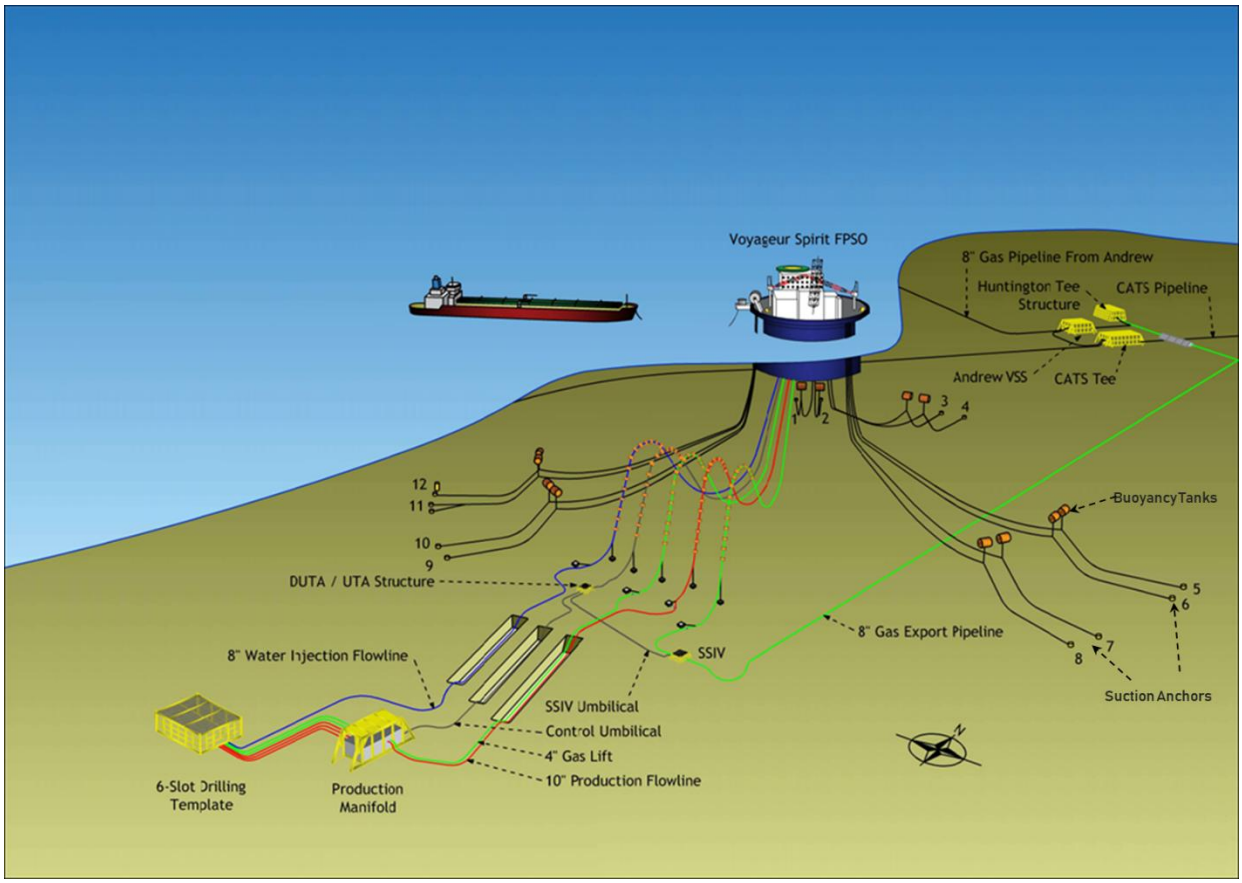


Huntington FPSO Float-Off

Close-Out Report

Approval page

Name	Position	Purpose	Signature	Date
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Rev. No.	Revised section	Paragraph No.	Description of changes
A1	Various	Various	Minor wording and formatting tweaks
C1	Various	Various	Seabed imagery and as-left clarified

Abbreviations & Acronyms

Term	Definition
CATS	Central Area Transmission System
CNS	Central North Sea
CoP	Cessation of Production
COR	Close-Out Report
DP	Decommissioning Programme
DSV	Dive Support Vessel
ECH	Electric, Chemical, Hydraulic (subsea umbilical)
ERRV	Emergency Response and Rescue Vessel
FPSO	Floating Production Storage and Offloading
Harbour	Harbour Energy plc
HSEx	Health & Safety Executive
km	Kilometre
m	Metre
MBES	Multibeam Echosounder
N/A	Not Applicable
NORM	Naturally Occurring Radioactive Material
NSTA	North Sea Transition Authority
OEUK	Offshore Energies UK
OGA	Oil & Gas Authority
OGUK	Oil & Gas UK (rebranded to OEUK in 2022)
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
Premier	Premier Oil E&P UK Limited

POB	Personnel on Board
PWA	Pipeline Works Authorisation
RO	Restriction Orifice
ROV	Remotely Operated Vehicle
SEPA	Scottish Environmental Protection Agency
SFF	Scottish Fishermen's Federation
SNS	Southern North Sea
SSIV	Subsea Isolation Valve
Te	Tonne
UK	United Kingdom
VSS	Valve Support Structure

HOLD List

HOLD	Section	Detail	Closeout

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1 Summary

1.1 Summary of Decommissioning Programmes

The Huntington field is operated by Premier Oil E&P UK Limited ('Premier'), which is a subsidiary of Harbour Energy plc ('Harbour'). Harbour was formed through an all-share merger between Premier Oil plc and Chrysaor Holdings Limited on the 31st March 2021.

The Huntington field is a subsea development located in block 22/14b in the Central North Sea, 230km east-northeast of Aberdeen, in a water depth of approximately 89 metres. The field was tied back to the Altera-owned Voyageur Spirit Floating Production Storage and Offloading (FPSO) facility, where produced fluids were processed. Gas was used for gas lift, fuel and exported to the Central Area Transmission System (CATS). Stabilised crude oil was exported via shuttle tankers. Production came online during 2013 and ceased in 2020.

The Huntington FPSO Float-off Decommissioning Programme (DP) covers the departure of the Voyageur Spirit FPSO and the removal of the associated riser and mooring systems from the Huntington field.

The remaining Huntington Field Infrastructure which is on the S29Ns is subject to separate Decommissioning Programmes.

- Cessation of production (CoP) was agreed by the Oil & Gas Authority (OGA, now NSTA) on 26/11/2019
- Production formally ceased on 05/04/2020
- The Decommissioning Programme was formally approved by the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) on 07/04/2020 and has not been revised

A summary of the decommissioned infrastructure and the approved decommissioning options is outlined in the tables below.

Table 1.1: Overview of the Decommissioned Installations in the Approved DP[1]		
Installation Type	**Number**	**Weight (Te)**
FPSO	1	27,596
Subsea Installation Type	**Number**	**Weight (Te)**
Suction Anchors	14	1,736
Mooring Lines	12[2]	3,400

[1] These installations were owned by Altera

[2] The approved DP incorrectly stated that there were 14 mooring lines to match the number of suction anchors. There were in fact 12 mooring lines, with one line connected to two suction anchors, and the 14th suction anchor was never connected

Table 1.2: Overview of the Decommissioned Pipelines & Umbilicals in The Approved DP	
Number of Pipelines to be decommissioned	4
Number of Umbilicals to be decommissioned	1
Total km of Pipelines & Umbilicals to be decommissioned	1.666 km
Total km of Pipelines & Umbilicals left in situ	N/A

Table 1.3: Overview of the Stabilisation Features in the Approved DP	
Type	**Number**
Concrete Mattresses	69

Table 1.4: Summary of the Approved Decommissioning Options in the Approved DP
1. Topsides
Complete removal of the FPSO for reuse (redeployment) by the owner (Altera)
2. Subsea Installations
Complete removal of 14 suction anchors and 12 associated mooring lines for reuse (redeployment) by the owner (Altera)
3. Stabilisation Features
69 mattresses to be recovered to shore for recycling or other waste treatment as appropriate
4. Pipelines, Flowlines & Umbilicals & Riser Sections
Recovery of the 8” Huntington Gas Export/Import riser, 8” Production riser, 8” Water Injection riser, 4” Gas Lift riser and the dynamic section of the Electric, Chemical, Hydraulic (ECH) Control Umbilical to shore for recycling or other waste treatment as appropriate

1.2 Schematic of Installations/Pipelines Being Decommissioned

Figure 1.1: Schematic of Installations/Pipelines Prior to Decommissioning

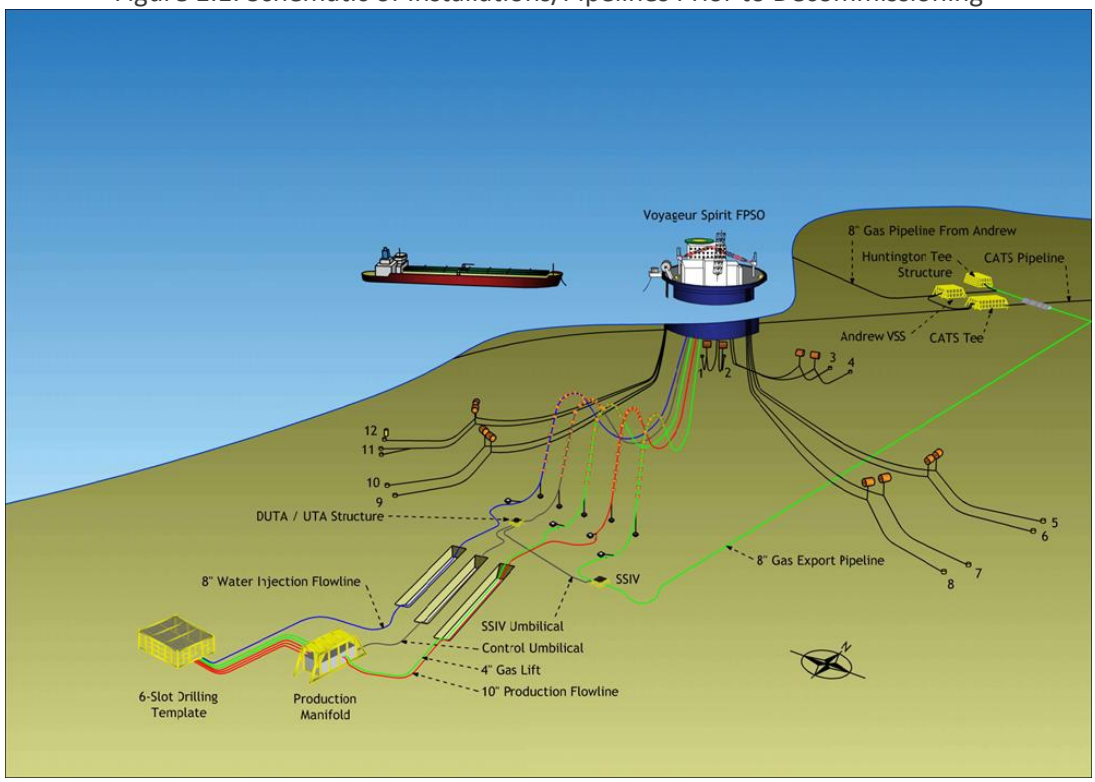
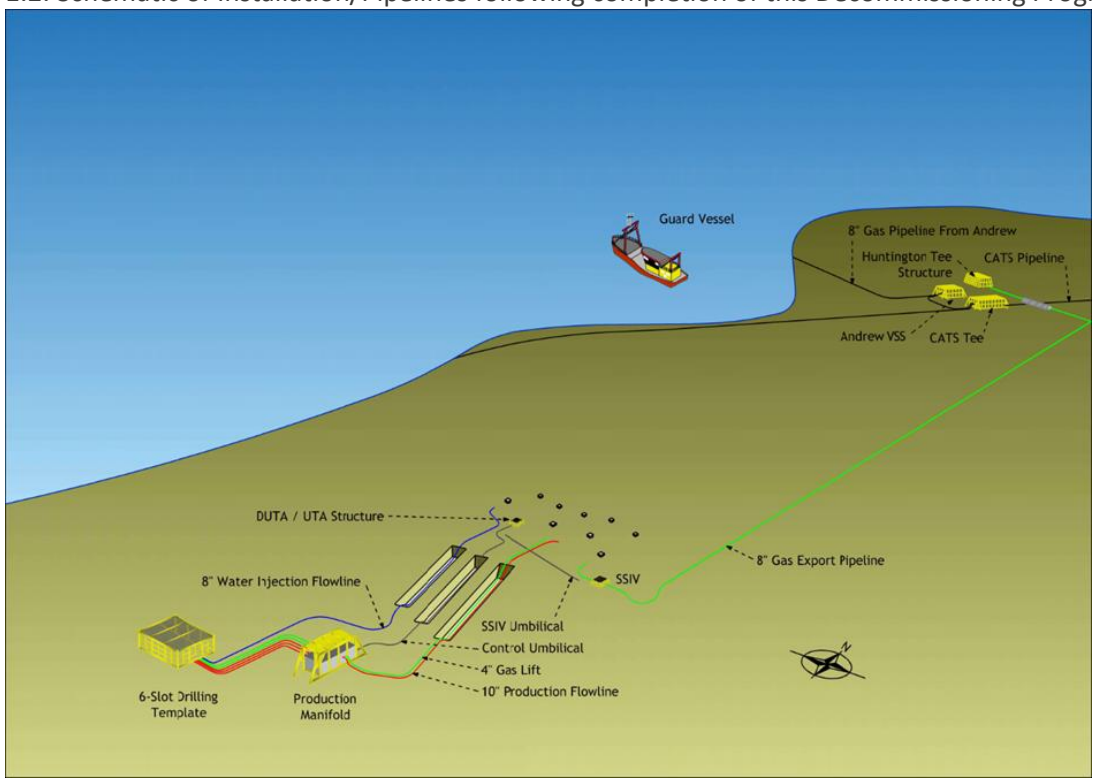
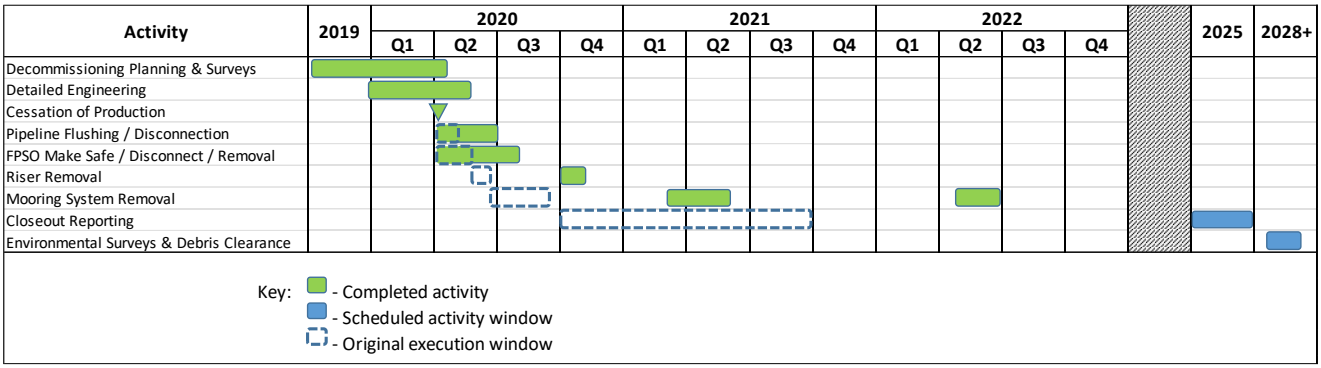


Figure 1.2: Schematic of Installation/Pipelines following completion of this Decommissioning Programme



1.3 Project Delivery against the Approved Schedule



When the Huntington FPSO Float-off DP was compiled, allowances for the associated environmental surveys and debris clearance activities were not included in the Gantt chart, because they will be executed as part of the approved Huntington Field Decommissioning Programmes. However, for clarity, these activities have been added to the chart.

The durations associated with the "FPSO Make Safe / Disconnect / Removal" and "Pipeline Flushing / Disconnection" activities were extended due to difficulties associated with the depressurisation of the gas export pipeline. This in turn had a knock-on effect on the subsequent riser and mooring system removal scopes.

In 2021, Altera attempted to fully recover the FPSO mooring system. However, problems were encountered, and five suction anchors remained in the field. Harbour recovered these remaining anchors in Q2 2022, completing the full removal of the FPSO mooring system.

In 2023, Harbour completed the final disconnection of the Huntington infrastructure from CATS, which involved the removal of 14 mattresses which are part of the Huntington FPSO Float-off DP.

At the time of writing, four out of the 69 mattresses included in the approved Huntington FPSO Float-off DP remain in the field within the former FPSO 500m zone. These mattresses were temporarily 'pealed back' to allow for riser disconnection operations in 2020 and then moved back and left in their original position to protect disconnected flowline ends.

To allow this Huntington FPSO Float-off Close-Out Report (COR) to be prepared, it was agreed with OPRED to track the four remaining mattresses as part of the progress reporting associated with the approved Huntington Field DP.

1.4 Associated Decommissioning Approvals

Table 1.5: Associated Decommissioning Approvals	
CoP	Agreed by the OGA (now NSTA) November 2019 Occurred April 2020
Huntington Decommissioning Programme for FPSO float-off	Approved by OPRED April 2020
Decommissioning Programmes for Huntington Field infrastructure	Approved by OPRED March 2021
PWA	52/V/20 authorised by OGA (now NSTA) March 2020 to: • Flush the gas export system, disconnect the gas export pipeline from the Huntington Tee, and remove the gas export riser • Flush the production system and remove the production riser • Flush the gas lift system and remove the gas lift riser • Flood the water injection system and remove the water injection riser • Flush the umbilical chemical cores and remove the dynamic umbilical • Disconnect the Subsea Isolation Valve (SSIV) control umbilical 37/V/23 authorised by NSTA March 2023 to: • Depressurise, flood, disconnect and remove the 24” gas export spool between the Andrew Valve Support Structure (VSS) and Huntington Tee
Environmental Permits	PLA/737: 2020 flush, disconnect and removal scopes DCA/140: 2022 remaining suction anchor recovery and 2023 CATS disconnect scope

2 Decommissioning Activities

2.1 Contracts Awarded

Table 2.1: Contracts Awarded
2020: The subsea activities were executed by Subsea 7 as part of a corporate frame agreement between Premier and Subsea 7. The FPSO-related activities were managed by Altera, including tendering exercises and contract awards. Harbour are aware that Altera awarded contracts for the unmooring and tow of the FPSO to DOF Subsea, and the yard stay to Kishorn Port / Semco Maritime. Following a tendering exercise, Premier awarded a contract for the processing of the final slops offload, including all flushing/cleaning fluids, to Asco. A contract for guard vessel services was awarded to the Scottish Fishermen's Federation (SFF). **2021:** Altera awarded a contract for the removal of the mooring system to DOF Subsea. **2022:** The removal of the remaining five suction anchors (scope transferred from Altera to Harbour) was executed by Boskalis, as add-on scope to a wider 2022 Central North Sea (CNS) and Southern North Sea (SNS) decommissioning campaign. **2023:** Following a competitive tendering exercise in 2022, Harbour Energy awarded a contract to Boskalis for a wider 2023 CNS and SNS decommissioning campaign, which included the gas export spool scope at Huntington.

2.2 FPSO Operations

Table 2.2: FPSO Operations
Production from the Huntington field officially ceased at 5pm on 5th April 2020, immediately followed by the last commercial offload from the field. Topside and marine flushing and cleaning activities commenced and were originally estimated to take a total of two months to complete. However, due to difficulties associated with the depressurisation of the gas export pipeline, the duration of the topside and marine flushing and cleaning programmes were extended by approximately five weeks. The final slops were offloaded on 28th June 2020. Following another short delay due to permitting issues, mooring laydown operations commenced on 14th July 2020, and the FPSO departed from the Huntington field on 27th July 2020, arriving in Kishorn Loch a few days later. The Emergency Response and Rescue Vessel (ERRV) was stood down on 28th July 2020, when a SFF guard vessel arrived in the field. The removal of the FPSO mooring system (by Altera) commenced on 6th March 2021, with the mobilisation of the Skandi Hera for the recovery of the upper chains, polyester ropes and lower chains. This scope was successfully completed on 20th March 2021.

The Skandi Acergy was used for the recovery of the suction anchors, split over two campaigns:

- Campaign 1: 18th – 29th of April 2021
- Campaign 2: 24th – 29th of May 2021

At the end of the two campaigns, nine out of the 14 suction anchors were successfully recovered, but five suction anchors remained in the field because they could not be pumped out of the soil. As part of an overall settlement agreement between Altera and Premier, the ownership of these five suction anchors was transferred to Premier.

The removal of the remaining five suction anchors commenced on 4th May 2022, with the mobilisation of the Boa Sub C. Compared to the previous suction anchor removal campaign in 2021, the vessel mobilised with a higher capacity pumping spread and a subsea excavator to remove soil around the outside of the anchor to reduce friction, if required. The excavator was required for two out of the five anchors. Post-recovery Multibeam Echosounder (MBES) seabed surveys were conducted at each anchor location. The five suction anchors were successfully recovered, and the demobilisation completed on 16th June 2022. This marked the completion of the full removal of the FPSO mooring system.

In April 2023, Altera's Voyageur Spirit FPSO left Kishorn dock to be refurbished in Dubai, before being redeployed on ENI's Baleine development (Côte d'Ivoire).

2.3 Subsea Operations

Table 2.3: Subsea Operations

The Dive Support Vessel (DSV) scopes in 2020 were planned to be carried out in two campaigns. The DSV Seven Falcon mobilised for the first campaign on 11th April 2020, to carry out all the required subsea flushing operations. The vessel demobilised on 20th April 2020. Due to difficulties associated with the depressurisation of the gas export pipeline, the flushing of this pipeline was deferred, and ultimately led to the requirement to have an extended second DSV campaign, including approximately 10 days of standby time in port.

The DSV Seven Falcon mobilised for the second campaign on 24th May 2020 to disconnect and isolate the six Xmas trees in the Huntington drilling template, disconnect the water injection, gas lift and production risers subsea, and to cut the water injection riser below the FPSO hull. The DSV then transited to Peterhead on 30th May 2020, to commence standby while the FPSO continued to depressurise the gas export pipeline.

The DSV commenced the transit back to the Huntington field on 11th June 2020, to flush the gas export pipeline, disconnect the gas export pipeline from the Huntington Tee, disconnect the gas export riser subsea, and to cut the remaining risers and umbilical below the FPSO hull. The vessel demobilised on 18th June 2020.

Table 2.3: Subsea Operations
A Subsea 7 team then mobilised to the Voyageur Spirit FPSO to release the riser tails remaining in the FPSO's I-tubes following the earlier cuts below the hull. All five tails were successfully lowered to the seabed between the 26th and 29th June 2020. The CSV Siem Spearfish mobilised on 14th October 2020 to retrieve the four risers and dynamic umbilical, including bend stiffeners, connectors and concrete mattresses laid over the risers, and the five riser tails. The vessel demobilised on 3rd November 2020. Decommissioning of the Huntington subsea infrastructure in the CATS Tee 1 500m zone was completed during Q2/Q3 2023, as part of the approved Huntington Field Decommissioning Programmes. This also included 14 concrete mattresses which are part of the Huntington FPSO Float-off Decommissioning Programme.

2.4 Subsea Installations

All subsea installations included in the approved Huntington FPSO Float-off DP have been recovered to shore for re-use / recycling.

Table 2.4: Subsea Installations Decommissioning			
Description	**Agreed Decom Solution**	**Total Removed (Actual) and Date of Removal**	**Status**
Suction Anchors	Full Removal (14)	14 2021 (9) / 2022 (5)	Fully Removed
Mooring Lines	Full Removal (12)	12 2021 (12)	Fully Removed

2.5 Pipelines/Umbilicals & Jumpers

All risers included in the approved Huntington FPSO Float-off DP have been recovered to shore for recycling.

Table 2.5: Pipelines/Umbilicals & Jumpers Decommissioning			
PL Number	**Description**	**Agreed Decom Solution and Date of Removal**	**Current Status (Please state the length in kms, left in situ/removed)**
PL2805	Gas Export/Import Pipeline Riser	Full Removal 2020	Fully Removed 0.366
PL2806	Production Riser	Full Removal 2020	Fully Removed 0.325
PL2807	Gas Lift Riser	Full Removal 2020	Fully Removed 0.325

Table 2.5: Pipelines/Umbilicals & Jumpers Decommissioning			
PL Number	**Description**	**Agreed Decom Solution and Date of Removal**	**Current Status (Please state the length in kms, left in situ/removed)**
PL2808	Water Injection Riser	Full Removal 2020	Fully Removed 0.325
PLU2809	Dynamic Umbilical	Full Removal 2020	Fully Removed 0.325

2.6 Pipeline Stabilisation Features

69 Concrete mattresses were included in the approved Huntington FPSO Float-off DP, with 65 mattresses recovered to date. The remaining four mattresses currently protect disconnected flowline ends within the former FPSO 500m safety zone. To allow the Huntington FPSO Float-off Close-Out Report to be prepared, it was agreed with OPRED to track the four remaining mattresses as part of the progress reporting associated with the approved Huntington Field DP.

Table 2.6: Pipeline Stabilisation Features Decommissioning			
Description	**Agreed Decom Solution**	**Total Removed (Actual) and Date of Removal**	**Status**
Concrete Mattresses	Full Removal (69)	65 2020 (51) 2023 (14)	65 mattresses fully removed / four left in situ* for removal as part of the approved Huntington Field DP

*Mattresses were temporarily peeled back to allow for riser disconnection operations in 2020 and then moved back to the original position to protect the disconnected flowline ends. (2x mattresses were on the disconnected end of the water injection line and 2x mattresses were on the disconnected ends of the production / gas lift lines).

2.7 Detail All Variance from the Approved Decommissioning Programme

Table 2.7: Variance
No formal amendments have been made to the Huntington FPSO Float-off DP. However, following discussions with OPRED, it has been agreed that the removal of four mattresses remaining in situ at the time of writing, will be tracked as part of the Huntington Field DP activities.

2.8 Stakeholder Engagement

Table 2.8: Stakeholder Engagement
During 2020, as a result of unforeseen gas export pipeline depressurisation issues, extensive discussions took place between Premier, Altera, OPRED, the OGA (now NSTA) and the HSEx. In addition, Altera engaged with the Scottish Environmental Protection Agency (SEPA) to fast-track an EAR 2018 permit application for the Voyageur Spirit FPSO, supported by Premier. Prior to commencement of the 2022 campaign to remove the five remaining suction anchors from the Huntington Field, discussions were held with OPRED to agree an alternative end state for the suction anchors, should recovery of any of the five suction anchors prove to be unsuccessful. For the avoidance of doubt, all suction anchors have been successfully recovered. Prior to commencement of the 2023 campaign to complete the final disconnection of the Huntington infrastructure from the CATS infrastructure, discussions were held with the HSEx, NSTA and OPRED to agree the regulatory requirements for the removal of the 24" gas export spool.

3 Impact on Environment

3.1 Activities

There were two loss of primary containment cases during the riser system recovery campaign in 2020:

1. The first hydraulic fluid release happened whilst carrying out Remotely Operated Vehicle (ROV) operations to cut the risers. One of the filter housings on the ROV fractured, which resulted in the loss of Tellus 22 hydraulic fluid to sea. The ROV system was recovered to deck and the filter replaced. The capacity of the actuator is four litres, and three litres was recovered from the actuator during fluid change out, which means one litre was lost to the environment.
2. The second hydraulic fluid release came from a compensator on the ROV hydraulic skid. The total volume of Tellus 22 hydraulic fluid released to sea on that occasion was five litres. The action taken to prevent further releases, was to use surface hydraulics to function the shears. At the same time, the failed compensator was removed and blanked off, allowing continued use of the ROV hydraulic skid on the remaining compensators.

In total, six litres of hydraulic fluid (Tellus 22) were lost to the environment from the ROV, while cutting and removing risers from the seabed. It should be noted that Tellus 22 does not have a detrimental impact on the environment.

Furthermore, a pre-decommissioning environmental baseline survey was conducted during 2020, including a habitat assessment. Video and stills photography, and a full suite of grab samples were successfully acquired from eight stations.

3.2 Future Monitoring

There are no future monitoring requirements associated with the departure of the Voyageur Spirit FPSO and the removal of the associated riser and mooring systems from the Huntington field.

4 Impact on Health and Safety

4.1 Details of any Incidents / Accidents during Project Execution

There were three health and safety related incidents during project execution which are worth noting.

1. Pipework Low Temperature

To facilitate the depressurisation of the gas export pipeline, it was opened to the FPSO flare, but after two hours the operation was halted due to low temperature concerns relating to the pipework downstream of the 8.3mm restriction orifice (RO) on the blowdown route.

The Huntington export gas was very rich, resulting in significant hydrocarbon dropout during the depressurisation process. Subsequent detailed process simulation work indicated that the temperature downstream of the RO could drop to as low as -76°C.

The pipework immediately downstream of the RO was rated at -101°C, but there was a piping spec change a few meters downstream of the RO, which had a minimum temperature of -46°C, which included the flare knock-out drum, so hence the concern.

Following extensive engagement between Premier, Altera, OPRED, the OGA (now NSTA) and the HSEx, an alternative depressurisation route was selected, utilising the heat-traced gas import pipework with a 1.2mm RO. Although it took significantly longer, this allowed the gas export pipeline to be depressurised safely.

2. Dropped Object

During the recovery of a flexible riser section, whilst the riser load was being lifted over the vessel deck, the rigging between the dead man anchor (DMA) and the riser parted, allowing the riser section to fall approximately 1m to deck. The failure occurred at the point where the soft slings rigging came in contact with the DMA. The swaying of the load created friction contact between the DMA and the soft lifting slings, resulting in chaffing and subsequent failure of the slings.

The lifting arrangement was subsequently modified to use wire rope slings rather than soft slings.

3. Near Miss

During the recovery of mooring line 12, the tension rose unexpectedly. This was due to a layout drawing error, which showed mooring line 12 connected to suction anchor 12-L rather than 12-X. The layout drawing was updated and the recovery of mooring line 12 was safely completed.

5 Waste

Table 5.1: Materials/Waste Returned to Shore[3]				
Material/Waste	**Total Weight (Te) – as per the approved DP**	**Tonnage In situ**	**Tonnage to shore (including date)**	**Disposal Method**
Steel	185.8	0.0	202.8 (2020) 726.1 (2022)	Recycled Recycled

[3] Harbour-owned installations and pipelines only, including the five suction anchors which were transferred from Altera to Premier

Concrete	325.4	0.0	251.9 (2020) 27.1 (2022) 69.3 (2023)	Recycled Recycled Reuse
Plastic	165.5	0.0	177.2 (2020) 0.7 (2023)	Other Recovery[4] Reuse
Non-Ferrous	6.9	0.0	7.5 (2020)	Recycled
Hazardous (Residual hydrocarbons, chemicals)	Trace	0.0	Trace	Treatment
Radioactive waste (NORM etc.)	Trace	0.0	0.0	N/A
Other	0.0	0.0	0.0	N/A
Total	**683.6**	**0.0**	**1,462.6**	

Excluding the tonnage associated with the five suction anchors, the total tonnage to shore was 709.4 vs 683.6 in the approved DP; a marginal increase of 3.8% which can be attributed to estimating tolerances and nominal weight increases due to residual marine growth.

The waste above was processed by the following waste management facilities:

- John Lawrie Metals Limited, Greenbank Road, Tullos, Aberdeen, Authorisation number WML/N/0020154.
- K2 Polymers, Riverside Business Park, Wallsend, Authorisation number WE254204.
- EIS Waste Management Ltd, Gallowhill, Checkbar, Nigg, Aberdeen, Authorisation number WML/N/0020191.
- Miller Plant, North Mains of Findon Quarry, Findon, Aberdeen, Authorisation number WML/XS/1113160.
- Thompsons of Prudhoe, Battleship Warf, Port of Blyth.
- A J Rennie, Upper Blairmaud, Boyndie, Authorisation number WML/XC/5004701.

6 Lessons Learned

General

- At the start of 2020, the developing COVID-19 pandemic brought significant health risks and uncertainty to the project. The Huntington field ceased production on the 5th April 2020, shortly after the first nationwide lockdown came into force. Despite this, the subsea and topside flush, clean and disconnect activities commenced as planned, albeit with reduced Personnel on Board (POB) capacities on the FPSO and DSV. This demonstrated that the developing situation was managed appropriately by Altera and Subsea 7, supported by Oil & Gas UK (OGUK), now Offshore Energies UK (OEUK), and Step Change in Safety industry guidance.

FPSO

- The project experienced significant delays as a result of the gas export pipeline depressurisation issue (see Section 4.1). Over the life-of-field, only the gas export riser contents had been blown down on several occasions, so the assumption was made that depressurising the gas export pipeline volume would not cause any issues. The lesson learned is to apply similar (process) engineering assurance practices when transitioning from operations to decommissioning, as when transitioning from commissioning to operations, focusing on the activities which are non-routine.

[4] Waste to Energy

- The subsea contractor and FPSO operator appointed the same subcontractor for the subsea and topside flushing / cleaning operations, which reduced the project management interfaces and increased project execution efficiencies.
- For an FPSO development, capturing flushing returns in tanks for processing onshore can be a good option, to eliminate the risks associated with having to clean up cold flushing returns offshore (emulsions etc.).
- It is important to develop a clear NORM strategy upfront, including NORM surveys and agreement on FPSO cleanliness levels for coming off station.

Riser Cutting

- Based on experience from the Shelley decommissioning project, it was known that a controlled release and lowering of the risers would be resource intensive, put significant pressure on topside POB, and could be troublesome (release of bend stiffener connectors), with very limited potential upside to offset those challenges. In addition, there were rigid I-tube transition pieces below the hull and there was a requirement to minimise the FPSO draught. This led to development of a purpose-build ROV riser cutting solution, which allowed a diamond-wire saw to be positioned directly underneath the hull to cut through the bend stiffener connector and riser. This worked very well, leaving ~1m stubs below the hull.

Riser Recovery

- The riser recovery method of cutting subsea and recovering cut sections either individually (buoyancy sections) or in a large basket (seabed sections) was selected during the early riser recovery engineering phase. This was seen as the most optimal and cost-effective method for a vessel with two cranes (one crane could be carrying out subsea operations while the other was free to carry out deck operations as required). However, at a late stage in the project, the recovery vessel was changed to a vessel with a single crane, and during offshore execution it became clear that the significant labour-intensive deck operation of handling the scrap riser sections associated with this method was far from ideal. For a single-crane vessel, the option of recovery through a tensioner and cut on deck may have been more efficient.
- The shear cutter crimped the ends of each pipe (as predicted), restricting access for inspection. As items could not be confirmed as either NORM-contaminated or NORM-free, they had to be double-handled offshore (for bagging) and sent to a 3rd party onshore for further testing, before being sent to the waste contractor, which were extra steps. As expected, all recovered infrastructure was NORM-free, therefore the extra steps and associated cost proved to be unnecessary. A better understanding of NORM testing requirements and development of an upfront testing philosophy agreed between all parties, could have avoided some, if not all, of the extra handling.

Mooring System Recovery

- Altera owned, and were responsible for, the FPSO mooring system. During the installation of the suction anchors in 2011, one suction anchor could not be installed successfully, which led to the installation of a 14th suction anchor. When it came to removing the suction anchors in 2021, only nine out of the 14 suctions anchors could be removed by Altera. The scope of removing the remaining five suction anchors in 2022 was transferred to Harbour, and by using higher capacity pumps, four out of the five suction anchors could be removed. The fifth anchor required external excavation and side-pulling to remove it.

7 Cost Summary

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

8 Photographs

Riser Cut in Progress



Completed Riser Cut



FPSO on Tow



FPSO in Kishorn Dock

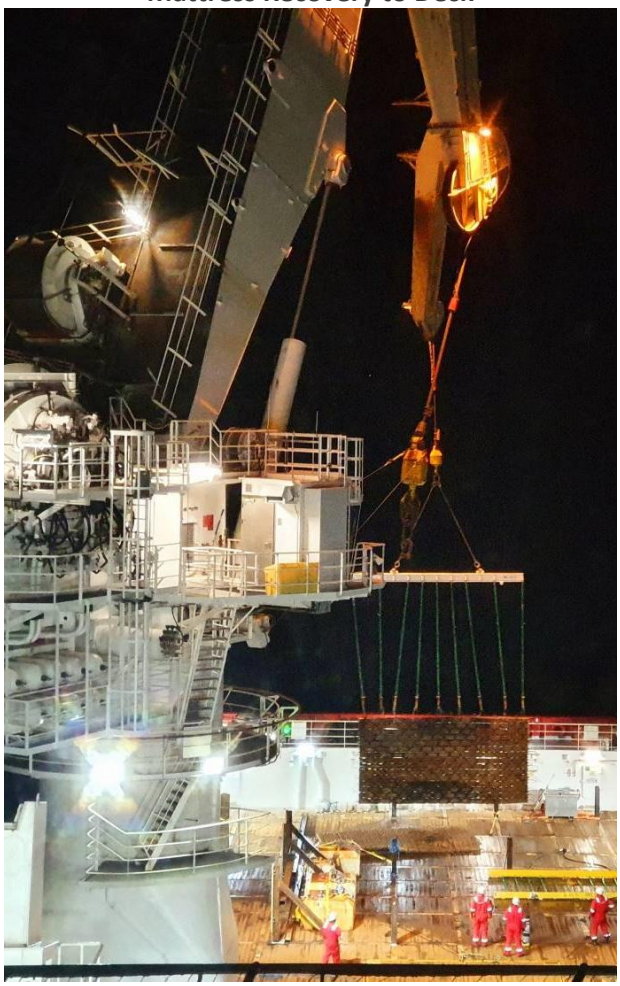


Mattress Recovery with ROV

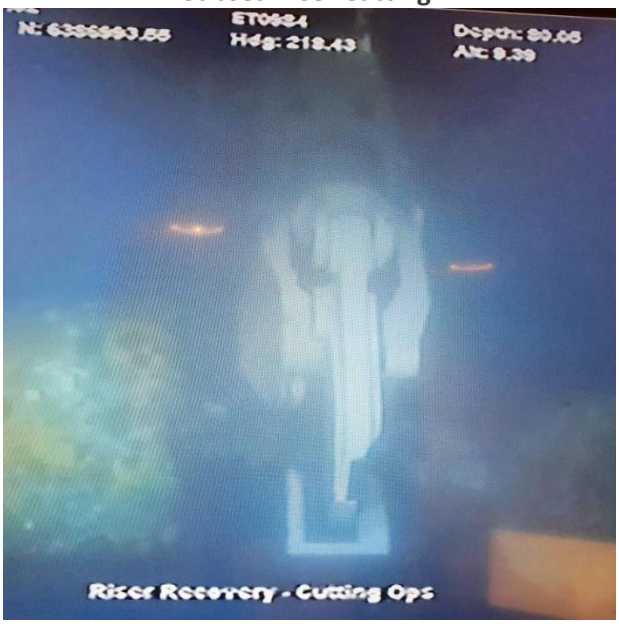




Mattress Recovery to Deck



Subsea Riser Cutting



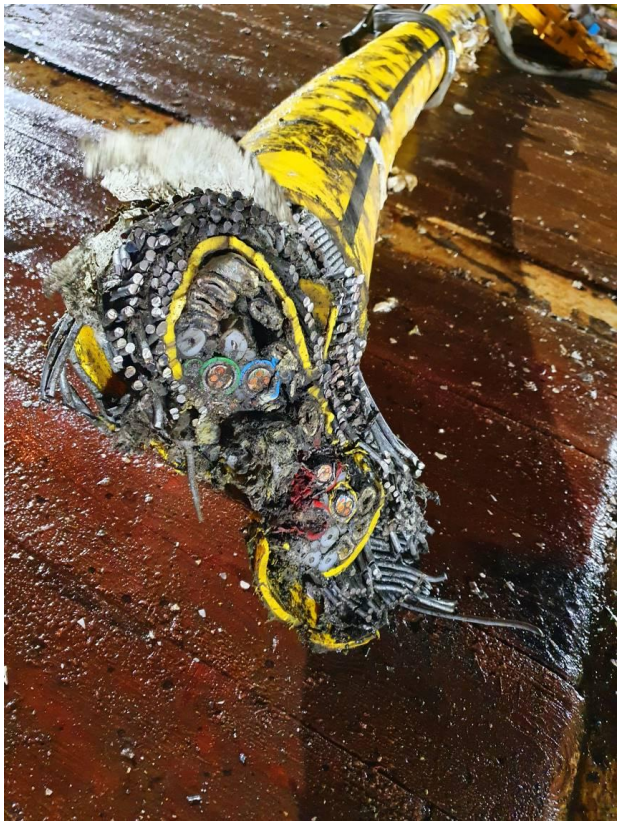
Crimped Shear Cut



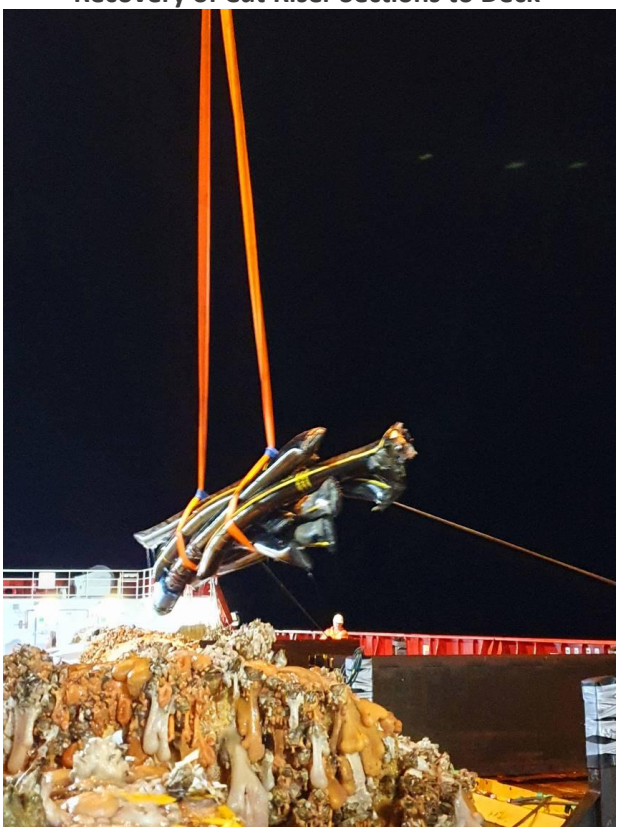
Diamond Wire Cut



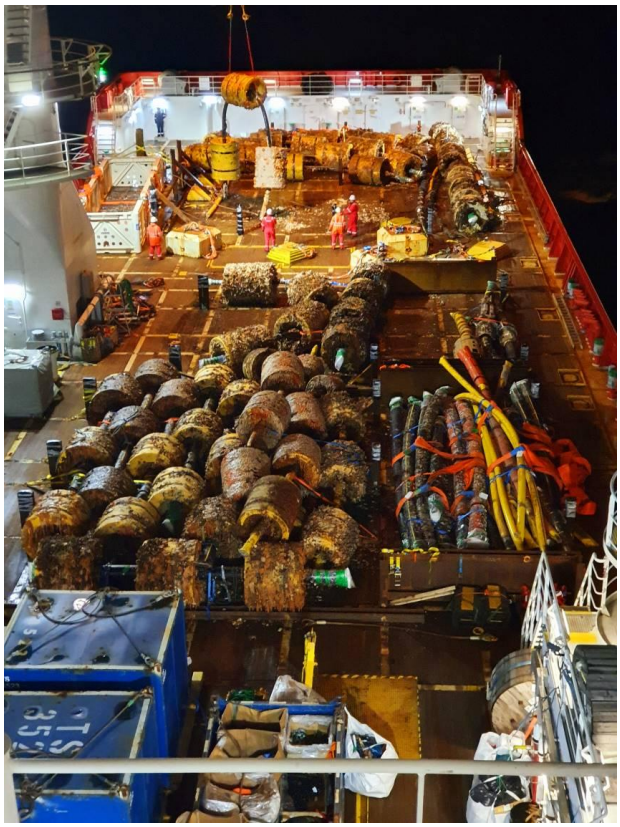
Shear Cut



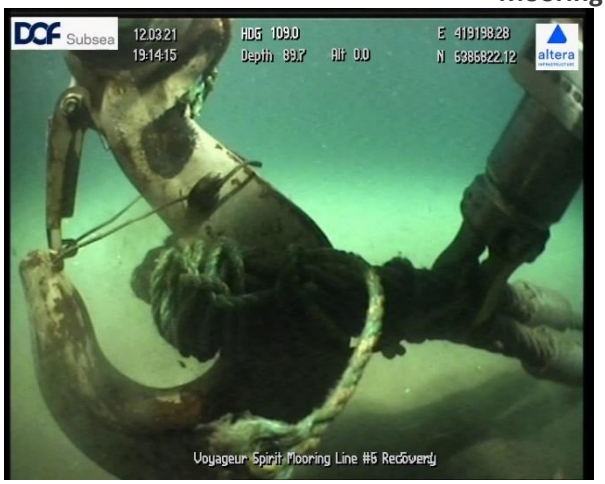
Recovery of Cut Riser Sections to Deck

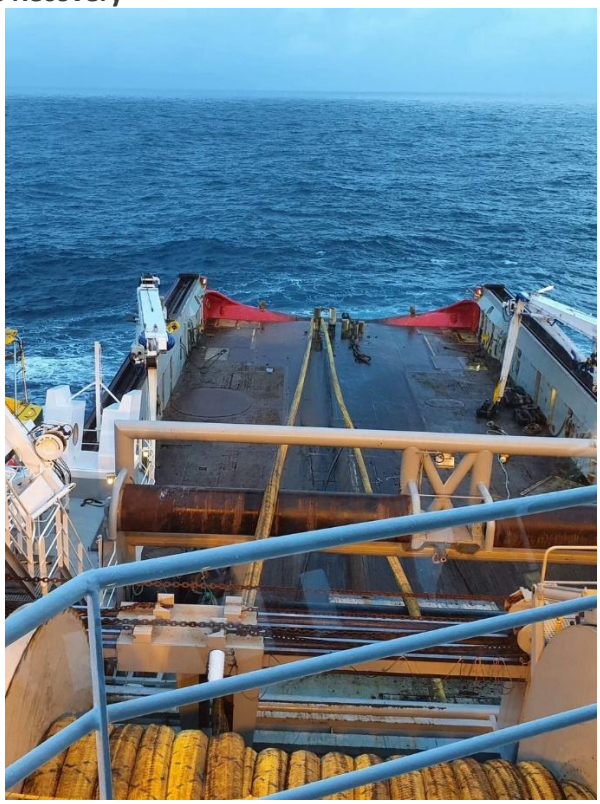


Recovered Risers on Deck

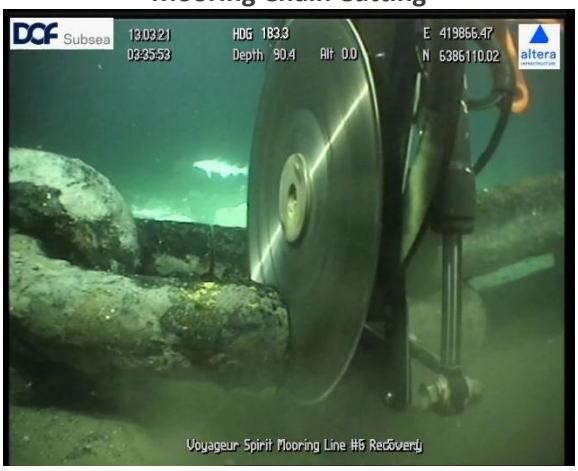


Mooring Line Recovery





Mooring Chain Cutting



Suction Anchor Pumping Tool



Suction Anchor Recovery





Suction Anchors on Deck



Suction Anchor Rigging Disconnection

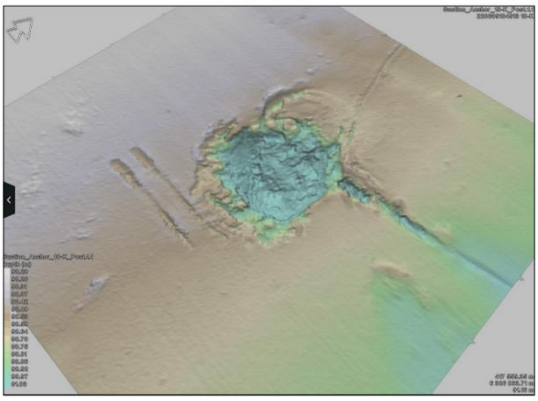


Mattresses on Deck

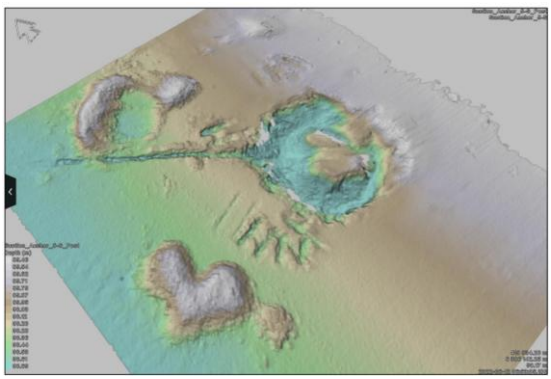




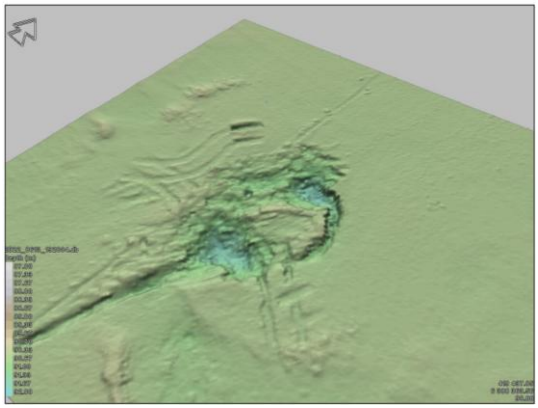
Seabed survey (2022) post suction anchor dredging and removal



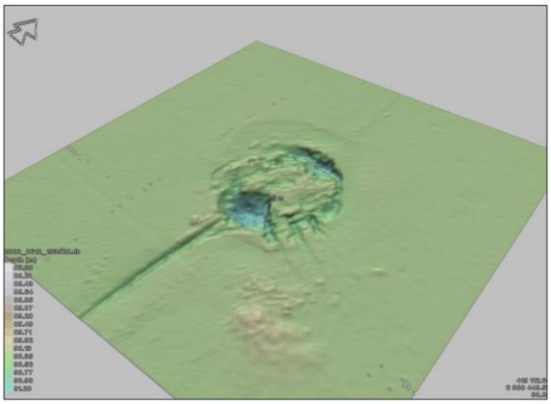
Suction Anchor 10-K



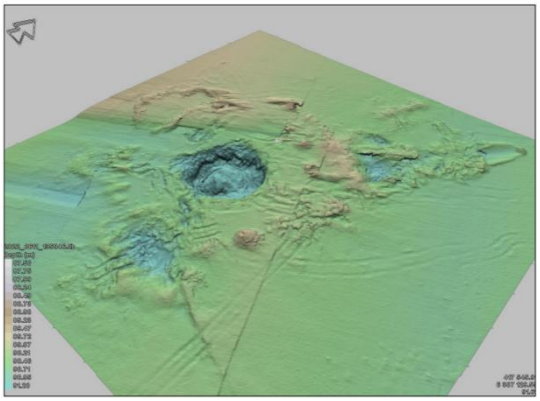
Suction Anchor 5-S



Suction Anchor 4-R



Suction Anchor 2-O



Suction Anchor 12-L

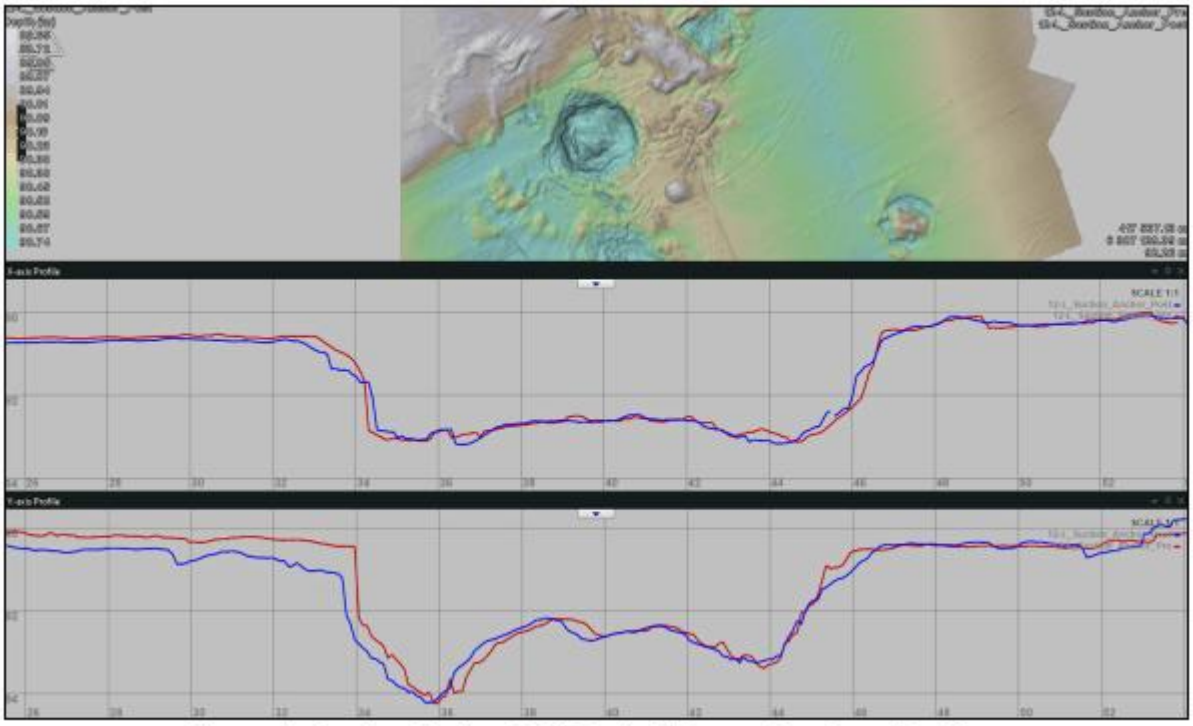
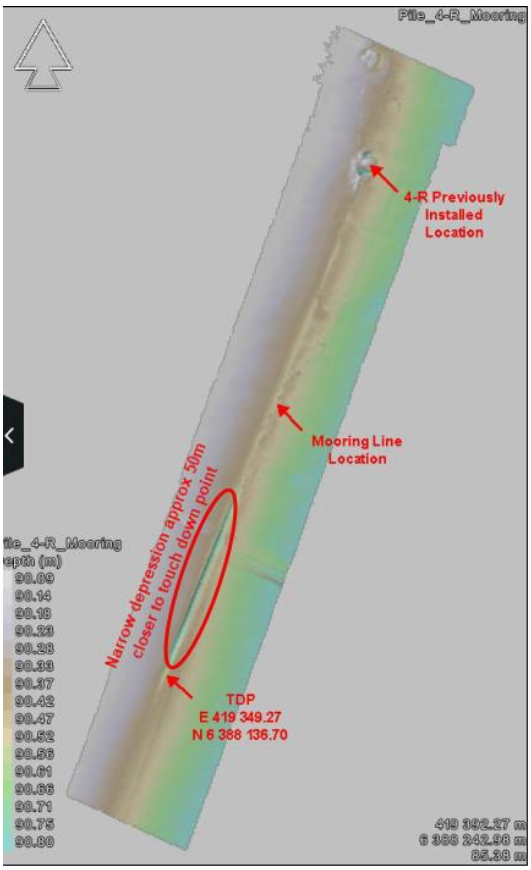


Figure 5: Suction Anchor 12-L Seabed Depression Cross Profiles

Seabed survey (2022) post mooring line removal



4-R Mooring Line DTM Overview

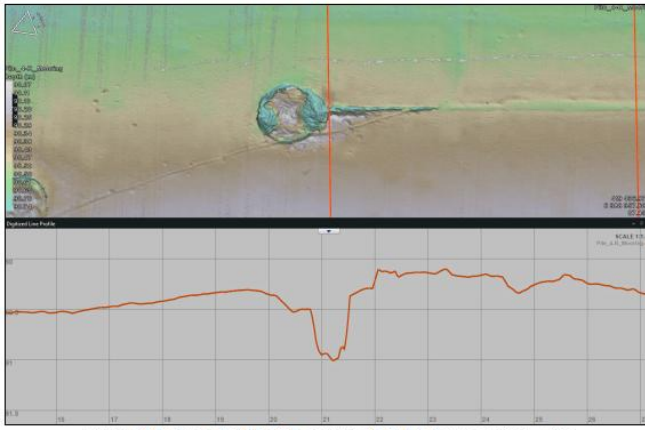


Figure 12: Cross Profile Adjacent to 4-R Anchor Location – 0m

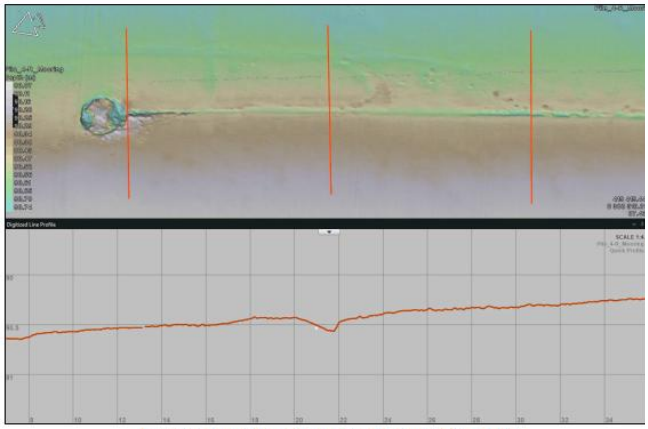
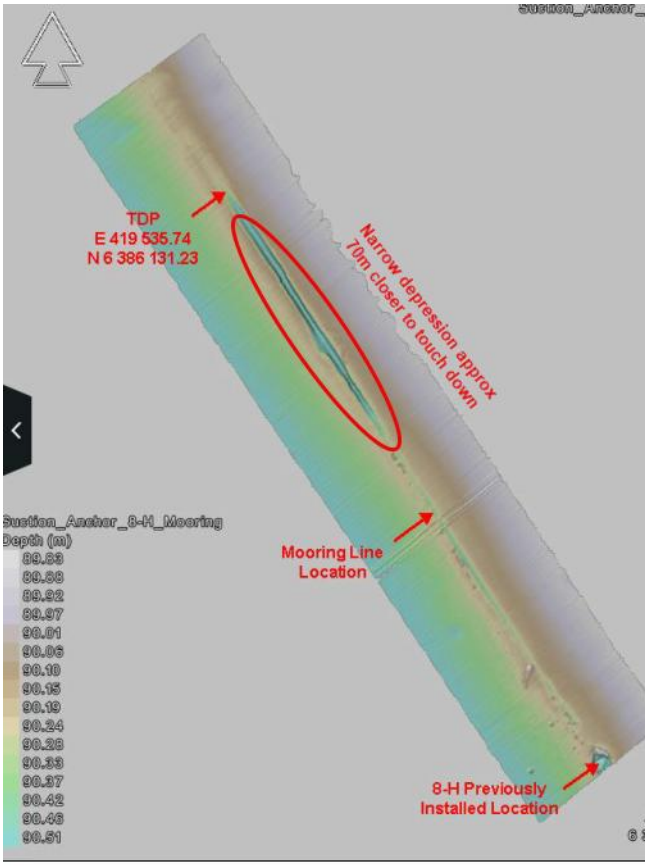


Figure 13: 4-R Mooring Line Cross Profile - 50m



8-H Mooring Line DTM Overview

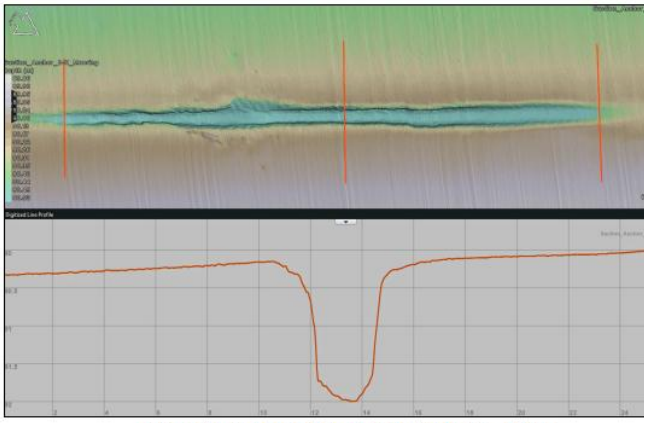


Figure 24: 8-H Mooring Line Cross Profile - 200m

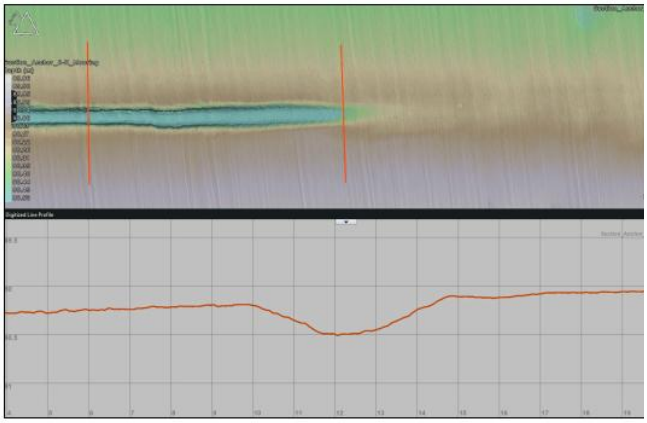


Figure 25: 8-H Mooring Line Cross Profile - 240m