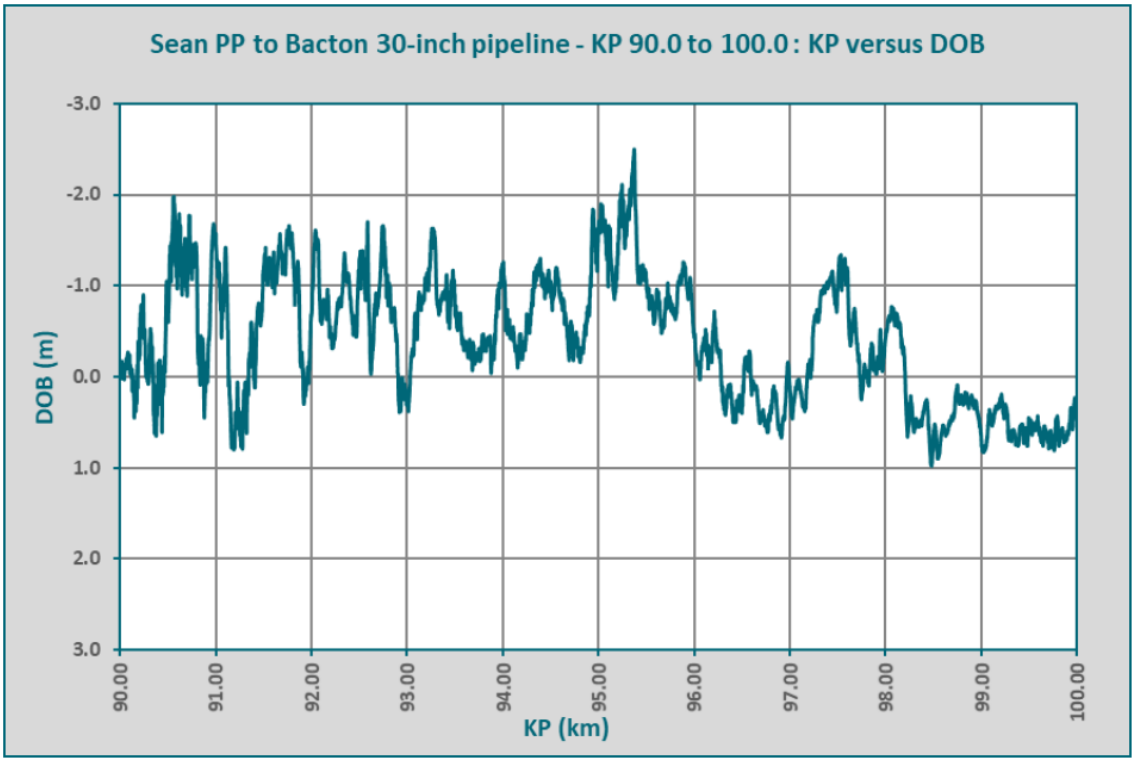

Sean PP to Bacton 30-inch pipeline - KP 40.0 to 50.0 : KP versus DOB
DOB (m)
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
40.00
41.00
42.00
43.00
44.00
45.00
46.00
47.00
48.00
49.00
50.00
KP (km)

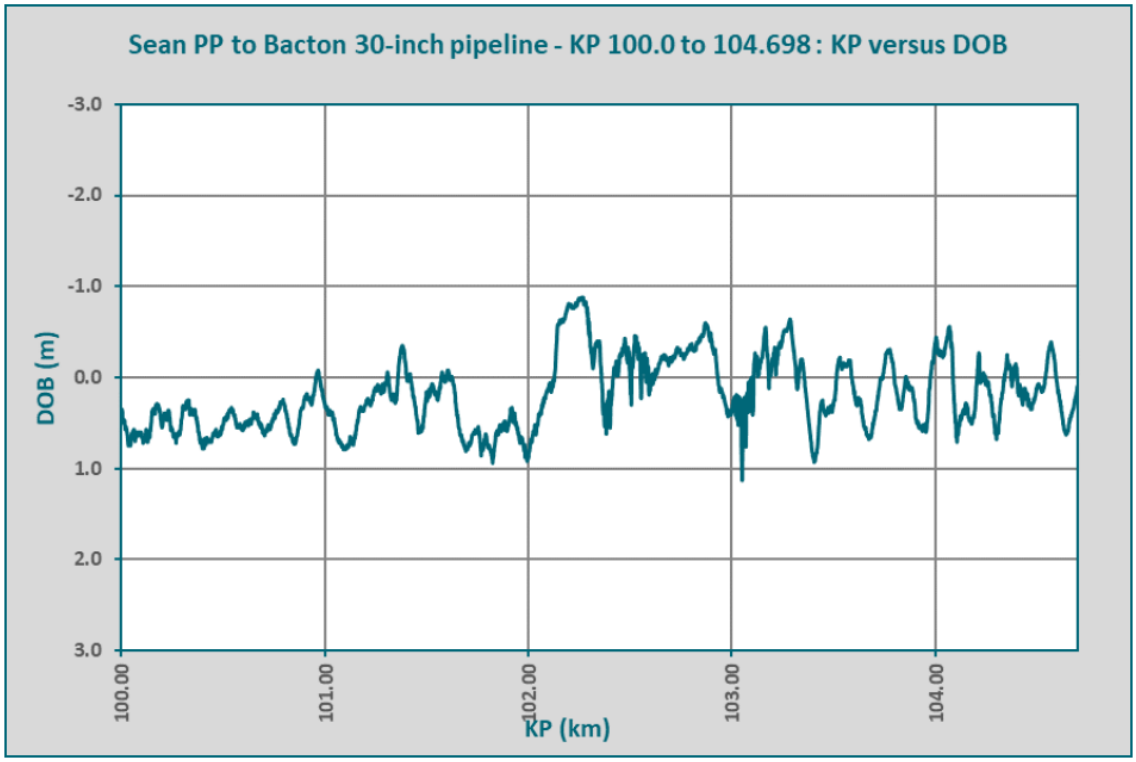

Sean PP to Bacton 30-inch pipeline - KP 50.0 to 60.0 : KP versus DOB
DOB (m)
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
50.00
51.00
52.00
53.00
54.00
55.00
56.00
57.00
58.00
59.00
60.00
KP (km)


Sean PP to Bacton 30-inch pipeline - KP 60.0 to 70.0 : KP versus DOB
DOB (m)
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
60.00
61.00
62.00
63.00
64.00
65.00
66.00
67.00
68.00
69.00
70.00
KP (km)


Sean PP to Bacton 30-inch pipeline - KP 70.0 to 80.0 : KP versus DOB
DOB (m)
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
70.00
71.00
72.00
73.00
74.00
75.00
76.00
77.00
78.00
79.00
80.00
KP (km)


Sean PP to Bacton 30-inch pipeline - KP 80.0 to 90.0 : KP versus DOB
DOB (m)
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
80.00
81.00
82.00
83.00
84.00
85.00
86.00
87.00
88.00
89.00
90.00
KP (km)


Sean PP to Bacton 30-inch pipeline - KP 90.0 to 100.0 : KP versus DOB
DOB (m)
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
90.00
91.00
92.00
93.00
94.00
95.00
96.00
97.00
98.00
99.00
100.00
KP (km)


Sean PP to Bacton 30-inch pipeline - KP 100.0 to 104.698 : KP versus DOB
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
DOB (m)
100.00
101.00
102.00
103.00
104.00
KP (km)

Appendix B Pipeline Crossing Locations

Appendix B.1 PL310 20-in Pipeline

No crossings

Appendix B.2 PL311 30-in Export Pipeline

Operator	Name	Type	Location	Information	Status
ONE-Dyas	Sean PP to SSIV	4-in umbilical	KP 106.38	Umbilical crosses over PL311 with a single mattress covering the umbilical	Operational
Perenco	Davy to Inde AT	6/4.5-in pipeline	KP 101.34	Gas/MEG pipeline bundle crosses over PL311, crossing is gravel covered.	Operational
Tullow	Thames to Orwell	4-in umbilical	KP 84.34	Umbilical crosses over PL311, crossing is gravel covered	Non-Operational
Tullow	Orwell to Thames	16-in pipeline	KP 84.25	Gas pipeline crosses over PL311, crossing is gravel covered	Non-Operational
Perenco	Welland to Thames	16-in pipeline	KP 83.21	Gas pipeline crosses over PL311, crossing is gravel covered	Non-Operational
Perenco	Thames to Yare C	4-in umbilical	KP 82.05	MEG pipeline crosses over PL311, crossing is gravel covered	Non-Operational
Perenco	Yare C to Thames	8-in pipeline	KP 82.04	Gas pipeline crosses over PL311, crossing is gravel covered	Non-Operational
Tullow	Horne to Thames	10/2-in pipeline	KP 81.95	Gas pipeline crosses over PL311, crossing is gravel covered	Non-Operational
Perenco	Arthur to Thames	12-in pipeline	KP 81.88	Gas pipeline crosses over PL311, crossing is gravel covered	Non-Operational
Perenco	Thames to Arthur	8-in pipeline	KP 81.84	Gas pipeline crosses over PL311, crossing is gravel covered	Non-Operational
Tampnet	Draupner to Lowestoft	Cable	KP 69.71	Cable crosses over PL311, both products are exposed	Operational