

# BRAE AREA

## BRAE BRAVO TOPSIDES, FLARE BRIDGE, FLARE TOWER & FLARE JACKET

### Decommissioning Close Out Report



August 2023 – Revision 03

9010-TAQ-99-PM-RP-00005-000



## DOCUMENT CONTROL

### Approvals

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### Revision Control

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1	First Draft		January 2023
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## ABBREVIATIONS

Abbreviation	Explanation
AFOD	AF Offshore Decommissioning
CO <sub>2</sub>	Carbon Dioxide
DP	Decommissioning Programme
EPRD	Engineering, Preparation, Removal & Disposal
GHG	Greenhouse Gas
HAF	Heerema and AFOD Consortium
HSE	Health and Safety Executive
MMS	Materials Management Strategy
MSF	Module Support Frame
NSTA	North Sea Transition Authority (Formerly the OGA)
OGA	Oil and Gas Authority
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
P&A	Plug and Abandon
ROV	Remotely Operated Vehicle
SEPA	Scottish Environmental Protection Agency
SSCV	Semi Submersible Crane Vessel
TAQA	TAQA Bratani Ltd
WBS	Work Breakdown Structure

# 1 Summary

## 1.1 Decommissioning Programme

The Brae Bravo installation was located in United Kingdom Continental Shelf (UKCS) Block 16/7a in the Central North Sea approximately 269km north-east of Aberdeen.

The Brae Bravo platform facilities included modular topsides and a steel jacket/sub-structure. The platform flare consisted of a second steel jacket/sub-structure, the flare tower and a steel connecting bridge to the Brae Bravo platform.

The scope of the facilities covered by this close out report is shown in blue in [Figure 1.1](#). The location of Brae Bravo in relation to the other installations in the Brae Area is shown in [Figure 1-2](#).

Cessation of production (CoP) was agreed by the Oil and Gas Authority (OGA), which has since been renamed as the North Sea Transition Authority (NSTA), in 2016 with production formally ceasing in July 2019.

The Decommissioning Programme (DP) was formally approved by Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) on 15 August 2018. (See [OPRED website](#)).

Removal and disposal of the Upper Main Platform Jacket is covered by a separate DP and is therefore not detailed within this document.

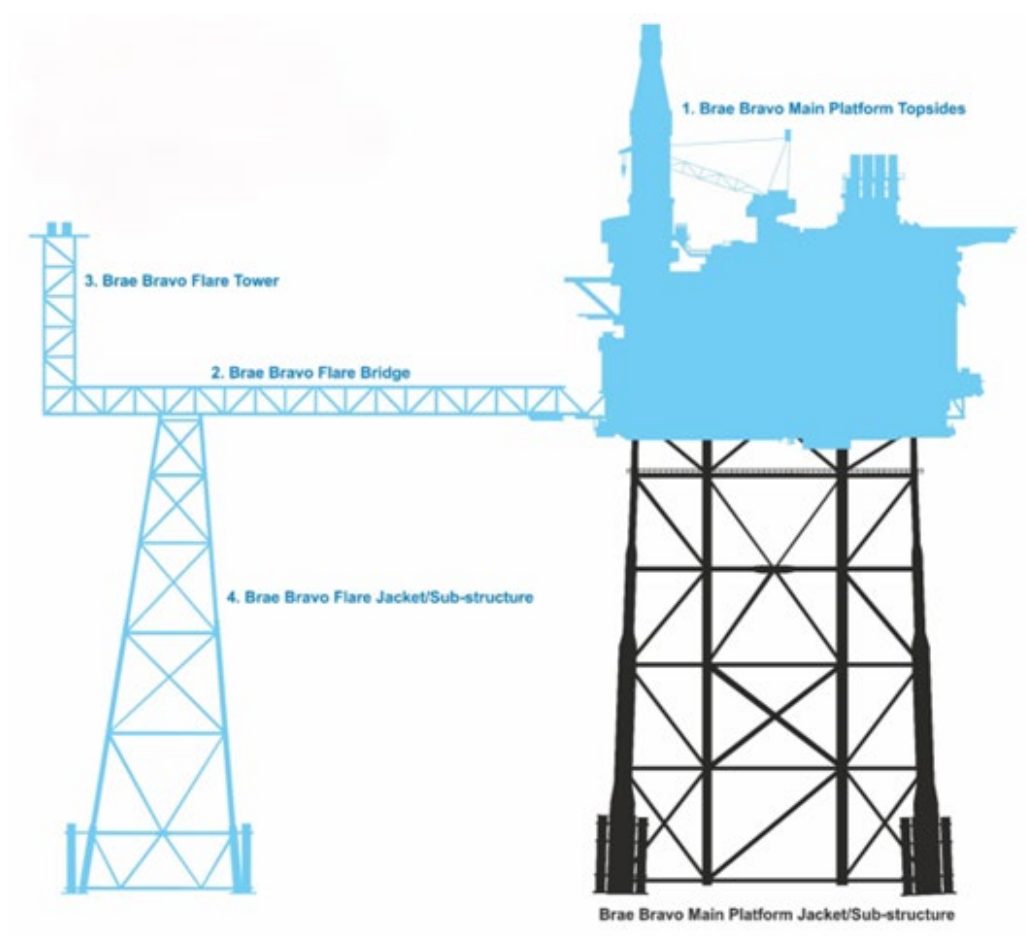


Figure 1-1: Brae Bravo Facilities

Table 1.1: Overview of the Decommissioned Installation(s) in the approved DP		
Installation Type	Number	Weight (tonnes)
Fixed Large Steel Platform (Topsides)	1	35,000
Flare Bridge & Flare Tower	1	1,200
Fixed Small Steel Jacket (Flare)	1	1,550
Subsea Installation Type		
There are no subsea installations associated with this DP		

Table 1.2: Overview of the Decommissioned Pipelines and Umbilicals in the approved DP	
Number of Pipelines	There are no pipelines or umbilicals associated with this DP
Number of Umbilicals	
Total km of Pipelines & Umbilicals	
Total km of Pipelines & Umbilicals left in situ	



**Table 1.3: Overview of the Stabilisation Features in the approved DP**

Type	Number
Concrete Mattresses	There are no stabilisation features associated with this DP
Grout Bags	
Sandbags	

**Table 1.4: Overview of the Wells in the approved DP**

Type	Number
Wells (Platform)	28
Wells (Subsea)	N/A
Appraisal Well	N/A

**Table 1.5: Overview of the Drill Cuttings in the approved DP**

Number of Piles & Volume (m <sup>3</sup> )	N/A
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**Table 1.6: Summary of the Approved Decommissioning Options in the approved DP**

Type	Selected Option
Topsides	Complete removal of the Brae Bravo topsides, flare bridge and flare tower for reuse, recycling, or appropriate disposal.
Substructure (Flare Jacket)	Complete removal of the Brae Bravo flare jacket/sub-structure for recycling and appropriate disposal.
Subsea Installation(s)	N/A
Pipelines, Flowlines & Umbilicals	N/A
Stabilisation Features	N/A
Wells	The barrier placement and verification of the Brae Bravo wells were designed to meet the requirements outlined in the Marathon Oil Well Abandonment Standard (WODCMS-ST-ROMS-WODC-WAS-0001) and with reference to the Oil and Gas UK Guidelines for Decommissioning of Wells. ( <i>Well Decommissioning Guidelines, Issue 6, Oil and Gas UK, June 2018</i> ). Any dispensations from the standards were approved with the appropriate risk assessment to demonstrate that risks are ALARP. (As Low As Reasonably Practicable)
Drill Cuttings	N/A

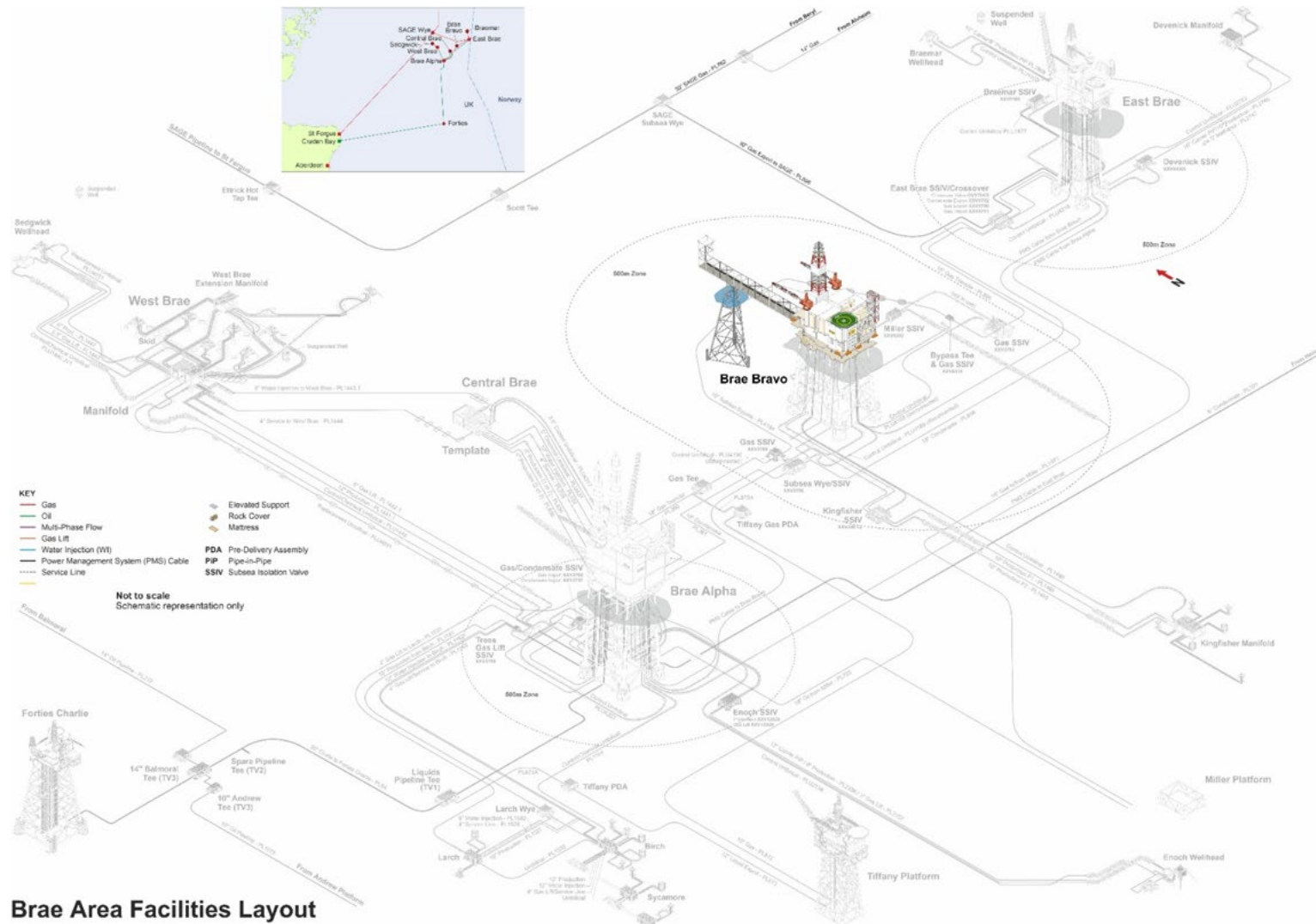
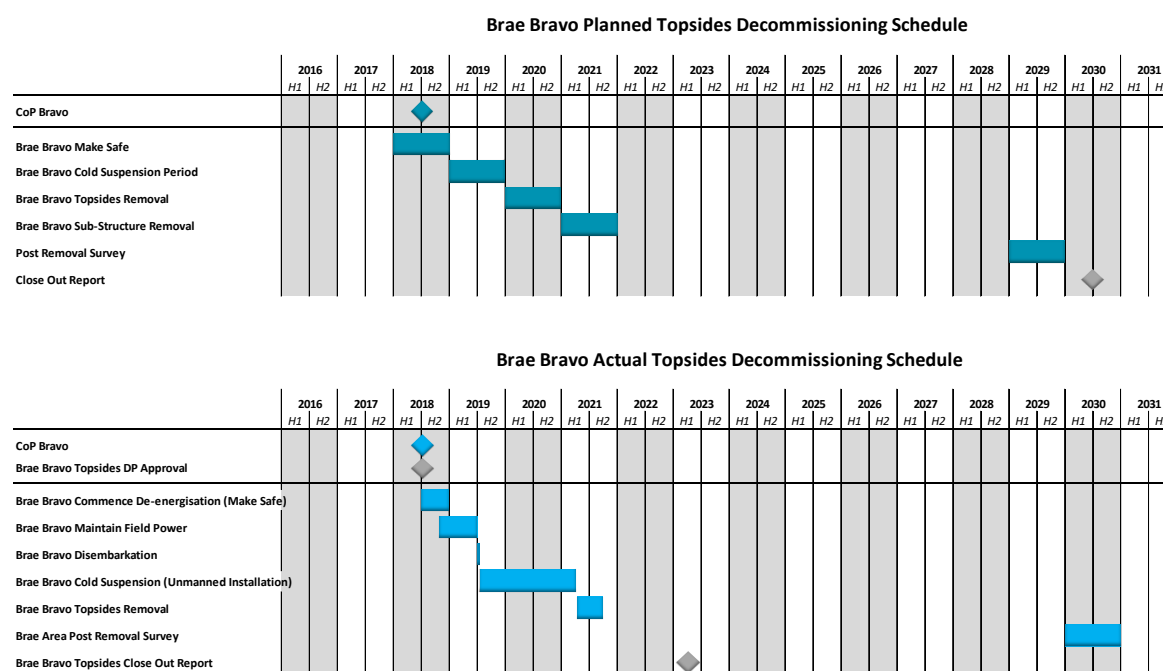


Figure 1-2: Decommissioned Installation

## 1.2 Project Delivery against the Approved Schedule



**Figure 1-3: Comparison of Planned vs Actual Decommissioning Schedules**

Figure 1.3, shows the originally intended schedule for decommissioning of the Brae Bravo compared to the actual schedule. The difference is due to the decision to delay make safe activities on Brae Bravo allowing power generation demand for the rest of the Brae Area to be maintained. Subsequently, following a review of available resources, and in full compliance of the executed contract, the decision was taken to delay the removal activities a further 12 months to 2021.

## 1.3 Project Overview

TAQA awarded the contract to a consortium of Heerema Marine Contractors and AF Offshore Decommissioning (AFOD)(HAF) for the engineering, preparation, removal, and disposal (EPRD) of the Brae Bravo topsides, flare bridge, flare tower and flare jacket. The modules were removed by reverse installation using the semi-submersible crane vessels (SSCVs), Thialf and Sleipnir.

There were two campaigns to remove the topsides modules and flare structures:

- Campaign 1: April/May 2021
  - Topsides preparation and removal of the helideck and platform crane by SSCV Thialf.
  - Preparation and removal of the flare bridge, flare tower and flare jacket by SSCV Sleipnir.
  - Transfer to Vats, a dismantling yard in Norway.
- Campaign 2: July/August 2021
  - SSCV Sleipnir Trip 1 – main jacket cutting, preparation and removal of west modules including the west side of the MSF.
  - SSCV Sleipnir Trip 2 – main jacket cutting, preparation and removal of remaining modules including the east side of the MSF.
  - Transfer to Vats, Norway to unload at dismantling yard.

The modules were dismantled at the AF Decom Environmental Base at Vats, Norway before onward transfer for further processing, disposal or to the smelter. The steel which was sent for reprocessing accounted for approximately 84% of the overall weight.

## 1.4 Associated Decommissioning Approvals

Table 1.7: Associated Decommissioning Approvals	
Platform Well Plug and Abandonment (P&A)	<p>Phase 1 – (Plug &amp; Lubricate) was approved under WIA/440 and was completed in 2017.</p> <p>Phase 2 (Plug &amp; Abandonment) and Phase 3 (Conductor and Wellhead Removal) was approved under WIA/433. The P&amp;A campaign and conductor removal was completed during 2018.</p> <p>* WIA = Well Intervention Application</p>
Topsides Preparation	<p>De-energisation and disembarkation of the platform were covered in the following permits:</p> <ul style="list-style-type: none"> <li>• Chemical Permit PRA71/CP/80/16</li> <li>• Chemical Permit DCA/132/CP/2544</li> <li>• Oil Discharge Permit PRA71/OLP/14/12</li> <li>• Oil Discharge Permit DCA/132OTP/607</li> <li>• Oil Discharge Permit DCA/132/OTP/1083</li> </ul> <p>The Safety Case Material Change for the Disembarkation and the Unattended Installation phase was accepted on the 7<sup>th</sup> of June 2019.</p> <p>*DCA = Decommissioning Application          *OLP = Oil Life Permit          *OTP = Oil Term Permit          *PRA = Production Operations Application</p>
Topside Removal	<p>The Brae Bravo Topsides DP was approved by OPRED in August 2018</p> <p>The following permits were granted for the topsides removal:</p> <ul style="list-style-type: none"> <li>• Marine Licence DCA/132/ML/671</li> <li>• Consent to Locate DCA/132/CL/1169</li> </ul> <p>The Topsides Dismantlement Safety Case was accepted on 23<sup>rd</sup> March 2021.</p>
Pipeline Works Authorisation (PWA)	<p>The following consents were granted during the duration of the project to account for the pipeline modifications:</p> <ul style="list-style-type: none"> <li>• PL360 – 157/V/18</li> <li>• PL360A – 160/V/21, 103/V/22</li> <li>• PL361 – 256/V/18, 158/V/20</li> <li>• PL361A – 162/V/21, 104/V/22</li> <li>• PL895 – 254/V/17, 303/V/18, 158/V/21, 286/V/22</li> <li>• PL1488 – 10/V/21, 209/V/22</li> <li>• PL1971 – 9/V/21</li> </ul>

## 2 Decommissioning Activities

### 2.1 Contracts Awarded

The key contractors utilised during the execution of the decommissioning programme are listed in Table 2.1.

Table 2.1: Contracts Awarded		
Contractor	Service	Date of Award
HAF Consortium	Brae Bravo Engineering, Preparation, Removal & Disposal (EPRD)	September 2018
Risktec	Hazard Identification (HAZID) support	October 2018
ESR Technology Limited	Specialist support with safety cases and associated studies	November 2018
Orga	Provision of navigational aids	March 2019
Lloyds Offshore Consultancy	Provision of Marine Warranty Surveyor (MWS) services	June 2019
ABB Limited	Specialist engineering support for dismantling	January 2020
Lloyds	Independent Verification	July 2020
Kent (Formerly Atkins)	Specialist structural engineering support	September 2020
Xodus	Nesting bird survey and assessment	January 2021
Ove Arup	Quality Assurance (QA) services	February 2021
Rosen	Specialist engineering support for assurance, welding, materials, and Non-Destructive Testing (NDT).	March 2021
Vroon	Emergency Response and Rescue Vessel (ERRV) for preparation and removal	March 2021
D3 Consulting	Disposal Site Representatives	July 2021

### 2.2 Platform Operations

The dates that key milestones were achieved during execution of the decommissioning programme are listed in Table 2.2.

Table 2.2: Platform Decommissioning	
Activity	Date
Completion of Plug and Abandonment (P&A) of platform wells	Nov 2018
Isolation of Subsea Tie-Back (Kingfisher)	July 2018
Completion of De-energisation and Disembarkation (D&D)	July 2019
End of Unmanned Period	April 2021
Commencement of Topsides Removals (Campaign 1)	April 2021
Commencement of Dismantling, Disposal & Recycling	May 2021

**Table 2.2: Platform Decommissioning**

Activity	Date
Completion of Topsides Removals (Campaign 1)	June 2021
Commencement of Topsides Removals (Campaign 2)	July 2021
Completion of Topsides Removals (Campaign 2)	July 2021
Completion of Dismantling, Disposal & Recycling	February 2023

## 2.3 Well Decommissioning

The status and date of abandonment of the platform wells are listed in Table 2.3.

**Table 2.3: Well Decommissioning**

Well	Designation	Status & Date of Abandonment	Abandonment Category
Platform Wells (Brae Bravo)			
16/07a-B01 (North Brae)	Gas Condensate Producer	WDP3 25/02/18	PL 0-0-0
16/07a-B02 (North Brae)	Gas Condensate Producer	WDP3 03/08/18	PL 0-0-0
16/07a-B03 (North Brae)	Gas Condensate Producer	WDP3 20/03/18	PL 0-0-0
16/07a-B04 (North Brae)	Gas Condensate Producer	WDP3 01/07/18	PL 0-0-0
16/07a-B05 (North Brae)	Gas Condensate Producer	WDP3 07/10/18	PL 0-0-0
16/07a-B06 (North Brae)	Gas Condensate Producer	WDP3 07/07/18	PL 0-0-0
16/07a-B08 (North Brae)	Gas Injector	WDP3 21/07/18	PL 0-0-0
16/07a-B09 (North Brae)	Gas Condensate Producer	WDP3 10/03/18	PL 0-0-0
16/07a-B15 (North Brae)	Gas Condensate Producer	WDP3 27/09/18	PL 0-0-0
16/07a-B16Z (North Brae)	Gas Condensate Producer	WDP3 11/09/18	PL 0-0-0
16/07a-B17 (North Brae)	Gas Condensate Producer	WDP3 21/10/18	PL 0-0-0

**Table 2.3: Well Decommissioning**

Well	Designation	Status & Date of Abandonment	Abandonment Category
16/07a-B18 (North Brae)	Gas Condensate Producer	WDP3 05/11/18	PL 0-0-0
16/07a-B19 (North Brae)	Not Completed	WDP3 17/11/18	PL 0-0-0
16/07a-B20 (North Brae)	Oil and Gas Condensate Producer	WDP3 09/06/18	PL 0-0-0
16/07a-B21 (Beinn)	Oil and Gas Condensate Producer	WDP3 21/06/18	PL 0-0-0
16/07a-B22 (North Brae)	Oil and Gas Condensate Producer	WDP3 17/06/18	PL 0-0-0
16/07a-B23Z (Beinn)	Gas Condensate Producer	WDP3 25/04/18	PL 0-0-0
16/07a-B24 (Central)	Oil Producer	WDP3 12/12/18	PL 0-0-0
16/07a-B25 (North Brae)	Gas Condensate Producer	WDP3 16/07/18	PL 0-0-0
16/07a-B26 (North Brae)	Gas Condensate Producer	WDP3 27/07/18	PL 0-0-0
16/07a-B27 (North Brae)	Gas Condensate Producer	WDP3 26/08/18	PL 0-0-0
16/07a-B29 (North Brae)	Gas Condensate Producer	WDP3 09/08/18	PL 0-0-0
16/07a-B30 (Beinn)	Gas Condensate Producer	WDP3 14/04/18	PL 0-0-0
16/07a-B31Z (Central)	Oil Producer	WDP3 30/05/18	PL 0-0-0
16/07a-B32 (North Brae)	Not Completed	WDP3 16/08/18	PL 0-0-0
16/07a-B33 (Beinn)	Gas Condensate Producer	WDP3 24/11/18	PL 0-0-0
16/07a-B34 (North Brae)	Gas Condensate Producer	WDP3 27/03/18	PL 0-0-0
16/07a-B35 (Beinn)	Not Completed	WDP3 04/09/18	PL 0-0-0

## 2.4 Subsea Installations

**Table 2.4: Subsea Installations Decommissioning**

There are no subsea installations associated with this DP

## 2.5 Pipelines/Umbilicals & Jumpers

**Table 2.5: Pipelines / Umbilicals and Jumpers Decommissioning**

There are no pipelines or umbilicals associated with this DP

## 2.6 Pipeline Stabilisation Features

**Table 2.6: Pipeline Stabilisation Features Decommissioning**

There are no pipeline stabilisation features associated with this DP

## 2.7 Drill Cuttings

**Table 2.7: Drill Cuttings Decommissioning**

There are no drill cuttings associated with this DP

## 2.8 Results of Post Decommissioning & Environmental Surveys & Debris Clearance

**Table 2.8: Environmental Surveys & Debris Clearance**

Remotely Operated Vehicle (ROV) footage was reviewed following the removal of the flare jacket. This indicated clean indents in the seabed following structural pile retrieval with no evidence of seabed disturbance in the surrounding area.

On completion of the wider Brae Area decommissioning activities, a post-decommissioning survey will be conducted within a 500m radius of the Brae Bravo installation, the results of which will be shared within future Brae Area close out reports.



## 2.9 Stakeholder Engagement

**Table 2.9: Stakeholder Engagement**

The Brae Bravo Operator consulted a wide range of interested parties during the decommissioning planning stages, preparation of the comparative assessments and environmental statements, and compilation of the decommissioning programmes. These included:

- OPRED Environmental Management Team
- OPRED Offshore Decommissioning Unit
- Greenpeace
- HSE
- JNCC (Joint Nature Conservation Committee)
- Marine Conservation Society
- Marine Scotland
- National Federation of Fishermen's Organisations
- Oil and Gas Authority
- OSPAR (Oslo/Paris Convention)
- SEPA (Scottish Environment Protection Authority)
- SFF (Scottish Fishermen's Federation)
- WWF

Information regarding decommissioning of the Brae Area is also available to other interested parties and the general public via the Decommissioning page on TAQA UK's website:

<https://eu.taqa.com/decommissioning/>

TAQA continued to provide regular updates and engage with the regulators during the offshore project execute phase and onto the onshore dismantling and final processing of the Brae Bravo topsides.

This included:

- HSE
- OPRED – Offshore Decommissioning Unit (ODU), Environment Management Team (EMT), Inspectorate
- NSTA (formally OGA)
- SEPA (Scottish Environmental Protection Agency)
- Media releases

## 3 Impact on Environment

### 3.1 Activities

There were two environmental incidents that occurred during the removal of the Brae Bravo topsides:

- Unpermitted deployment of a wave rider buoy – On 18 April 2021, a wave rider buoy was deployed by the Bylgia Tug supporting the SSCV Thialf during the preparation phase for the topsides removal. The purpose of the buoy was to monitor the environmental conditions. Notice was not given for the deployment of the buoy preventing TAQA being able to have a required Marine Licence in place. TAQA ensured all notifications to mariners were made to inform them of the location of the buoy and a retrospective Marine Licence applied for and subsequently approved on 10 May 2022.

This incident has been captured in the project's lessons learned register and is now part of the Permits, Licences, Authorisations, Notifications and Consents (PLANC) register for future decommissioning projects to ensure the requirement for a permit is communicated to the EPRD contractors and that a Marine Licence is applied for prior to deployment.

- A section of the platform identification sign was dislodged and fell to the seabed – On 18 July 2021, a section of the aluminium platform identification sign became dislodged during the lifting operations and fell into the sea and sank to the seabed within the 500 m safety zone. The section was approximately 4 m x 0.3 m x 0.004 m and weighed 15 kg. An ROV survey was unable to locate the sign, however this area will be surveyed again following completion of the Brae Area decommissioning campaign and oilfield related debris will be retrieved where possible.

All other emissions and discharges remained within permitted limits and there were no spills to sea.

Ongoing logs of seabird activity on and surrounding the platform were kept during the preparation and removal phases of the topsides to ensure compliance with the Wild Birds Directive. There continued to be no evidence of nesting bird activity on the platform.

### 3.2 Greenhouse Gas Emissions

TAQA has developed an Emissions Management Strategy which details how TAQA will support the UK government's commitment to achieve net zero Greenhouse Gas (GHG) emissions by 2050 and the Scottish government's target of 2045, through aligning with the NSTA's Stewardship Expectation 11 (Net Zero) and demonstrating that being an environmentally responsible operator is part of our licence to operate.

Net zero means that the UK's total GHG emissions would be equal to or less than the emissions the UK removed from the environment. This can be achieved by a combination of emission removal, emission reduction, and offsetting.

TAQA is a responsible asset steward and already aims to use energy as efficiently as possible under the constraints of the current asset set.

Atmospheric emissions associated with decommissioning activities are however inevitable. TAQA is dedicated to minimising greenhouse gas emissions from decommissioning operations, as far as is

reasonably practicable for each project. TAQA is committed to working with the supply chain and joint ventures as part of meeting these commitments. Atmospheric emissions are an element of the assessment process when determining removal scopes and a focus area for tender reviews. For example, Heerema (part of the HAF consortium) are Climate Neutral Certified and invest in carbon offsetting projects. More information can be found on their website:

<https://www.heerema.com/sustainability>

With future decommissioning projects in mind, TAQA assessed the emissions associated with the Brae Bravo topsides removal project. This assessment will act as a baseline and help set expectations for future projects.

Clear boundaries and assumptions have been documented for the scope of the emissions assessment to allow replication and comparison with future decommissioning projects.

The scope encompassed the following elements:

- Emissions associated with the processing of new steel for the installation of lift points
- SSCV fuel use while in the 500m zone
- Support vessel fuel use
- SSCV fuel use during transit to and from the dismantling yard
- Helicopter travel offshore during SSCV activities
- TAQA site reps to and from dismantling yard
- Dismantling machinery and equipment at dismantling yard
- Road transportation from dismantling yard to the initial processing/disposal sites
- Sea transportation from dismantling yard to the smelter
- Smelting
- Ancillary transport to the dismantling yard for meetings, etc.

The results from the assessment show a total of approximately 17,000 tonnes of CO<sub>2</sub> (Carbon Dioxide) can be attributed to the Brae Bravo topsides, flare bridge, flare tower and flare jacket decommissioning project.<sup>1</sup> This equates to approximately 6% of the average annual platform CO<sub>2</sub> emissions during previous normal platform operating mode.

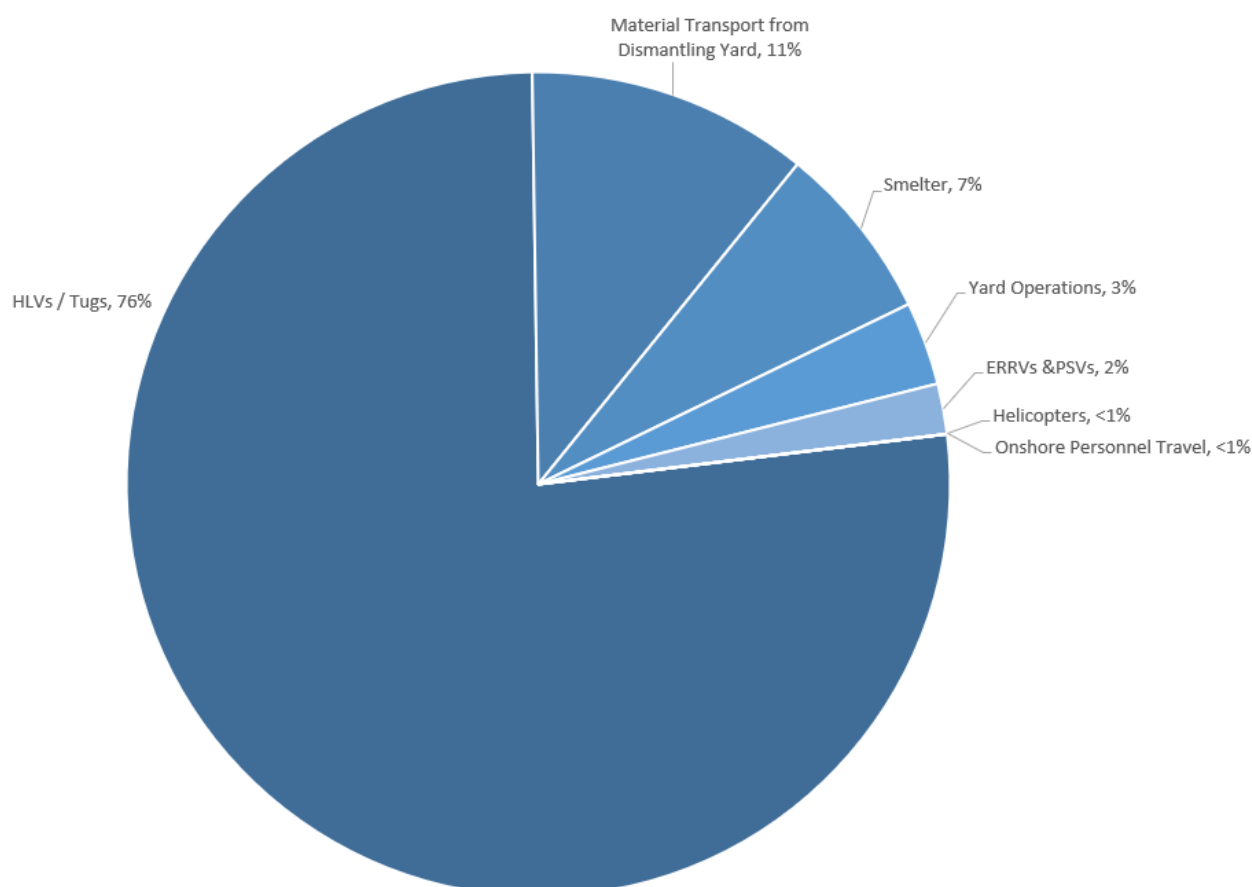
Taking the total mass of material returned to shore and processed (taking into account all the elements listed above), this produced a rate of 0.5 tonnes CO<sub>2</sub> per tonne of material decommissioned. (This compares to the Institute of Petroleum Standard\* of 1.889 tonnes CO<sub>2</sub>/tonne material processed which would be emitted to manufacture the equivalent mass of new steel).

\* Guidelines for the Calculation of Estimates of Energy Use and Gaseous Emissions in the Decommissioning of Offshore Structures. Institute of Petroleum, 2000.

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<sup>1</sup> This figure does not take into account any carbon offsetting.

Figure 3.1 below shows the contributing sources to the overall total of CO<sub>2</sub>.



**Figure 3-1: Sources of CO<sub>2</sub>**

Over the course of the Brae Bravo topsides removal project the following emission reduction opportunities were realised:

- Approximately two thirds of the fuel usage by the SSCV Sleipnir was liquified natural gas (LNG) which results in less GHG emissions than traditional fuel oil
- The smelter is located in northern Norway and is supplied by hydro-electric power. (Note. If processed at a non-hydro powered smelting plant, this value would have been typically an order of magnitude greater)
- The primary power source at the Vats dismantling yard is hydro-electric
- Road haulage was reduced by the use of barges to transfer the large quantities of steel directly from the yard to the smelter by sea

### 3.3 Future Monitoring

Following completion of the wider Brae Area decommissioning activities, TAQA will carry out a post decommissioning environmental seabed survey. The survey will focus on chemical and physical disturbances of the decommissioning and be compared with the pre decommissioning survey. A copy of the survey results will be forwarded to OPRED. After the survey results have been sent to OPRED and reviewed, a post monitoring survey schedule will be agreed by both parties taking account of ongoing liability, and the status and findings of previous surveys. The schedule will apply a risk-based approach to the frequency and scope of further surveys. At least two post decommissioning environmental surveys are expected.

## 4 Impact on Health Safety and Environmental Performance

### 4.1 Details of any Incidents / Accidents during Project Execution

Decommissioning of the Brae Bravo topsides was a highly complex project involving a team of personnel from multiple companies, disciplines, cultures, business processes and languages. A strong and collaborative safety culture was demonstrated by the low number of events throughout the project. This was emphasised throughout all phases of the project including project management, planning, engineering, and worksite activities, and also through the sharing of learnings and best practice that can be applied to future projects.

There were no Regulatory Reportable Injuries or Dangerous Occurrences recorded during project activities. There were nine minor first aid events over the two offshore campaigns. Five of the first aid events consisted of minor burns and cuts. The remaining four cases, which were recorded in quick succession early in Campaign 1, related to a small item (speck of dust etc.) getting into eyes. To address this, TAQA procured and issued specialised safety eyewear to the entire workforce. As a result, there were no further eye injury cases on the project.

The project also recorded five near miss cases. These were events that occurred but had no actual adverse impact to personnel, environment or the asset but had the potential for a more serious outcome. The importance of these cases being reported is to enable the events to be fully investigated and actions put in place to mitigate reoccurrence of events of this nature or similar, with a potentially more serious outcome.

## 5 Waste

In recognition of TAQA's role as Waste Producer and the inherent waste Duty of Care, TAQA developed a Materials Management Strategy (MMS) in preparation for decommissioning Brae Bravo. The MMS formed a route map for management of decommissioning materials and aligned key materials management decisions and actions with the relevant Offshore Energies United Kingdom (OEUK) decommissioning work breakdown structure (WBS) for the project, from the early project management stage (WBS1) to completion of onshore materials management (WBS8).

The MMS was designed to address the five key principles required by SEPA and OPRED for decommissioning materials management, thus enabling:

- Early engagement with the regulators and waste management sector
- Application of the waste hierarchy
- Ensuring Duty of Care through the decommissioning cycle
- Development and maintenance of a robust and detailed Materials Inventory
- Development and maintenance of an Active Waste Management Plan (AWMP) for the decommissioning work

TAQA liaised with SEPA throughout the project ensuring the regulator was kept abreast of the planned works and throughout the application process for the Trans Frontier Shipment (TFS) Notification for which TAQA also liaised with the Norwegian Environment Agency.

<b>Material</b>	<b>Total Weight (T) as per the approved DP</b>	<b>Material left In situ (T)</b>	<b>Actual Weight (T) to shore</b>	<b>Disposal Method</b>
Steel	33,232	0	31,094	Recycled
Concrete	46	0	80	Recycled
Marine growth	320	0	33	Recycled
Non-ferrous	2,517	0	987	Recycled
NORM (Naturally Occurring Radioactive Material)	10	0	4	Disposed
Hazardous	137	0	1,930	107 T recycled 346 T sent for energy recovery 1,477 T disposed
Other including plastic and WEEE (Waste Electrical and Electronic Equipment)	1,854	0	3,020	98 T reused 2,243 T recycled 461 T sent for energy recovery 218 T disposed
<b>Total</b>	<b>38,116<sup>3</sup></b>	<b>0</b>	<b>37,148</b>	

<sup>2</sup> The actual weights returned to shore and associated disposal method include radioactive smoke detectors (0.299 tonnes included in the hazardous waste total) and NORM. At the time of writing, these are pending repatriation for disposal. The disposal routes have been identified and the required (TFS) Notification procedure is in progress.

<sup>3</sup> The total weight presented in Table 5.1 is greater than the sum of the weights presented in Table 1.1 as Table 1.1 does not include concrete and marine growth.

Table 5.1: Materials Returned to Shore<sup>2</sup>

Material	Total Weight (T) as per the approved DP	Material left In situ (T)	Actual Weight (T) to shore	Disposal Method
Total reuse/recycling/energy recovery as percentage of total weight to shore			95.4%	
Total disposed as percentage of total weight to shore			4.6%	

As is shown in the table, the topsides project exceeded the materials management target of a minimum 95% by weight reuse/recycling/energy recovery, and less than 5% by weight disposal of the materials returned to shore.

## 6 Lessons Learned

Throughout all phases of the scope covered by this DP lessons learned sessions have been held regularly and a comprehensive register has been generated. Below are what are considered by TAQA to be the most important lessons.

1. During the offshore campaigns TAQA mobilised a multi-discipline team to the SSCVs to manage the execution. The presence of the TAQA team on-board the SSCVs to oversee safety, operations and engineering was highly successful. TAQA integrated fully with the EPRD engineering teams and the EPRD offshore workforce to assure, verify and support the successful execution of the project.

It has also been recognised that maintaining a consistent core team throughout the planning and engineering phase contributed heavily to the success of the project.

2. TAQA created an induction which was given onshore ahead of travelling to the SSCVs to help set clear expectations to the entire offshore workforce. To further enhance the on-boarding process a second induction was presented offshore with pocket-sized safety booklets containing key information given to all personnel. These helped communicate to the workforce not only what the expectations around safety were, but also why they were important and how we could work together to achieve a positive safety culture.
3. TAQA engaged early in the project with the HSEx regarding the management and phasing of the safety cases. This allowed discussions to be held on key aspects early, allowing solutions to be put in place in good time.
4. An open and constructive relationship was established early on with OPRED and SEPA. This greatly helped the planning for, and subsequent approval of, the necessary permits and consents to complete the work.
5. The requirement for escape to sea/emergency response equipment for the return to Brae Bravo could have been reviewed at an earlier stage. Additional provisions could potentially have been made prior to the disembarkation of the platform, rather than upon arrival of the SSCV.
6. Full-time site representatives were mobilised to the dismantling yard to oversee operations, support Health, Safety, Environment and Quality (HSEQ) and ensure the waste duty of care was followed. This has contributed positively to the operations on site and achievement of the recycling target.



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## 7 Cost Summary

### 7.1 Cost Progress Summary

Submitted to OPRED in confidence.

## 8 Photographs



Figure 8-1: Approaching Brae Bravo as the project commenced offshore in Campaign 1

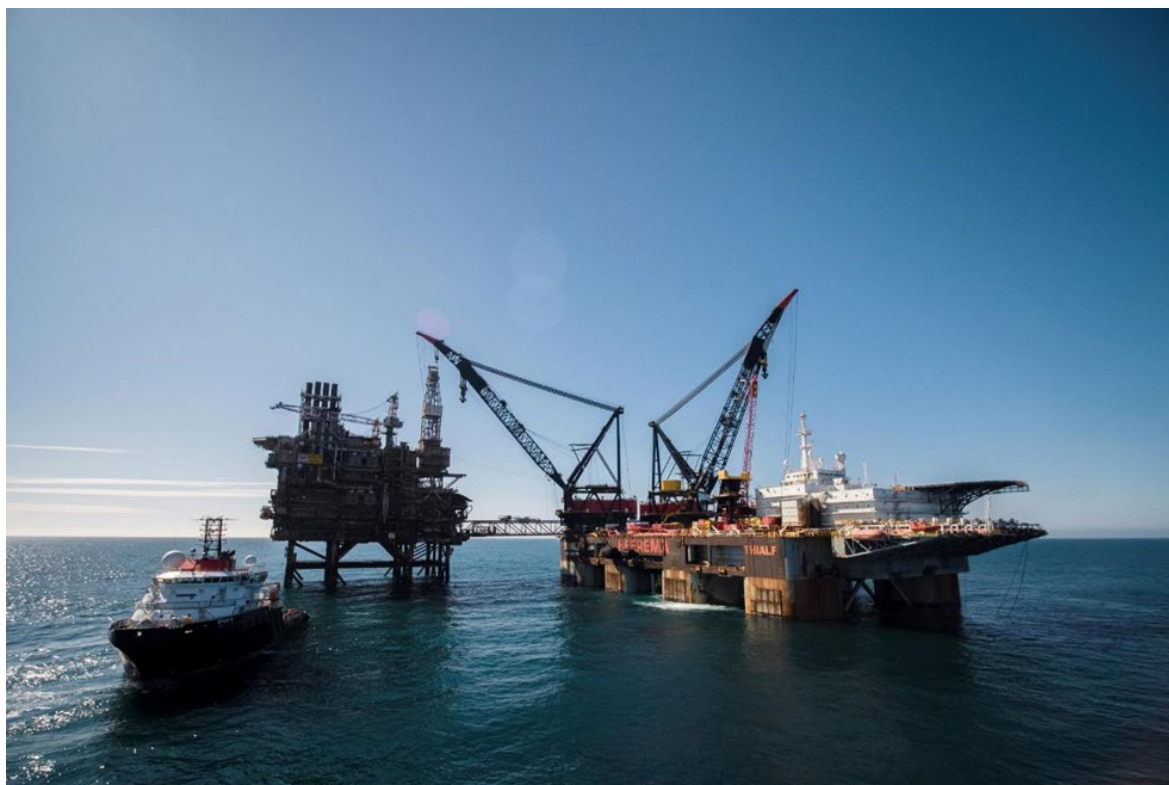


Figure 8-2: Setting up equipment at the start of Campaign 1



Figure 8-3: Transferring rigging platforms to the flare

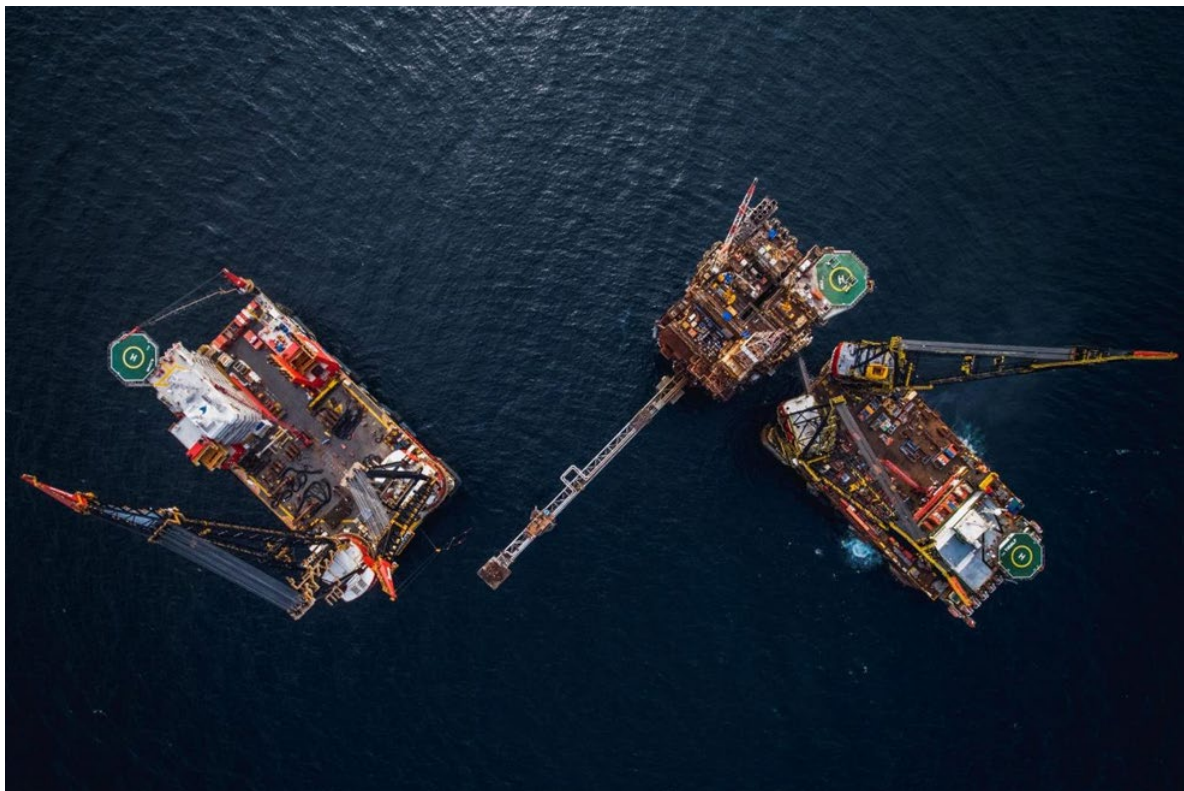


Figure 8-4: Two of the world's largest SSCVs working in tandem





Figure 8-5: Sleipnir removing the entire flare jacket in a single lift



Figure 8-6: Flare jacket as it was landed on the quayside



Figure 8-7: Sleipnir arriving at Brae Bravo to commence Campaign 2



Figure 8-8: Brae Bravo Drilling Rig removal





Figure 8-9: West Module Support Frame (MSF) removal



Figure 8-10: Topsides removal complete offshore



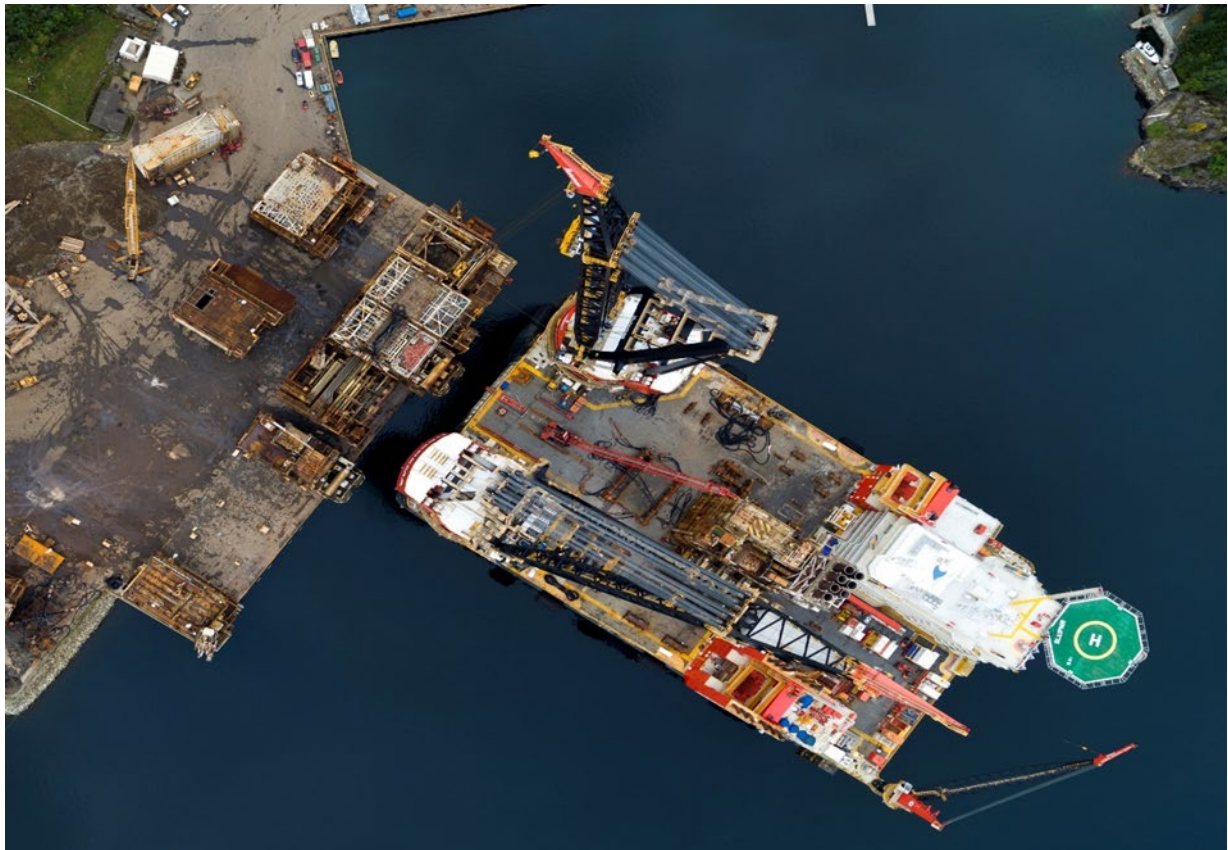


Figure 8-11: Module offload at the Vats yard quayside



Figure 8-12: Bravo modules relocated on the quayside ready for demolition





Figure 8-13: Module 8 ready to commence demolition



Figure 8-14: Module demolition underway





Figure 8-15: Demolition ongoing



Figure 8-16: Material sorting





Figure 8-17: The final pile of steel



Figure 8-18: Hazardous waste sorting



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