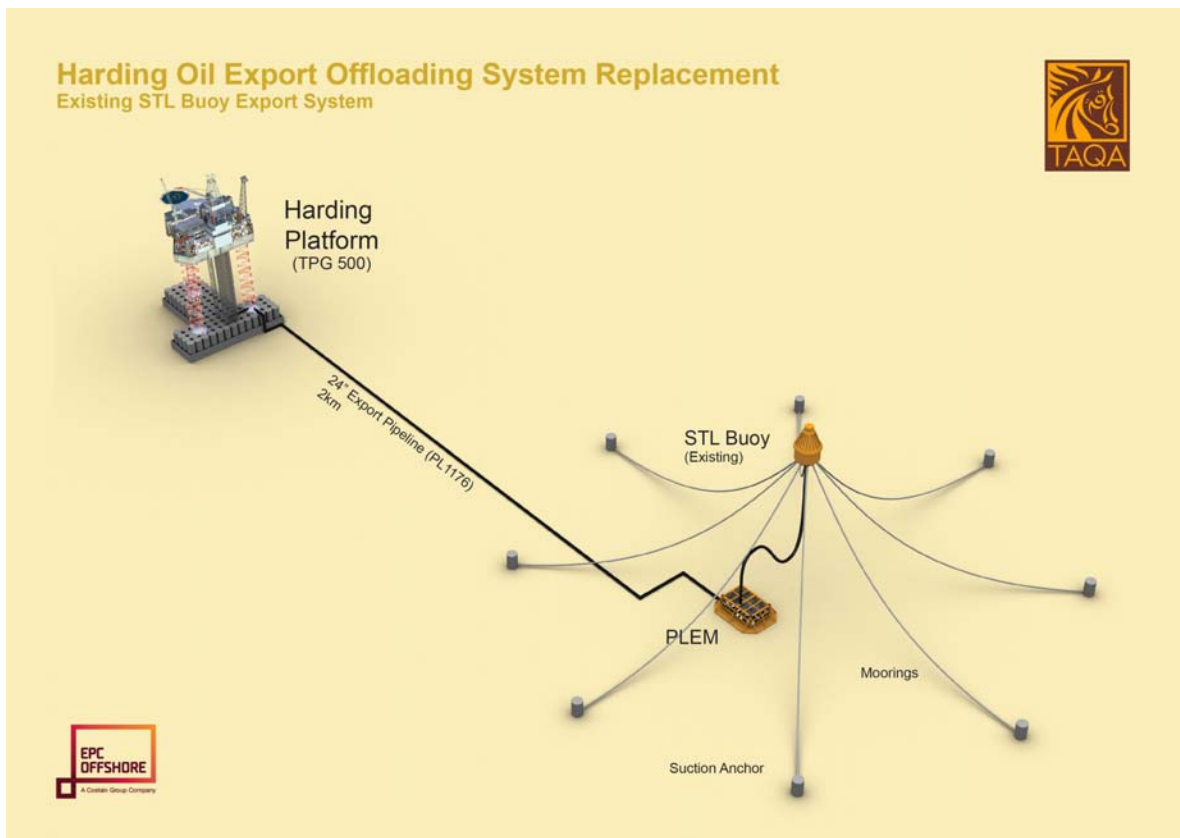


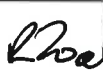
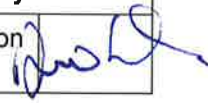


Decommissioning Close Out Report

Harding Submerged Turret Loading System

HAR-01031-PRM-PM-REP-0007-TAQ



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A4	Re-issued for OPRED Approval	2.3 – Ownership of STL buoy added 3.2 – HOLD removed, SI 2017 No. 458 revoked the STL 500m safety zone. 9.0 - new section added	30/05/17

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HOLDS LIST

NONE

HOLD	Paragraph	Description
-	-	-

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GLOSSARY OF ABBREVIATIONS

AHT	Anchor Handling Tug
APL	Advanced Production & Loading (part of NOV Group)
BEIS	Department for Business, Energy & Industrial Strategy
Britoil	Britoil Limited
CSV	Construction Support Vessel
DSV	Dive Support Vessel
EPA	Environmental Protection Act
HSE	Health and Safety Executive
km	kilometre
Maersk Oil	Maersk Oil North Sea UK Limited
MAT	Master Application Template
ODU	Offshore Decommissioning Unit
OEI	Offshore Environmental Inspectorate
OLS	Offshore Loading System
OPEP	Oil Pollution Emergency Plans
OPPC	Oil Pollution Prevention and Control
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
PLEM	Pipeline End Manifold
PWA	Pipeline Works Authorisation
SAT	Subsidiary Application Template
SFF	Scottish Fishermen's Federation
SI	Statutory Instrument
STL	Submerged Turret Loading System
TAQA	TAQA Bratani Limited
UKCS	United Kingdom Continental Shelf
WROV	Work-class Remote Operated Vehicle

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1.0 PROJECT BACKGROUND

1.1 Summary of Project Scope

The Harding field is located in the UKCS Licence Block 9/23b in the Central North Sea, approximately 320 km north-east of Aberdeen. Water depth at the field is 110m. The field was discovered in January 1988 and first production was in April 1996. The field was operated by BP until June 2013, when TAQA purchased BP's field equity and took over the operatorship.

The field has one central production, drilling and accommodation platform located between the Central and South reservoir accumulations. The Harding platform is a large, heavy-duty jack-up rig fixed to a concrete gravity base structure containing oil storage tanks. The oil is exported from the storage tanks to shuttle tankers via a loading system, STL, located approximately 2km to the east of the platform.

The STL is supported by a submerged mooring and loading interface buoy, which is anchored to the seabed via eight mooring lines and suction anchors. Due to obsolescence the STL was replaced by a new Offshore Loading System (OLS) in summer 2016.

The following components of the STL are redundant and have been removed:

- Eight mooring lines and associated components
- Eight steel seabed suction anchors
- The shuttle tanker mooring and loading interface buoy and associated components
- The offloading riser *

All planned work was successfully completed.

- * The Harding oil export pipeline PL1176 has been modified to replace the existing 16" flexible offloading riser with a new 20" flexible riser and associated spool pieces. This is defined in a variation to PWA 23/W/95.

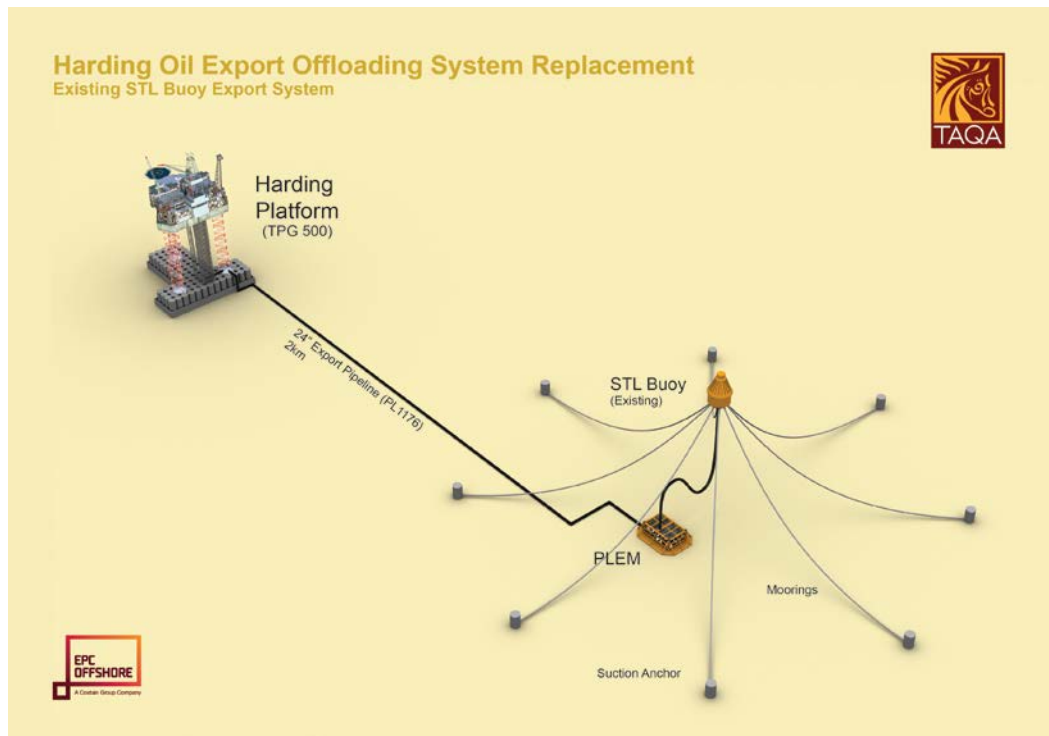


Figure 1.1 STL Loading System (now removed)

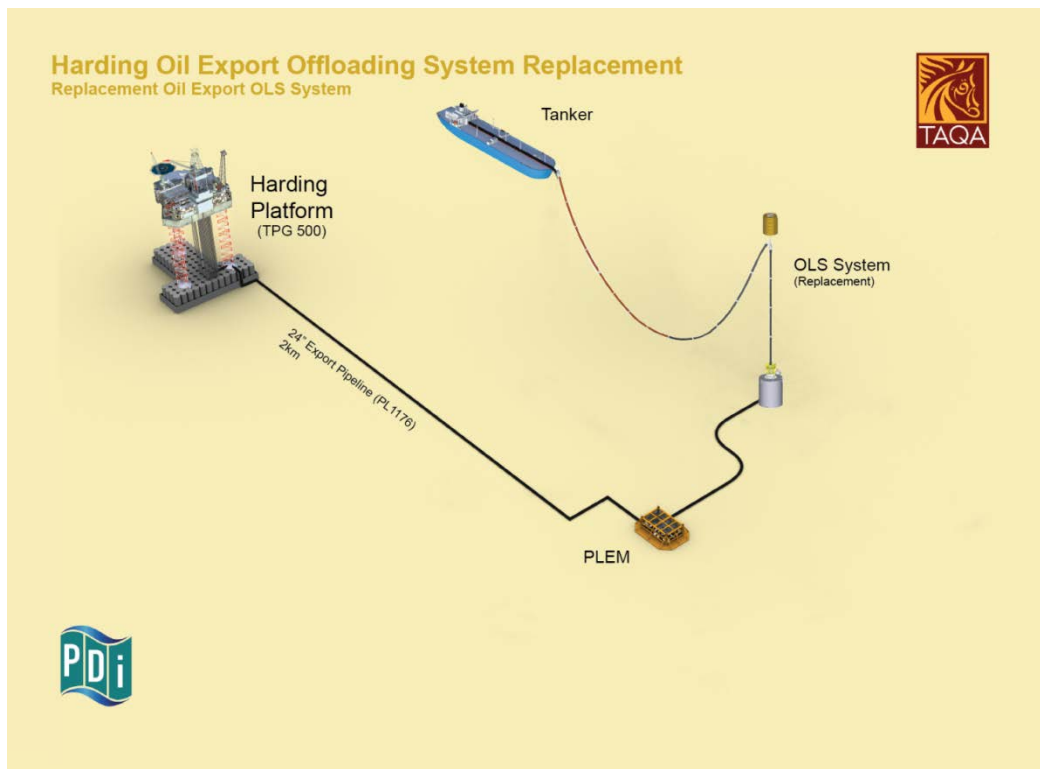


Figure 1.2 Replacement OLS System Schematic

1.2 Decommissioning Programme

The Harding STL System Decommissioning Programme, document number HAR-01031-DEC-PM-ADP-0001-TAQ, was approved by BEIS in February 2016.

2.0 DECOMMISSIONING ACTIVITIES THIS PERIOD

The decommissioning of the Harding STL system was completed as part of the offshore works to replace the loading system. The main activities in the decommissioning are briefly described below.

2.1 STL Buoy Mooring System

The mooring system;

- one pick-up line assembly attached to the top of the STL buoy
- eight mooring legs, each consisting a wire leg, connection plate and chain section, with the wire attached to underside of the STL buoy and chain attached to a suction anchor

In the first phase of offshore works, three vessels were involved, a DSV, an AHT and a CSV.

The pick-up assembly was disconnected from the STL buoy by divers and recovered to the deck of the AHT.

To remove the mooring legs, divers excavated to expose the buried chain, within 10m, to the suction anchor and attached a grommet (wire loop) to the chain. The chains were cut, by either WROV or divers, adjacent to the grommets and the AHT attached to the grommets and pulled the chain and wire to its deck. A WROV cut the wire at the STL buoy to allow the AHT to complete the recovery.

5 – 10m length sections of chain remained attached to the anchors and were recovered with the anchors.

The mooring chain, wires and connection plates were recycled as scrap steel; see Table 5.1.

2.2 STL Offloading Riser

The STL offloading riser was disconnected from the STL buoy and the PLEM and recovered onto the CSV in the first phase of offshore works.

The offloading riser, including the buoyancy modules attached to the riser, were recycled; see Table 5.1.

2.3 STL Buoy

Once all mooring legs and offloading riser were removed, the STL buoy was removed from the field under tow by an AHT and taken to Lerwick. The buoy was lifted from the harbour at Lerwick and stowed on a purpose-built support stool.

The STL buoy was returned to its owner, Teekay Navion Offshore Loading Pte. Ltd., once on Lerwick quayside and Teekay then sold it to the original manufacturers, APL, who intended to remove the internal piping parts for evaluation of the in-service degradation and recycle the main body of the buoy as scrap steel.

2.4 STL Suction Anchors

During the diving work in preparation of mooring legs for recovery, attempts were made to test the suction anchors and identify any problems or defects that would impede their removal. These tests were also intended to confirm that their integrity was sufficient for the reverse installation method to succeed. In general, the anchors were in good condition and the only repair made was to the pressurisation piping at anchor 3. However, all anchors were found to have a significant leak path from their vent hatches due to ill-fitting 'o' rings.

Attempts were made to replace or add sealant to the anchors during the first DSV phase of work but none were successful. Investigation of available seals identified that a 'quad' ring (sometimes referred to as an 'x' ring), along with some other methods, may provide the seal required on the vent hatch. All seals on the anchors' vent hatches were replaced with quad rings during the second phase of diving work and the integrity confirmed by a pressure test of each anchor.

The suction anchors, including a short section of mooring chain, were all successfully removed, by a CSV using the reverse installation method and were shipped to Lerwick and off-loaded. The anchors were cut into smaller sections and recycled as scrap steel.

A trawl sweep was carried out over the sites of the removed anchors and no obstructions were found and a clearance certificate was issued; refer to section 8.

3.0 IMPACT ON ENVIRONMENT

3.1 Decommissioning OPEP

There was no OPEP required for the decommissioning of Harding STL.

3.2 Decommissioning Permits

The table below lists the various permits approved for the decommissioning of Harding STL;

REFERENCE NUMBER(s)	PERMIT TITLE	DATE APPROVED
SAT - CP/985/2 MAT - DCA/28	Chemical permit - Decommissioning	29/06/16
CL/409/1	Consent to Locate for Mooring or Buoy – Change from STL to OLS	26/05/16
SI 2017 No. 458	The Offshore Installations (Safety Zones) (No.2) Order 2017 [this revoked the STL safety zone]	20/03/17
Variation - 22/V/16 DepCon – 5/D/16	PWA 23/W/95 Variation ¹	27/05/16
ML/164/0	Marine Licence – temporary storage of riser ¹	26/05/16
OTP/411/1	Oil Discharge (OPPC) – Pipeline PL1176 ¹	03/06/16

Table 3.1: Permit List

Notes;

1. The modification of pipeline PL1176 was not part of the Harding STL Decommissioning Programme. However, as modification of the pipeline was necessary for the decommissioning of the STL, the PWA Variation, associated Marine Licence and OPPC are included here for completeness.

4.0 IMPACT ON HSE

4.1 Incidents / Accidents

One incident was recorded during the decommissioning of Harding STL.

On completion of the tow of the STL buoy it was lifted onto the quayside at Lerwick harbour. A quantity of oily water spilled from the piping within the STL buoy and spilled into the harbour and adjacent quayside. The estimated volume of the oil spilled during this incident was 3 litres. This incident occurred on 6 June 2016.

The oil spilled into the harbour was dispersed in less than 6 hours due to the wave action at the time of the incident. Clean up of the permanent quayside and adjacent equipment and vehicles was completed within a few days of the incident. The gravel hardstand area, used for temporary storage of the STL buoy, will be removed and replaced early in 2017 once the buoy has been dismantled and recycled.

Following the incident a review of the operation was held and although no firm conclusion was made it is believed the spring and seal arrangement within the STL valve had been inadequately cleaned by the water flush.

4.2 Safety Case Amendment

Harding Safety Case was amended, to incorporate the removal of the STL and installation of the OLS, and reissued on 25 July 2016. The amendment was not a Material Change so did not therefore require approval from the HSE.

4.3 Dismantling Safety Case

A Dismantling Safety Case was not required.

4.4 Emergency Response Exercise

No emergency response exercise was undertaken.

4.5 Safety Roadshow

No safety roadshow was undertaken.

4.6 BEIS (OEI) Inspection

No inspection was planned or carried out by BEIS (OEI).

5.0 KEY MILESTONES

5.1 Onshore Preparation

The preparation for the decommissioning of the Harding STL System began in mid-2013 with review of the available alternatives for the STL system, together with the requirements and timing for removal of the STL system.

The selection of the new loading system, and requirements for removal of the STL system, was confirmed in May 2014.

The milestones for the decommissioning works thereafter were;

19 April 2014	Initial meeting with BEIS ODU on plans for removal of Harding STL system and requirements in regard of decommissioning
13 August 2014	Agreement reached with BEIS on plan for submission, review and through to approval of Harding STL System Decommissioning Programme.
31 March 2015	First issue to BEIS of Harding STL System Decommissioning Programme
02 February 2016	Harding STL System Decommissioning Programme approved by BEIS

5.2 Offshore Works

The milestones for the offshore works in decommissioning the Harding STL system were;

28 May 2016	Final oil export through Harding STL system
04 June 2016	Commencement of removal of Harding STL system
16 June 2016	STL mooring chains and wires, buoy and pick up assembly removed from the field
24 August 2016	Commencement of removal of Harding STL system suction anchors
27 August 2016	Completion of the removal of the Harding STL system suction anchors
04 September 2016	Completion of trawl sweep over the areas of the removed suction anchors; no obstructions found

5.3 Onshore Recycling / Disposal of Harding STL system

The milestones for the onshore recycling and disposal works in decommissioning the Harding STL system were;

16 June 2016	STL mooring system and buoy landed in Lerwick
28 August 2016	Suction anchors landed in Lerwick
22 September – 17 October 2016	Suction anchors cut into smaller sections for shipping
28 October 2016	Materials shipped from Lerwick for recycling and disposal

Table 5.1 below lists the quantities of materials recovered from the Harding STL and the disposal of that material. Note that the STL buoy is not included in the table below as it is not TAQA property and, at the time of writing (December 2016), remains intact with plans to dismantle and recycle in January 2017.

Re-use of the buoyancy modules was investigated but no opportunities were identified. Two enquiries were received for re-use of the suction anchors but these did not develop into viable opportunities.

TAQA confirm that they have complied with their obligations under section 34 of EPA 1990 and that all onshore recycling / disposal works were carried out by appropriately licenced contractors, refer to Section 9.0 for further information.

	Reuse	Recycling	Waste-To-Energy	Landfill	Sub-Total	All figures are tonne.
Oils	0.00	2.00	0.00	0.00	2.00	Oil recovered from flexible riser 0.075t Lithium batteries 2.000t rags & granules from riser cutting
Miscellaneous	0.00	0.15	2.00	0.00	2.15	0.075t transponder parts
Sludges/liquids	0.00	0.00	0.00	0.00		
Tank washings	0.00	0.00	0.00	0.00		
Chemicals	0.00	0.00	0.00	0.00		
Paints	0.00	0.00	0.00	0.00		
Drums/Containers	0.00	0.00	0.00	0.00		
Scrap metal	0.00	1629.30	0.00	0.00	1629.30	454.50t suction anchors 2.50t transponder casing & PLEM spool 1172.30t mooring chain, wire, tri-Plates, shackles & wire sockets 32.90t riser
Segregated recyclables					41.75	2.55t buoyancy modules
Wood	0.00	0.00	0.00	0.00		
Plastics	0.00	0.00	0.00	0.00		
Glass	0.00	0.00	0.00	0.00		
Aluminium cans	0.00	0.00	0.00	0.00		
Paper	0.00	0.00	0.00	0.00		
Cardboard	0.00	0.00	0.00	0.00		
Air Filters	0.00	0.00	0.00	0.00		
Cooking Oil	0.00	0.00	0.00	0.00		
Confidential Paper	0.00	0.00	0.00	0.00		
Other	0.00	41.75	0.00	0.00		8.00t pick-up line 0.80t plastic not recyclable 1.50t concrete blocks
General waste	1.50	0.00	0.00	8.80	10.30	
Totals	1.50	1673.20	2.00	8.80	1685.50	

Table 5.1: Recycling / Disposal of Harding STL Materials

6.0 ESTIMATED VS. ACTUAL COSTS

ITEM	Estimated Cost (£m)	Actual Cost (£m)
Platform(s) /Jacket(s) - Preparation / Removal and Disposal	N/A	N/A
Pipeline, Umbilical and Subsea Installation Decommissioning	13.8	9.5
Well Abandonment	N/A	N/A
Continuing Liability – Future Pipeline and Environmental Survey Requirements	N/A	N/A
TOTAL	13.8	9.5

The differences between the Estimated Cost and Actual Cost are;

DESCRIPTION	Cost Difference (£m)
Allowance for shipping STL buoy to Norway not required and recycling costs lower than estimate	-0.9
Difficulties in suction anchor removal lower than allowed in estimate	-1.2
Lower than estimated offshore execution and TAQA direct costs, including insurance	-1.0
Contingency not used	-1.2

7.0 PHOTOGRAPHS



Figure 7.1 AHT recovery of anchor chain



Figure 7.2 AHT preparing STL for tow to Lerwick



Figure 7.3 Anchor being recovered to deck of CSV



Figure 7.4 Anchors in storage at Lerwick (STL buoy in background)

8.0 SEABED CLEARANCE CERTIFICATE

The seabed clearance certificate for the sites of the suction anchors which has been extracted from the SFF document 'Trawl Sweep Report, Harding Anchors, MV "Favonius" PD17', is presented overleaf.



SFF Services Limited
24 Rubislaw Terrace
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E: sff.services@sff.co.uk

www.services.sff.co.uk

Date: 01st September 2016

TAQA: Harding Anchors Trawl Sweep
VERIFICATION TRAWL SWEEPS ON DESIGNATED ANCHOR LOCATIONS ALONG THE HARDING FIELD

This is to certify that the MV "Favonius" PD17 carried out gate cutting operations at the following anchor locations:

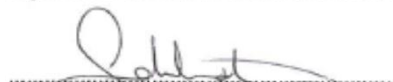
Anchor 1 -	59° 16.923'N, 001° 32.856'E
Anchor 2 -	59° 16.890'N, 001° 33.367'E
Anchor 3 -	59° 16.676'N, 001° 33.687'E
Anchor 4 -	59° 16.411'N, 001° 33.619'E
Anchor 5 -	59° 16.247'N, 001° 33.200'E
Anchor 6 -	59° 16.280'N, 001° 32.685'E
Anchor 7 -	59° 16.497'N, 001° 32.361'E
Anchor 8 -	59° 16.763'N, 001° 32.433'E

Remedial work was carried out with chain mat and single net before final verification sweep with the trawl gear. To the best of our knowledge the swept areas are considered safe to allow normal fishing operations to proceed.

Signed for on behalf of the Owners of the MV "Favonius" PD17


(Andrew Buchan) (Skipper)

Signed for on behalf of SFF Services Limited


(John Watt) Operations Director

Doc. No. 5, Rev 5.4, April 2015

9.0 MATERIALS DISPOSAL LISTING

Table 9.1 overleaf lists the sites / facilities receiving the materials recovered from the Harding STL, the companies which transported the materials and the sites where materials were delivered for recycling or disposal.

Materials	Initial Recipient			Carrier			Disposal Site			Waste Transfer Note Reference
	Site Name	Address	SEPA Licence / Permit No.	Company Name	Address	Waste Carrier Registration No.	Site Name	Address	SEPA Licence / Permit No.	
Chain	Peterson	Greenhead Base Gremista Lerwick Shetland ZE1 0PY	WML/XC/1138075	C.F Booth Ltd	Armer St. Rotherham S60 1AF	CB/RN/5979/D, CB/BN/5772/FH	Port of Wismar	Kopenhagener Str. 3, 23966 Wismar, Germany	WD/20/R719	WTN 16098
Tri Plates	Peterson	Greenhead Base Gremista Lerwick Shetland ZE1 0PY	WML/XC/1138075	C.F Booth Ltd	Armer St. Rotherham S60 1AF	CB/RN/5979/D, CB/BN/5772/FH	Port of Wismar	Kopenhagener Str. 3, 23966 Wismar, Germany	WD/20/R719	
Shackles	Peterson	Greenhead Base Gremista Lerwick Shetland ZE1 0PY	WML/XC/1138075	C.F Booth Ltd	Armer St. Rotherham S60 1AF	CB/RN/5979/D, CB/BN/5772/FH	Port of Wismar	Kopenhagener Str. 3, 23966 Wismar, Germany	WD/20/R719	
Suction Anchors	Peterson	Greenhead Base Gremista Lerwick Shetland ZE1 0PY	WML/XC/1138075	C.F Booth Ltd	Armer St. Rotherham S60 1AF	CB/RN/5979/D, CB/BN/5772/FH	Port of Wismar	Kopenhagener Str. 3, 23966 Wismar, Germany	WD/20/R719	
Sockets	Peterson	Greenhead Base Gremista Lerwick Shetland ZE1 0PY	WML/XC/1138075	C.F Booth Ltd	Armer St. Rotherham S60 1AF	CB/RN/5979/D, CB/BN/5772/FH	Port of Wismar	Kopenhagener Str. 3, 23966 Wismar, Germany	WD/20/R719	

Materials	Initial Recipient			Carrier			Disposal Site			Waste Transfer Note Reference
	Site Name	Address	SEPA Licence / Permit No.	Company Name	Address	Waste Carrier Registration No.	Site Name	Address	SEPA Licence / Permit No.	
Transponders	Veolia	Greenhead Base, Lerwick, ZE10PY	PPC/A/1003203	TWMA	Vaster Gott, Shetland, ZE9SG	SNO/039826/CB	TWMA	Vaster Gott, Shetland, ZE29SG	PPC/A/102330	WTN 16074
Buoyancy Modules	Veolia	Greenhead Base, Lerwick, ZE10PY	PPC/A/1003203	Streamline Shipping	Garthspool Road, Lerwick, ZE 0NY	WRC/R/1148056	Bondsworth Recycling	Carters Old Yard ST6 2LD	MF/0309/WV	WTN 16092
Mooring Wire	Peterson	Greenhead Base Gremista Lerwick Shetland ZE1 0PY	WML/XC/1138075	Garriock Bros	Unit 30, Gemista Industrial Estate, Lerwick Shetland ZE1 0PX	SNO/038333	C.F Booth Ltd	Armer St. Rotherham	WD20/R/719, EA/WML/61595	WTN 160103
Riser	Veolia	Greenhead Base, Lerwick, ZE10PY	PPC/A/1003203	Peterson	Greenhead Base, Lerwick, Shetland ZE1 0PY	SNO/039317/CB	CF Booth	Salters Lane, Rotherham	WD20/R/719, EA/WML/61595	WTN 16064
Oil from Riser	Veolia	Greenhead Base, Lerwick, ZE10PY	PPC/A/1003203	TWMA	Vaster Gott, Shetland, ZE9SG	SNO/039826/CB	TWMA	Vaster Gott, Shetland, ZE29SG	PPC/A/102330	WTN 16080
Oily Granules/Spill Pads	Veolia	Greenhead Base, Lerwick, ZE10PY	PPC/A/1003203	TWMA	Vaster Gott, Shetland, ZE9SG	SNO/039826/CB	TWMA	Vaster Gott, Shetland, ZE29SG	PPC/A/102330	WTN 16081

Materials	Initial Recipient			Carrier			Disposal Site			Waste Transfer Note Reference
	Site Name	Address	SEPA Licence / Permit No.	Company Name	Address	Waste Carrier Registration No.	Site Name	Address	SEPA Licence / Permit No.	
Pick-up Line	Peterson	Greenhead Base Gremista Lerwick Shetland ZE1 0PY	WML/XC/1138075	DISPOSED OF AT AN ONSITE FACILITY			SIC	Greenhead Base Lerwick ZE1 0PY	PPC/A/10003141	WTN 2412
Concrete Blocks	Veolia	Greenhead Base, Lerwick, ZE10PY	PPC/A/1003203	CURRENTLY BEING USED ONSITE (I.E. NOT WASTE)						
PLEM Spool	Veolia	Greenhead Base, Lerwick, ZE10PY	PPC/A/1003203	C.F Booth Ltd	Armer St. Rotherham S60 1AF	CB/RN/5979/D, CB/BN/5772/FH	Port of Wismar	Kopenhagener Str. 3, 23966 Wismar, Germany	WD/20/R719	WTN 16098
Plastic Waste	Veolia	Greenhead Base, Lerwick, ZE10PY	PPC/A/1003203	Peterson	Greenhead Base, Lerwick, Shetland ZE1 0PY	SNO/039317/CB	Gremista Waste Management Facility	Gremista, Lerwick ZE1 0PY	PPC/N/50027	WTN 16062

Table 9.1: Materials Disposal Listing