



Decommissioning Close Out Report Brynhild Pipelines

UNCOSTED VERSION

DOCUMENT CONTROL TABLE:**Contents**

		Page
	Summary	3
1.1	Summary of Decommissioning Programme	
1.2	Schematic of Installation(s)/Pipeline(s) Being Decommissioned	
1.3	Gantt Chart	
1.4	Associated Decommissioning Approvals	
2	Decommissioning Activities	8
2.1	Contracts Awarded	
2.2	Platform Operations	
2.3	Well P&A	
2.4	Subsea Installations	
2.5	Pipelines/Umbilicals & Jumpers	
2.6	Pipeline Stabilisation features	
2.7	Drill Cuttings	
2.8	Results of Post Decommissioning & Environmental Surveys & Debris Clearance	
2.9	Key Milestones	
2.10	Stakeholder Engagement	
3	Impact On The Environment	13
3.1	Activities	
3.2	Future Monitoring & Management Planning	
4	Impact on HSE	14
4.1	Details of any Incidents/Accidents During Project Execution	
5	Waste/Waste Inventory	14
6	Lessons learned	15
7	Cost Summary	16
8	Photographs	17
9	Appendices	23

1 SUMMARY

1.1 Summary of Decommissioning Programme

Brynild is an oil field located in the southern part of the Norwegian sector in the North Sea, in block 7/7, bridging the border between blocks 7/7 and 7/4. It is located 10 kilometers from the UK sector boundary and approximately 246 kilometers from the Aberdeen coast.

Brynild was developed as a subsea tie-back to the Haewene Brim FPSO at the Pierce field. Operator of the Pierce Field is Enterprise Oil Limited, which also retains Well and Pipeline Operatorship for the field. The FPSO is operated by Bluewater. The Pierce field will continue in operation after the Brynild tie-back has been decommissioned.

Whilst Brynild is in the Norwegian Sector, the production pipeline, water injection pipeline and control umbilical cross over into the UKCS at block 23/22b and connect to Haewene Brim FPSO in block 23/27a which is 12km from the median line crossing (only 12km of each line and the umbilical is within the UKCS).

The Brynild field location and pipeline route are shown in Section 1.2, ref. Figure 1.1.

The Brynild production commenced in December 2014 and Cessation of Production (CoP) occurred on 21 January 2018.

Decommissioning of the Brynild pipelines in UK has been executed in the period Q4 2020 to Q4 2021.

Decommissioning of the Brynild field on the Norwegian sector has been executed in parallel with the UK scope. The 4 Brynild wells on the NCS were plugged and abandoned in Q2/Q3 2020, and the subsea facilities recovered in Q2 2021. Buried pipelines and umbilical have been left in-situ.

Relinquishment of the Brynild Production License (PL148) following completion of the Norwegian decommissioning scope was approved by the Ministry of Petroleum and Energy 07.12.2021.

In accordance with the Petroleum Act 1998, Lundin Energy on behalf of the Section 29 holders, applied for approval of a decommissioning program (DP) to the Department for Business, Energy and Industrial Strategy (BEIS). The final version of the DP (document reference: 21488-TEFMC-000-Z-RA-00004, Rev H) was submitted on 11 June 2020 and approved 11 June 2020.

The UK decommissioning scope comprised PL3083 Production line, PL3084 Water Injection Line and PLU3085 Water Injection Line.

The Norwegian Continental Shelf (NCS) part of Brynild Decommissioning was approved by Norwegian Ministry of Petroleum and Energy (MPE) 28.09.2020.

There has been neither amendments nor revisions to the approved Decommissioning Program.

Table 1.1: Overview of the Decommissioned Pipelines & Umbilicals In The Approved DP	
Number of Pipeline(s) to be decommissioned	2
Number of Umbilical(s) to be decommissioned	1
Total KM of Pipeline(s) & Umbilical(s) to be decommissioned	36.3 KM
Total KM of Pipeline(s) & Umbilical(s) left in situ	36.2 KM

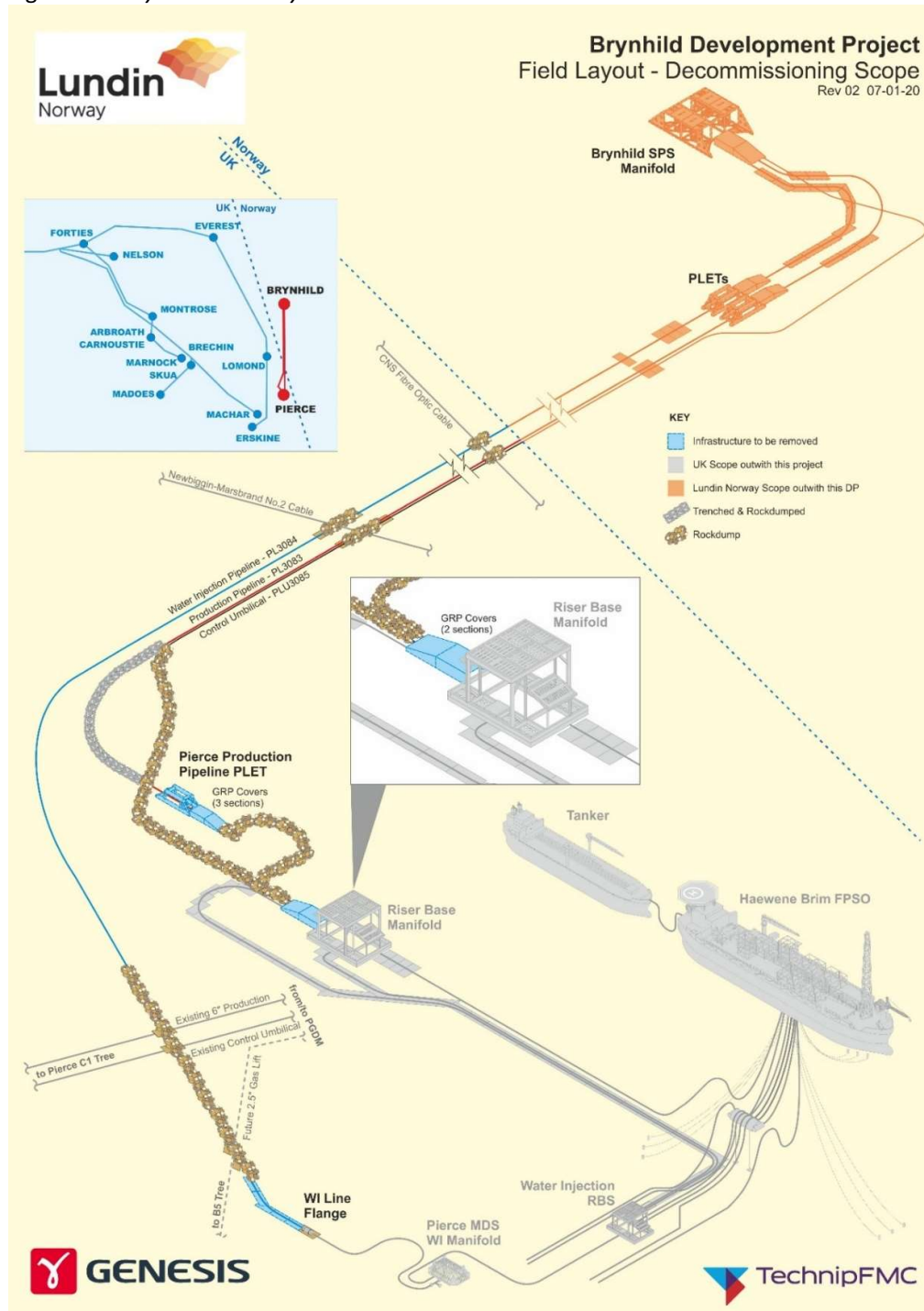
Table 1.2: Overview of the Stabilisation Features In The Approved DP	
Type	Number
Concrete Mattresses	36
Grout Bags	432

Table 1.3: Summary of the Approved Decommissioning Option(s) In The Approved DP	
Type	Selected Option
1. Topsides	N/A
2. Substructures (Jackets)	N/A
3. Subsea Installation(s)	N/A
4. Pipelines, Flowlines & Umbilicals List each pipeline as per the approved DP – <i>Consider using the Table 3.8 (columns 1 & 2) from the approved DP for ease</i>	<p>Flush, disconnect from PLET and RBM and leave buried in situ the 10"/6" OD Production PiP pipeline and 6" OD production jumper and the 5" OD Control Umbilical. Disconnect from Pierce WI system and leave buried in situ the 6" OD Water Injection pipeline. Cut ends will be covered by rocks.</p> <p>PL3083 Production line items to be recovered;</p> <ul style="list-style-type: none"> • PLET incl. PLET support frame, FJSS and GRP covers (3 off) • FJSS at RBM • Pipeline and jumper end sections <p>PL3084 Water Injection line items to be recovered;</p> <ul style="list-style-type: none"> • Mattresses • Pipeline end sections <p>PLU3085 Control Umbilical</p> <ul style="list-style-type: none"> • Umbilical end section incl. termination head
5. Stabilisation Features	Mattresses will be 36 & Grout bags will be 432
6. Wells	N/A. Abandoned in accordance to Norwegian legislation for Decommissioning of Wells
7. Drill Cuttings	N/A.

1.2 Schematic of Pipeline Being Decommissioned

The Brynhild field location and pipeline route are shown in Figure 1.1.

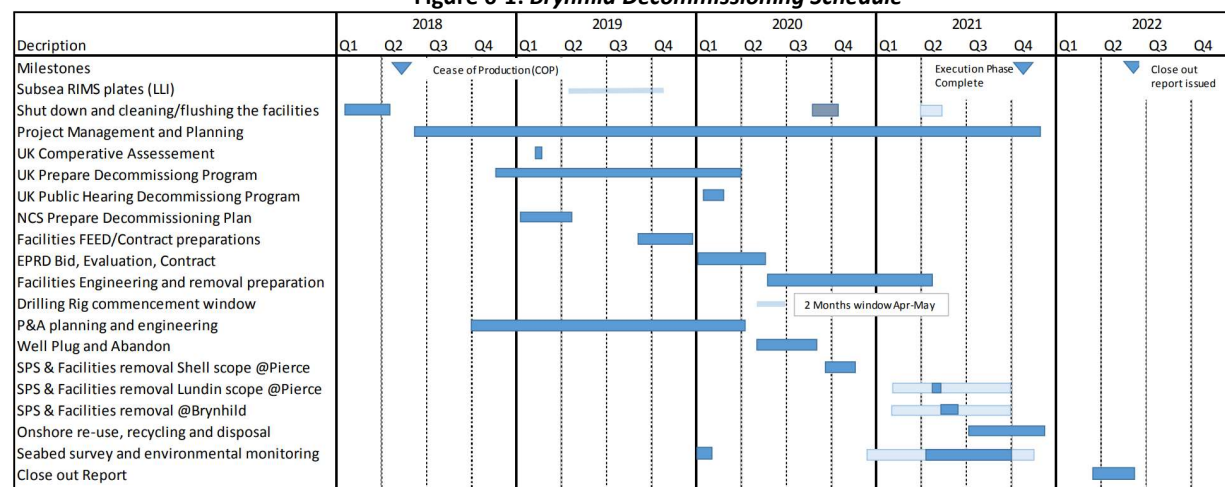
Figure 1.1: Brynhild Field Layout



1.3 Project Delivery against the Approved Schedule

Following completion of the Brynhild Pipelines decommissioning operations in UK, Lundin Energy has reviewed all activities to ensure that the scope has been fully executed in accordance with the approved DP, that risks to other sea users have been removed or reduced as far as possible and all regulatory requirements have been met. Where any variations to the DP have arisen, these have been documented in this close out report. Reference is made to Section 3.1.

Figure 6-1: Brynhild Decommissioning Schedule



1.4 Associated Decommissioning Approvals

Table 1.7: Associated Decommissioning Approvals	
PWA 4/W/13 and subsequent variations (392/V/21)	Authorised by OGA November 2020, variation updated May 2021 and finally in November 2021 to: Flush and disconnect umbilical PLU3085 and production pipeline PL3083. WI pipeline PL3084 disconnect. All activities completed within November 2021.
Chemical Permit (CP/2508/3)	Approved by OPRED/BEIS January 2021 with subsequent variations updated March 2021 and June 2021. Use and discharge of chemicals to sea at flushing and, disconnection activities for PLU3085, PL3083 and PL3084. CP return submitted July 2021.
Oil Discharge Permit (OTP/1088/1)	Approved by OPRED/BEIS March 2021 and June 2021 covering leakage of oil to sea at disconnection of the production pipeline PL3083. Completed June 2021. OTP return submitted June 2021.
Marine Licence (ML/665/3)	Approved by OPRED/BEIS March 2021, updated June 2021 and September 2021 for temporary storage and removal and deposit of rock related to PLU3085, PL3083 and PL3084. Completed November 2021. ML return submitted December 2021.
Deposit Consent (DEPCON) (48/D/21 and 97/D/21)	Approved by OGA May 2021 for permanent deposit of rock on cut ends of PLU3085, PL3083 and PL3084. Completed November 2021. DEPCON return submitted December 2021.
Transfrontier Shipment of Waste from UK to Norway (Notification no. GB0002000709, NEA ref.: 2021/3496)	Approved by SEPA and Norwegian Environment Agency May 2021. Final Movement documents returned November 2021
Licence granted to Lundin Energy AS for import of radioactive waste with NORM to Norway. Norwegian Radiation and Nuclear Safety Authority, ref.no: 21/01003-4/425.1	The pipeline cut section is cleaned. Awaiting documentation for repository at the approved site at Stangeneset, Gulen municipality, Norway.

2 DECOMMISSIONING ACTIVITIES

2.1 Contracts Awarded

Table 2.1: Contracts Awarded
Contract for Engineering, Preparation, Removal and Disposal (EPRD) of Brynhild subsea facilities in UK and Norway was awarded to DeepOcean 05.07.2020. The marine campaign was executed in period June-July 2021.
Pierce field operator Shell disconnected the Brynhild water injection pipeline from Pierce system on behalf of the Brynhild owners. Contract for this scope was awarded by Shell to Boskalis Q1 2021 and the scope was executed in November 2021.

2.2 Platform Operations

N/A

2.3 Well P&A

N/A

2.4 Subsea Installations

Table 2.4: Subsea Installations Decommissioning			
Description	Agreed Decom Solution	Total Removed (Actual) and Date of Removal	Status
Pipeline End Termination (PLET)	Removal (1)	1 Removed	Removed
PLET Support frame (1)	Removal (1)	1 Removed	Removed
PLET GRP Protection Covers (3)	Removal (3)	3 Removed	Removed
Flowline Jumper Support Structure (FJSS)	Removal (2)	2 Removed	Removed
RBM GRP Protection Covers (2) ^{Note 1)}	Removal by Pierce Operator	0 Removed	In situ

Note 1) The Riser Base Manifold (RBM) GRP covers were temporarily re-located in order to disconnect umbilical and production pipeline from RBM. 17 concrete mattresses installed by Pierce Field Operator on top of the Brynhild production pipeline and control umbilical and the Pierce production pipeline entering under covers also had to be temporary relocated as part of this operation. RBM GRP Covers and the 17 concrete mattresses were re-installed in order to protect the Pierce production pipeline and openings in the GRP cover. RBM GRP covers and mattresses will be removed by Pierce Field Operator at the time of Pierce decommissioning.

2.5 Pipelines/Umbilicals & Jumpers

Table 2.5: Pipelines/Umbilicals & Jumpers Decommissioning			
PL Number	Description	Agreed Decom Solution and Date of Removal	Status with lengths in kms removed and left in situ
PL3083	Production Pipeline	Leave in situ. Recover exposed end sections	Exposed end sections removed. Cut end covered with rock.
PL3084	Water Injection Pipeline	Leave in situ. Recover exposed end sections	Exposed end section removed. Cut end covered with rock.
PLU3085	Control Umbilical	Leave in situ. Recover exposed end sections	Exposed end section removed. Cut end covered with rock.

There are pipeline/ cable crossings associated with a CNS fibre optic cable and a Newbigging – Marsbrand cable inside the UKCS, both cables cross underneath both Brynhild pipelines and umbilical. The cables are trenched and buried and at the point where the crossings occur are rock covered and are intended to be decommissioned in-situ. There is therefore no impact to the existing cables at these crossings. There is an existing 6" production line and control umbilical associated with the Pierce Field that are trenched and buried and cross below PL3084 (WI Pipeline). The point where the crossings occur are rock covered. There is therefore no impact to the Pierce pipeline and umbilical at these crossings.

2.6 Pipeline Stabilisation Features

Table 2.6: Pipeline Stabilisation Features Decommissioning		
Description	Agreed Decom Solution and Date of Removal	Status
Concrete Mattresses (buried below rock) (31)	Leave in situ	In situ
Concrete Mattresses (surface laid) (5) ^{Note 1)}	Removal 1 mattress will be removed by Pierce Operator	4 Removed
Grout bags (buried below rock) (432)	Leave in situ	In situ

Note 1) Decommissioning Programme states that 5 exposed mattresses will be recovered from PL3084 Water Injection Pipeline. Only 4 mattresses were recovered, as the last mattress was re-installed to protect the new blind flange installed at the point where Brynhild pipeline was disconnected from the Pierce Water Injection system. This mattress will be removed by Pierce Field Operator at the time of Pierce decommissioning.

2.7 Drill Cuttings

N/A

2.8 Results of Post Decommissioning & Environmental Surveys & Debris Clearance

Table 2.8: Environmental Surveys & Debris Clearance

On behalf of Lundin Energy, the vessel MV Edda Freya was tasked with conducting the following post decommissioning surveys:

- visual inspection and acoustic sensors survey (dual MBE and Side Scan Sonar) of the Water Injection Pipeline, Production Pipeline and the Control Umbilical within the UK Sector.
- as-left MBES survey (including Side Scan Sonar) covering areas where decommissioning took place i.e. the area covering the site of the removed PLET and in-situ RBM and the area between them.

The Constructor 5 WROV was utilized to execute the visual inspection. In addition to the video camera, acoustic sensors (dual MBE system and Side Scan Sonar) were used to perform the survey along Production Pipeline, Water Injection Pipeline and Control Umbilical. The center camera was used for the visual acquisition and as well for tracking of the product (inside trench or rock berm). The MBE system was setup to 20m range, giving around 30m swath. SSS was setup to 75m range on High Frequency and Low Frequency.

The as-left video inspection covered the immediate areas where decommissioning scope had been performed such as the area around the recovered PLET and the GRP covers at the in-situ RBM.

The surveys confirmed that pipeline and umbilical were completely buried. No oil and gas related debris was identified in the inspected corridor of +/- 75 m (total coverage of 150 m).

A summary of the survey results is included in Appendix 1. Further details are given in Pierce Survey Report, Doc. No. 21488-DEEPO-U-RA-00001.

Pipelines and umbilical burial depths were recorded in 2013 and 2015. Results from the surveys in 2013 and 2015 are included in Appendix 2, showing a burial depth of more than 0.6 m along the entire route. No spanning, buckling or exposure has been observed in any of the later surveys in 2017 and 2021.

A visual inspection was performed in the area where the WI flowline was disconnected from the Pierce water injection system. The survey is documented in Brynhild WI Decommissioning Field Report, Doc. No. PDP-BSKLS-E-OA-7180-00005. The survey demonstrate that the cut WI flowline end is completely covered with rock. Further, an additional burial survey was taken, starting at the point the 6" WI rigid flowline transitioned from rock to burial to the cut pipeline end. No anomalies were identified during these surveys in the meaning of no findings, irregularities or deviations regarding oil and gas related items were revealed/uncovered by either the post-decommissioning visual surveys or the as-left MBES survey.

Following clarifications with OPRED regarding requirement for environmental survey, OPRED (email from Fiona Livingston 18.05.21) have waived the requirement for environmental survey due to the modest scope of the Brynhild decom works and their location.

2.9 Key Milestones

Table 2.9: Key Milestones

Umbilical (PLU3085)

- Methanol core and hydraulic/chemical lines flushed. Unsuccessful attempt to completely flush the scale inhibitor and emulsion breaker lines due to clogged lines, ref. Section 7.
- Disconnected from Riser Base Manifold at Pierce
- Exposed section (approx. 37 m) cut and recovered. Cut end plugged and covered with rocks
- Trenched and buried umbilical left in situ.
- Survey of 100 m corridor along umbilical route to verify burial and no oil and gas related debris

Production flowline (PL3083)

- Disconnected from Riser Base Manifold (RBM) at Pierce. Pressure cap installed at manifold. RBM (incl. GRP covers and associated concrete mattresses) are owned by Pierce and will be decommissioned at a later stage.
- Exposed jumper section at RBM end (approx. 45 m) and PLET end (approx. 30 m) cut and recovered. Cut ends covered with rock.
- PLET incl. support frames and GRP protection covers recovered
- Pipe-in-pipe exposed section (approx. 10 m) cut and recovered. Cut end plugged and covered with rock.
- Survey of area inside Pierce 500 m safety zone where Brynhild structures were recovered to demonstrate completion of work and debris clearance
- Trenched and buried pipe-in-pipe flowline left in situ.
- Survey of 100 m corridor along buried pipeline route to verify burial and no oil and gas related debris

Water Injection Flowline (PL3084)

- Disconnected from Pierce water injection system. Pressure retaining blind flange installed.
- Exposed flowline section (approx. 30 m) cut and recovered. Cut end covered with rocks.
- 4 mattresses recovered
- Survey of area where water injection flowline was disconnected to demonstrate debris clearance
- Trenched and buried flowline left in situ

Survey of 100 m corridor along pipeline route to demonstrate verify burial and no oil and gas related debris

2.10 Stakeholder Engagement

Table 2.10: Stakeholder Engagement

Advisory comments were received on the EA Scoping Report from:

- The Scottish Fishermen's Federation - the size and profile of the rock to aligns with industry standards.
- Marine Scotland - advised that the latest available NMPi data should be checked regarding potential new information.
- Joint Nature Conservation Committee (JNCC) - recommended to minimise the introduction of new hard substrate materials to the seabed.
- Scottish Environmental Protection Agency (SEPA) - advised on Duty of Care with respect to Wastes and requirements for Trans-Frontier Shipment of wastes only.

3 IMPACT ON ENVIRONMENT

3.1 Activities

The works undertaken were aligned with the Decommissioning Program and the supporting documents, including the Environmental Impact Assessment.

The planned marine campaign comprised flushing of the umbilical (all chemical lines). Flushing of the chemical/hydraulic lines commenced 06.06.2021. Clogging significantly restricted the flushing flowrate. Despite of several attempts the flushing campaign was interrupted. Both BEIS and Norwegian authorities were informed during this incident. The Chemical Permit (BEIS) was updated and approved 08.06.2021 reflecting discharges to sea and abandonment of chemicals in the umbilical. PWA has also been updated and approved to reflect the as-left status.

An incident with discharge to sea on 12 June 2021 was reported according to PON1 notification. The incident involved a leakage of maximum 0,0005 tons of ROV hydraulic fluid (Shell Tellus S2 M 22) at 80 meter water depth on the Pierce Field.

3.2 Future Monitoring

Following completion of the Brynhild Pipelines decommissioning operations in UK, Lundin Energy has reviewed all activities to ensure that the scope has been fully executed in accordance with the approved DP, that risks to other sea users have been removed or reduced as far as possible and all regulatory requirements have been met. Where any variations to the DP have arisen, these have been documented in this close out report.

4 IMPACT ON HSE

There were no HSE incidents during marine campaign and onshore recycling.

5 WASTE

All recovered infrastructure materials were returned to shore in UK (WI scope of work by Shell) and Norway (production pipeline and control umbilical scope of work by Lundin Energy). The recovered materials were recycled utilizing 'Boskalis contracted (UK) Scotoil and 'DeepOcean contracted (N) Stena Recycling, appropriately licensed, waste management and recycling contractors. The wastes were delivered at Asco's South Base harbor, Peterhead Scotland and at Stena Recycling, Mekjarvik base, Stavanger Norway for recycling. Subsequent transport of waste to recovery facilities were arranged by the recycling contractors. Transboundary transport of waste was approved by the Scottish EPA (SEPA) and the Norwegian EPA.

Waste Management Plans (Doc.No. 14412-PEP-0001 and 21488-LUNAS-S-TA-00004) were applied to ensure compliance with the Waste Framework Directive. Waste returned to shore during the decommissioning of the Brynhild pipelines is detailed in Table 6.1 and Figure 6.1.

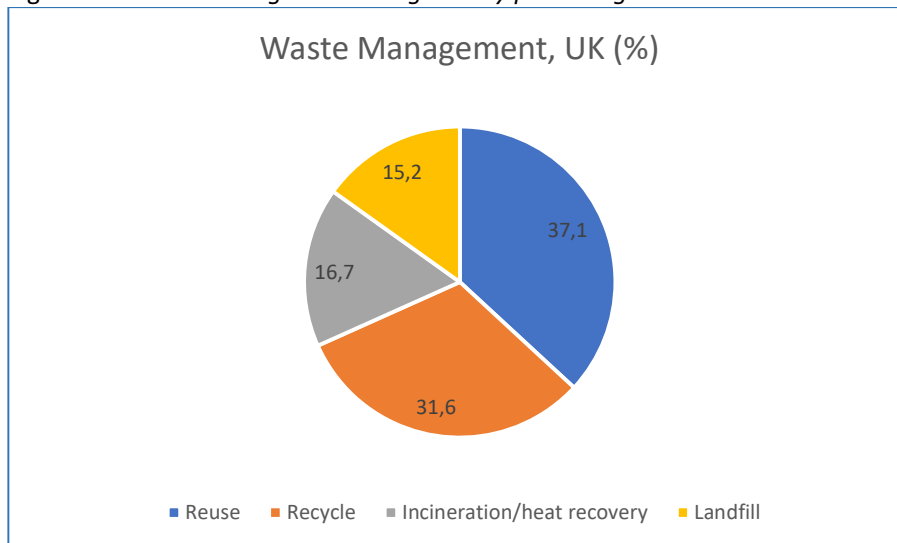
The decommissioning project defined a recycling target of minimum 67% which was achieved by a good margin.

Naturally occurring radioactive materials (NORM) was detected in cut sections of the production pipeline by standard procedures on the vessel. The sections were properly sealed and shipped to Mekjarvik for cleaning by WellConnection in Stavanger. A permit for import and permanent storage of NORM is granted by the Norwegian Radiation Protection Agency. The approved waste handler has reported 195 kg NORM from UK pending permanent storage in Norway. Awaiting further documentation on the permanent storage.

Table 5.1: Materials/Waste Returned to Shore					
Material/Waste	Total Weight (t) – as per the approved DP	Tonnage In situ	Tonnage to shore		Disposal Method
			Peterhead, Scotland	Mekjarvik, Norway	
Concrete mattresses	239	200.2	38.8 (14 Nov 2021)		Re-Use
Steel – Pipeline cut, PLETs, UHT, FJSS and support plate	2194	2160.9	1.5 (14 Nov 2021)	31.6 (25 June 2021)	Recycling
PLET GRP covers with ballast blocks *)	30.8	0	0	30.8 (25 June 2021)	Heat recovery/ Landfill
Total	2463.8	2361.1	40.3	62.4	

*) Ballast blocks not suitable for reuse – confirmed by laboratory analysis

Figure 5.1 Waste management categories by percentage



6 LESSONS LEARNED

Engineering/preparation phase;

- Good cooperation between Contractor and sub-suppliers
- Quality of the analysis, procedures, task plans clarified expectations upfront and provided good quality input as-built documentation
- Marine activity preparations should be done more timely upfront, e.g. bridging documents
- Covid 19 prevented visiting Contractor during engineering phase.

Authority processes;

- Good dialogue with authorities in UK and Norway (but challenging to follow-up the bi-lateral application on Transboundary Shipment of Waste)

Offshore execution;

- Generally good execution according to procedures, especially highly critical operations (heavy lift)
- Open and transparent way of working between Contractor and Operator
- Establishment of the Teams Chat shown to be extremely effective way of keeping everybody in the loop
- Discharge from the manifold (piping NCS) underestimated the potential discharge, include higher contingency
- Cutting with standard demolition jaws does not work well on umbilical with super duplex piping
- The diamond wire cutting saw had a tendency to get stuck – alternative tools to be available.

7 COST SUMMARY

Decommissioning costs have been provided to OPRED out with this report.

8 PHOTOGRAPHS

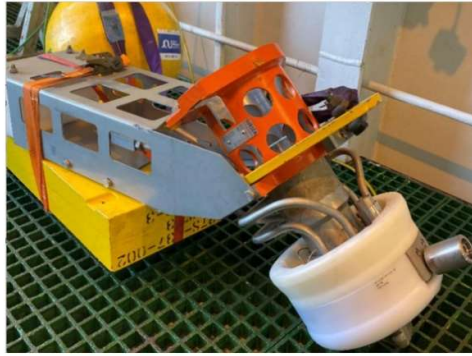


Photo #1 Umbilical flushing



Photo #2 Umbilical disconnect from Pierce RBM (Riser Base Manifold)



Photo #3 Installation of High Pressure Cap on Pierce RBM (Riser Base Manifold)



Photo #4 Cutting of production flowline with Diamond Wire Saw

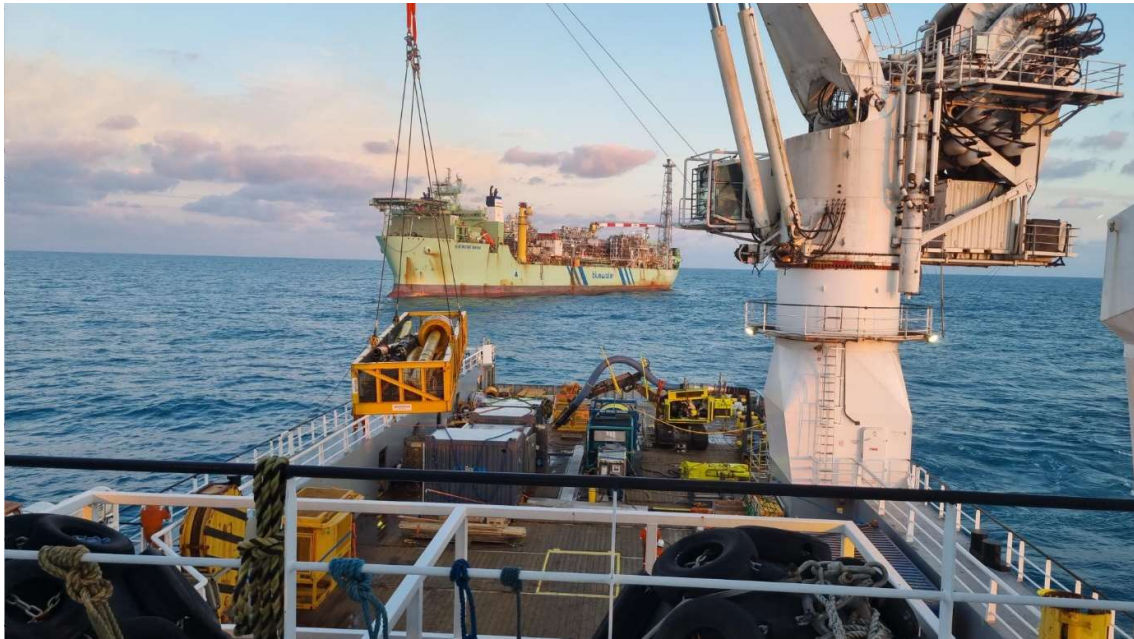


Photo #5 Recovery of basket with cut end sections of production flowline and umbilical

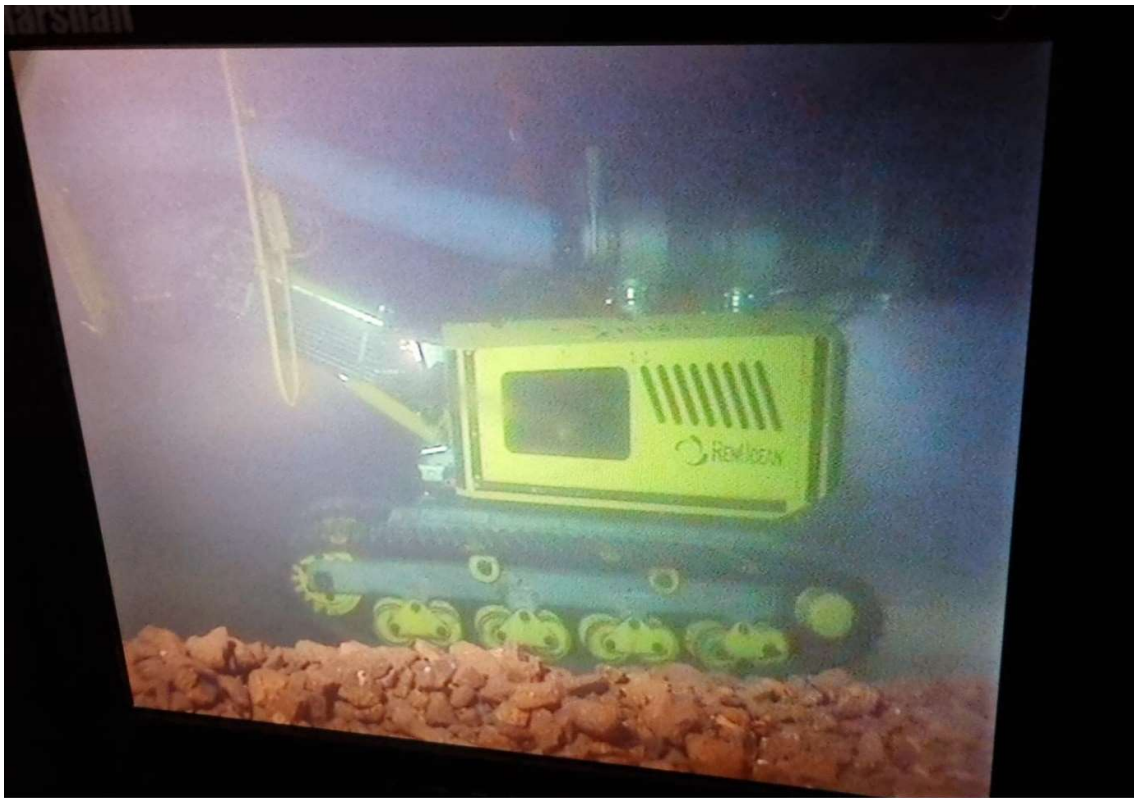


Photo #6 Rock removal from PLET GRP covers



Photo #7 Recovery of PLET



Photo #8 Recovery of PLET support frame



Photo #9 Recovery of the 3 PLET covers

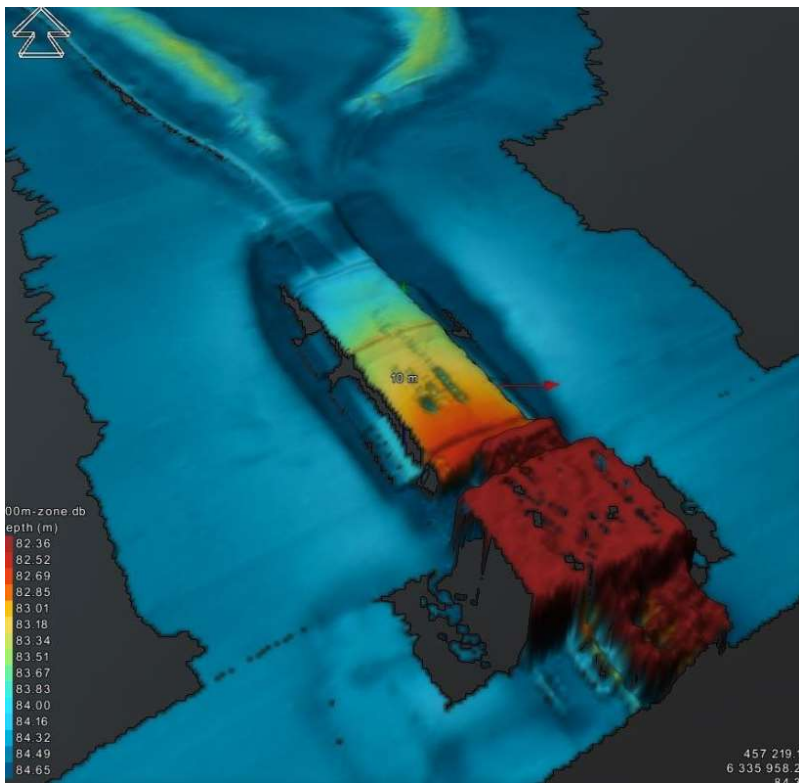


Photo #10 Multibeam survey of RBM surroundings

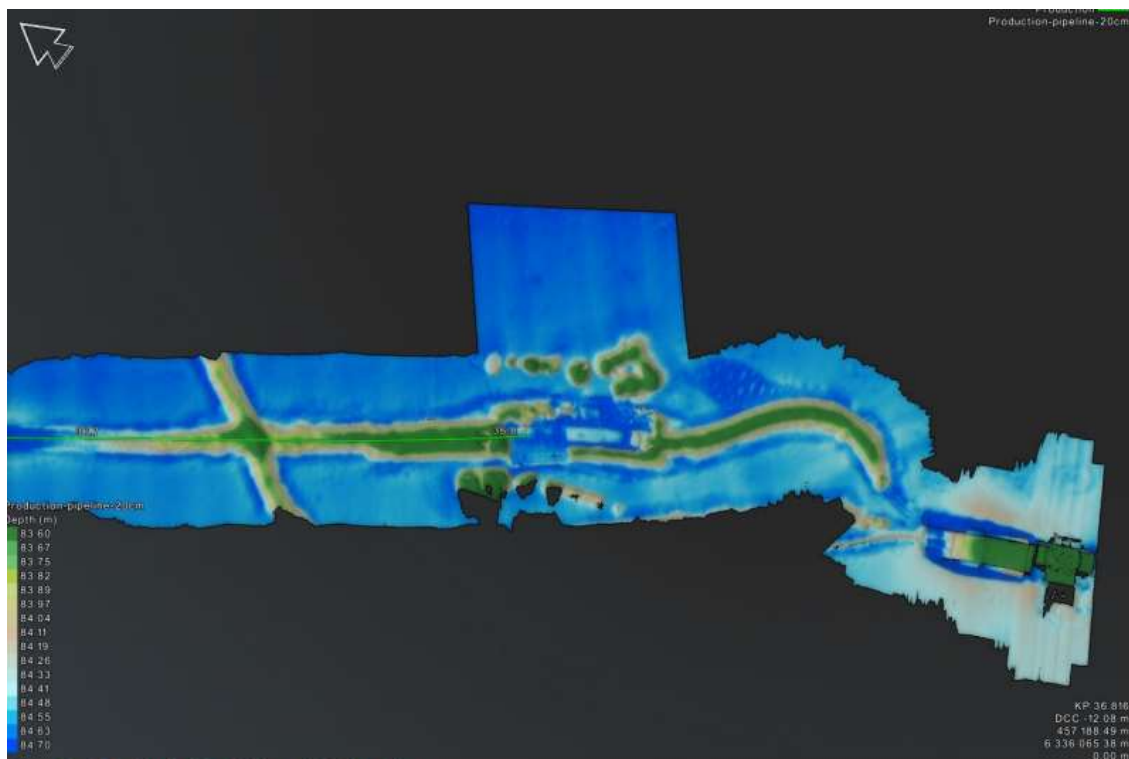


Photo #10 Multibeam survey of RBM surroundings



Photo #10 Cut WI flowline end sections recovered in basket

9 APPENDICES

APPENDIX 1 - Summary of pipeline surveys

DEEPOCEAN

6. SUMMARY OF RESULTS

6.1 PRODUCTION PIPELINE: KP 25.035 TO KP 36.803

Table 6.1 – Production Pipeline KP25.035 – KP 36.803 - Summary of Results

Pipeline Configuration	Pipeline was completely within burial
Burial	100%
Damage	None
Debris	No oil or gas industry related debris in inspected corridor of +/- 75m (150m swath)
Seabed Features and Targets	No significant seabed features
Pipeline / Cable Crossings	2
Miscellaneous	The production pipeline was found to be buried throughout the inspected section. Eleven gravel dumps were observed ranging in length from 3.9m to 336.0m. The total length of gravel-dumped sections totaled 1158.3m (9.4% of the surveyed section). The excavation through the gravel dump at the cut end of the pipeline at Pierce was observed at KP 36.797, infilled with recent gravel.

6.2 WATER INJECTION PIPELINE: KP 24.520 TO KP 37.225

Table 6.2 – Water Injection Pipeline - KP 24.520 to KP 37.225 - Summary of Results

Pipeline Configuration	Pipeline was completely in burial from KP 23.640 to KP 36.943 Pipeline was covered by mattress from KP 36.943 to KP 37.224 (WIM)
Burial	100% - small exposed sections between mattress
Debris	No oil or gas industry related debris in inspected corridor of +/- 75m (150m swath)
Seabed Features and Targets	No debris items or targets considered a hazard to the pipeline
Pipeline / Cable Crossings	9
Miscellaneous	The Water Injection pipeline was found to be buried throughout the inspected section. Eight gravel dumps were observed ranging in length from 20.1m to 602.8. The total length of gravel dumped sections totaled 1277.6m (10.2% of the surveyed section). The section between KP 36.943 and the Pierce Water Injection Manifold is mattress-covered. Twelve very short exposures of the pipeline were observed between KP 36.952 and WIM. Grout bags have been installed in gaps between the mattresses in this area, and at twelve locations the pipeline is visible between the grout bags (Figure 7-4 - Figure 7-15)

6.3 CONTROL UMBILICAL: KP 0.000 TO KP 1.020

Table 6.3 – Control Umbilical - KP 0.000 to KP 1.020 - Summary of Results

Pipeline Configuration	Umbilical was completely in burial
Burial	100%
Debris	No oil or gas industry related debris in inspected corridor of +/- 75m (150m swath)
Seabed Features and Targets	No debris items or targets considered a hazard to the umbilical
Pipeline / Cable Crossings	1
Miscellaneous	The umbilical was found to be buried throughout the inspected section. It is covered by gravel for most of its length where it is separated from the Production pipeline at the Pierce end. The umbilical is under a protection tunnel between the Riser Base Manifold and KP 0.025 and is covered by mattresses from KP 0.025 to the start of the gravel dump at KP 0.038.

Doc ID : NO.E11299-SUR-REP-001
 Title: : Pierce Survey Report
 Client doc. : 21488-DEEPO-U-RA-00001/ Shell P8DP-LUN-E-AA-7180-00022 Client Rev: 01

Rev : A
 Date : 2021-09-07
 Page : 11 of 32

APPENDIX 2 – Pipeline and umbilical Burial Depth Information

The graphs below show the measured depth of cover along the full length of each pipeline and umbilical, below seabed (0 being seabed level) from two separate surveys, a) an As-laid survey completed at the end of the pipelines installation in 2013 and b) an inspection survey carried out in July 2015.

The production pipeline and the umbilical share a common trench until they exit the trench near to Pierce (UK), at this point the pipeline and umbilical diverge but are fully rock covered on the surface and up to the cut points.

Graph vertical axis is in meters and horizontal axis is in kilometers.

2013 As Laid survey data excludes rock cover.

2015 Inspection Survey includes rock cover.

Figure A2-1 Production Pipeline / Umbilical Burial Depth

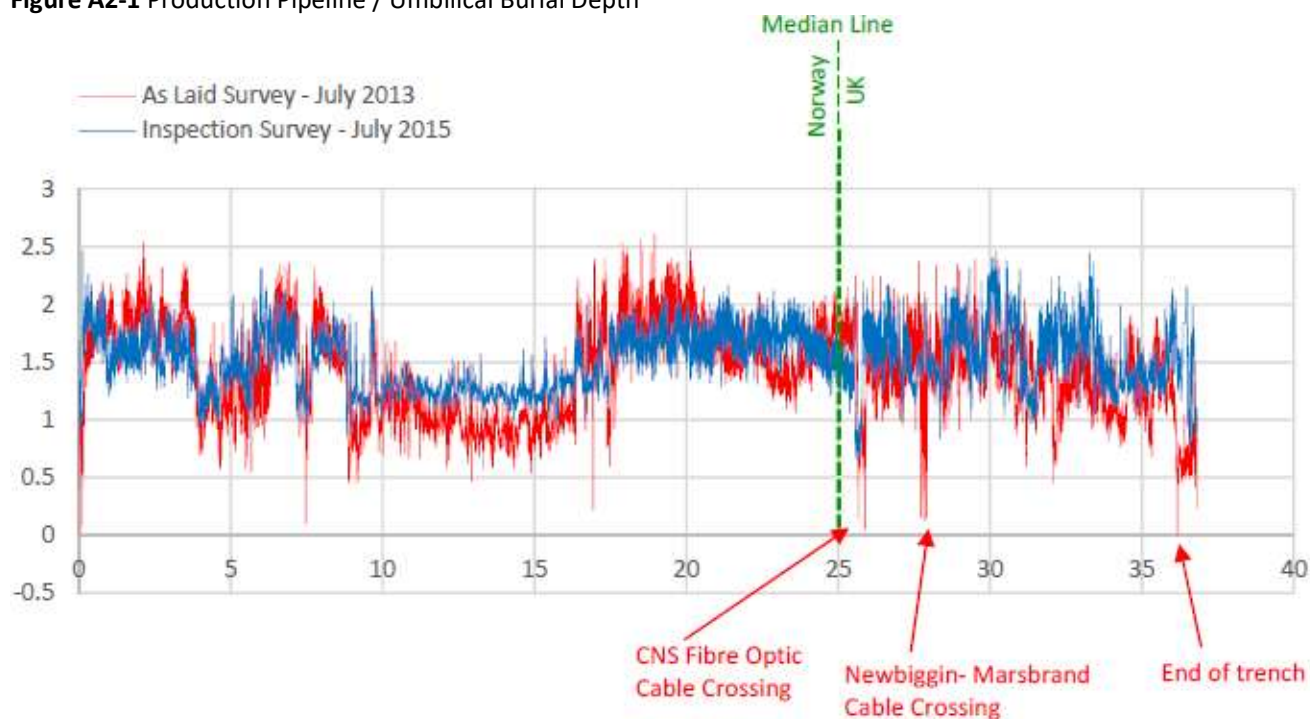


Figure A2-2 Water Injection Pipeline Burial Depth

