Tullow Oil SK Limited

9, Chiswick Park, 566 Chiswick High Road, London, W4 5XT
Tel: +44 (0)203 249 9000 Fax: +44 (0)203 249 8801

Department of Energy & Climate Change
Offshore Decommissioning Unit
3rd Floor
Atholl House
86 -88 Guild Street
Aberdeen
AB11 6AR

F.A.O. Alex Mateo, Decommissioning Manager

22 October 2015

RE: HORNE & WREN FIELD DECOMMISSIONING PROGRAMME

Dear Sir/Madam,

We acknowledge receipt of your letter dated 22 October 2015 with reference 12.04.06.08/56c.

We, Tullow Oil SK Limited, hereby submit the Final Decommissioning Programme for the Horne & Wren Field dated 22 October 2015, as directed by the Secretary of State on 22 October 2015.

The Final Horne & Wren Field Decommissioning Programme dated 22 October 2015, is submitted on behalf of Section 29 Notice Holders Tullow Oil SK Limited, Tullow Oil plc, and Centrica (Horne & Wren) Limited as requirement under section 29 of the Petroleum Act 1998.

Yours faithfully,

For and on behalf of Tullow Oil SK Limited

Signed .....
Name: ALAN GRAHAM MARTIN
Title: Director

TULLOW OIL SK LTD - HORNE & WREN DECOMMISSIONING PROGRAMMES

PROJECT CODE: 02029

F	22/10/15	Final Issue for Secretary of State approval	DS	IM	IM
E	02/09/15	Re-issued to incorporate comments and for formal review	DS	IM	IM
D	02/09/14	Re-issued to incorporate comments and for formal review	DS	IM	AE
C	14/08/14	Re-issued to incorporate comments and for formal review	DS	IM	AE
B	14/07/14	Issued to incorporate comments and for formal review	DS	IM	AE
A	18/3/14	Issued for DECC Informal Review	DS	IM	AE
Rev	**Date**	**Reason for Issue**	**Prepared**	**Checked**	**Approved**

DOCUMENT NUMBER :

02029-TLW-PM-PRG-0002

Contract Number	Area Code	System Code	Responsible Party
			Tullow Oil SK Ltd

REVISION CONTROL

Revision:	Para /Sect	Change Description

This sheet must be completed in detail, at each revision once this document has been approved. Details must include revision number, description and indication of which pages and paragraphs have been revised, date of revision approval and approval indication.

CONTENTS

(Inst. = Installations. P/L = Pipelines)

A. TABLE OF TERMS AND ABBREVIATIONS

Abbreviation	Explanation
CoP	Cessation of Production
DECC	Department of Energy and Climate Change
DPs	Decommissioning Programmes
DSV	Diving Support Vessel
ES	Environmental Statement
ESDV	Emergency Shut Down Valve
HLV	Heavy Lift Vessel
LAT	Lowest Astronomical Tide
m	Meters
MEG	Monoethylene Glycol
NUI	Normally Unattended Installation
OGUK	Oil & Gas UK
OPEP	Oil Pollution Emergency Plans
ORSL	Oil Spill Response Ltd
OSPAR	Oslo and Paris Convention
Perenco	Perenco (UK) Ltd
P & A	Plug and Abandonment
PL	Pipe Line
QRA	Quantitative Risk Assessment
SLV	Sheer Leg Vessels
SNS	Southern North Sea
SWAT	Suspended Well Abandonment Tool
UKCS	UK Continental Shelf

B. TABLE OF FIGURES AND TABLES

1. EXECUTIVE SUMMARY

1.1 Combined Decommissioning Programmes

This document contains two Decommissioning Programmes (DPs). (1) The Horne and Wren Installation (hereby referred to as H&W) and (2) the H&W pipelines. A separate programme for each set of associated notices under Section 29 of the Petroleum Act 1998 is incorporated within this document.

1.2 Requirement for Decommissioning Programme(s)

Installation: In accordance with the Petroleum Act 1998, Tullow Oil SK Ltd (hereinafter referred to as Tullow Oil) as operator of the Horne and Wren field and on behalf of the Section 29 notice holders are applying to the Department of Energy and Climate Change (DECC) to obtain approval for decommissioning the Horne and Wren field installations detailed in Section 2 of this document. (See also Section 8 - Partner(s) Letter(s) of Support).

Pipeline(s): In accordance with the Petroleum Act 1998, Tullow Oil as operator of the H&W field export line PL2080 and PL2081 pipelines (see Table 1.4) and on behalf of the Section 29 notice holders are applying to DECC to obtain approval for decommissioning the pipelines detailed in Section 2 of this document. (See also Section 8 – Partner(s) Letter(s) of Support).

In conjunction with public, stakeholder and regulatory consultation, the decommissioning programmes are submitted in compliance with national and international regulations and DECC guidelines. The schedule outlined in this document is for a 48 month decommissioning project plan due to begin in Quarter 4 2014.

1.3 Introduction

It should be noted that this decommissioning Program is a standalone document, although H & W Decommissioning Project Activities will be integrated with the Thames Area (that comprises of the Arthur, Thames Complex (including Thurne), Orwell, Wissey and Gawain fields) Decommissioning work scopes to optimise efficiency and realise synergies. Some examples of this to date are, Thames Area Cessation of Production (Approved by DECC 14/05/14) submittal and single area/joint Environmental Impact Assessment. (See figure 1.2 which identifies all the fields to be decommissioned as part of the Thames Area).There may be constraints that require some fields for the well and facility decommissioning to be standalone projects. Each operator will submit individual DPs for each field that can be undertaken independently.

Horne and Wren have reached their economic limit and no factors have been identified to extend such limit, therefore the H&W platform and wells are being prepared for decommissioning.

TOSK holds 50% equity in the Horne and Wren fields located on blocks 53/03c and 53/04b, under licences P786 and P852 respectively. The remaining 50% are held by Centrica. Horne and Wren last produced in 2012. The Horne reservoir's GIIP is an estimated 56 Bscf and has produced a total of 45.6 Bscf to date with an estimated recovery factor of about 81%. Meanwhile the Wren reservoir's GIIP is an estimated 48 Bscf and has produced a total of 35.2 Bscf to date with a recovery factor of about 73%. Since 2012 the fields have continued to incur the related operating costs. This resulted in net losses. With no commercially viable reserves addition or infrastructure utilisation opportunities in sight to economically justify sustaining such net losses as "mothballing" costs, the decision has been made by the owners to decommission.

The Horne field, discovered in 1992 by Hamilton Oil Company, straddles the boundary between Blocks 53/3c and 53/4b-F1. The 53/3c-3 discovery well was drilled vertically on the structure. It encountered Rotliegendes reservoir at 6,320 ft. TVDSS and reached a total depth of 8,994 ft. TVDSS in the Carboniferous. The well was successfully tested at a rate of 55 mmscfd. The gas contained 6.5% N2 and was very dry. The well was suspended as a gas discovery.
The Wren field lies in Block 53/4b, and was discovered in 1997 by ARCO British Ltd. Well 53/3c-6 was drilled directionally from 53/3c due to proximity to the shipping lane. The reservoir was encountered at 6,430 ft. TVDSS in the Rotliegendes Leman Sandstone interval, and reached a total depth of 7,394 ft. TVDSS in the Carboniferous. The well was not tested, due to mechanical reasons, but suspended as a gas discovery.

H & W were developed together and both wells started producing in June 2005.

The H&W minimum facility is a 2 well gas production platform located in Block 53/3c of the Southern North Sea, 65 kilometres East of the Bacton Terminal off the coast of Norfolk, in 40.6m water depth. The co-ordinates of the H&W Platform are WGS84 - 52° (54' 11.85) North, 2° (35' 54.91) East. UTM co-ordinates Zone 31U Eastings: 473092.023 Northings: 5861799.431.

The platform is aligned over two preinstalled conductors with the wellhead and processing facilities tied back to the SNS Thames complex.

The jacket consists of a 3-leg tripod skirt pile frame with a bottle-elevation profile. The jacket is 61m in length from the seabed to the head of the topsides support transition frame. The upper jacket section triangular profile measures 4m along each face tapering to 23m at the jacket base. The 3 No. 48" diameter piles 68m long with a penetration of 42m are driven through the 20m long sleeved lower jacket legs. The pile to jacket connection is formed via grouted connections. The topsides structure consists of a cellar and weather deck, with framing dimensions of 8m x 7m x 6.1m high. The topsides are supported off the jacket transition at elevation LAT +20.0m. The topsides framing consists of a 4 deck leg portal type structure with horizontal diaphragms incorporated in each deck. There are no processing facilities on the platform, it is essentially a wellhead platform only. There is no accommodation and the facility is normally unmanned. There is no helideck and access to the platform is via boat only. Control of the platform from Thames is via line of sight microwave, there is no umbilical between the two facilities. Production is routed to the Thames complex, after separation and metering, gas is exported through a 24" pipeline to the Bacton Gas Terminal, Norfolk.

The platform seabed tie in line inventory is as follows:

- 10" Gas Export Pipeline to Thames 49/28A facility
- $2^{1}/_{2}$" MEG/ Inhibitor line piggy backed to 10" Gas Export Line
- 8" Gas Flow line from the Wissey Facility.
- Control Umbilical to Wissey
- The H&W platform appurtenances consist of the following:
- 2 No. 30" Conductors
- 10" Export Riser.
- 3" MEG/ Inhibitor Riser
- 8" Import Riser.
- 2 No. 8" Future Risers
- 10" J-Tube

1.4 Overview of Installation(s)/Pipeline(s) Being Decommissioned

1.4.1 Installation(s)

Table 1.1: Installation(s) Being Decommissioned					
Field Name	Horne and Wren	Quad/Block	53/3C	Number of Platforms	1
Distance from nearest UK coastline (km)	65	Distance to median (km)	40	Platform type	Small Steel Jacket
Number of Subsea Installation(s)	None	Number of Drill Cuttings Pile(s):	None	Topsides Weight (Te): Jacket Weight (Te):	90 455
Number of Wells: Platform: Subsea:	2 Platform 0 Subsea	Production Type (Oil / Gas /Conde)	Gas	Water Depth (m)	40.6

Table 1.2 Installation(s) Section 29 Notice Holders Details		
Section 29 Notice Holder(s)	**Registration Number**	**Equity Interest (%)**
Tullow Oil SK Ltd	05287330	50
Tullow Oil Plc.	03919249	0
Centrica (Horne & Wren) Limited	04594558	50

1.4.2 Pipeline(s)

Table 1.3: Pipeline(s) Being Decommissioned		
Number of Pipeline(s)/ Umbilical(s)	2/0	(See Table 2.3)

Table 1.4: Pipeline(s) Section 29 Notice Holders Details		
Section 29 Notice Holder(s)	**Registration Number**	**Equity Interest (%)**
Tullow Oil SK Ltd.	05287330	50
Tullow Oil Plc.	03919249	0
Centrica (Horne & Wren) Limited	04594558	50

1.5 Summary of Proposed Decommissioning Programme(s)

Table 1.5: Summary of Decommissioning Programmes

Selected Option	Reason for Selection	Proposed Decommissioning Solution
1. Topsides		
Complete removal, re-use or recycle	Complies with OSPAR requirements and maximizes recycling of materials.	Decontaminate the topsides and remove the topsides by HLV. Re-use followed by recycle and then landfill will be the options for the topsides.
2. Jackets		
Complete removal, re-use or recycle	Leaves clean seabed, removes a potential obstruction to fishing operations and maximizes recycling of materials. To comply with OSPAR requirements.	Jacket legs will be removed and dismantled at an onshore location. Piles for the jacket structure will be severed below the seabed level at a minimum depth of 3m to ensure that any remains are unlikely to become uncovered. Re-use followed by recycle and then landfill will be the prioritised options. A PETS DCA application will be prepared and a MCAA licence application submitted to cover to removal of the installation jacket.
3. Subsea Installations		
None	N/A	N/A
4. Pipelines, Flow lines & Umbilical		
The 10 “pipe line (PL2080) and 2.5” (PL2081) chemical line will be flushed and left buried in situ.	Minimal seabed disturbance, lower energy usage, reduced risk to personnel engaged in the activity, pipelines are sufficiently buried and are stable.	Pipelines will be left in situ, with the cut ends re-buried below the seabed level at such a depth to ensure that any remains are unlikely to become uncovered. Surveys indicate pipelines will remain buried with flooding. Degradation will occur over a long period within seabed sediment and not expected to represent a hazard to other users of the sea. A PETS PLA application will be prepared and a MCAA licence application submitted to cover the proposed pipeline cutting and burial works. Chemical SATS and Oil Discharge SATs will be submitted as required in relation to the pipeline flushing operations.
5. Well Abandonment Operations		
Abandoned in accordance with UKOG for the suspension and	Meets DECC regulatory requirements.	A PETS WIA application will be prepared and a MCAA licence application submitted to cover well abandonment and removal of the wellhead

abandonment of wells		infrastructure.
6. Drill Cuttings		
Leave in place to degrade naturally	Cuttings were widely dispersed and fall below OSPAR 2006/5 thresholds.	Left undisturbed on seabed
7. Interdependences		
There are no drill cuttings associated with the installations.		

1.6 Field Location/Layout and Adjacent Facilities

Figure 1.1: H&W location within Southern North Sea

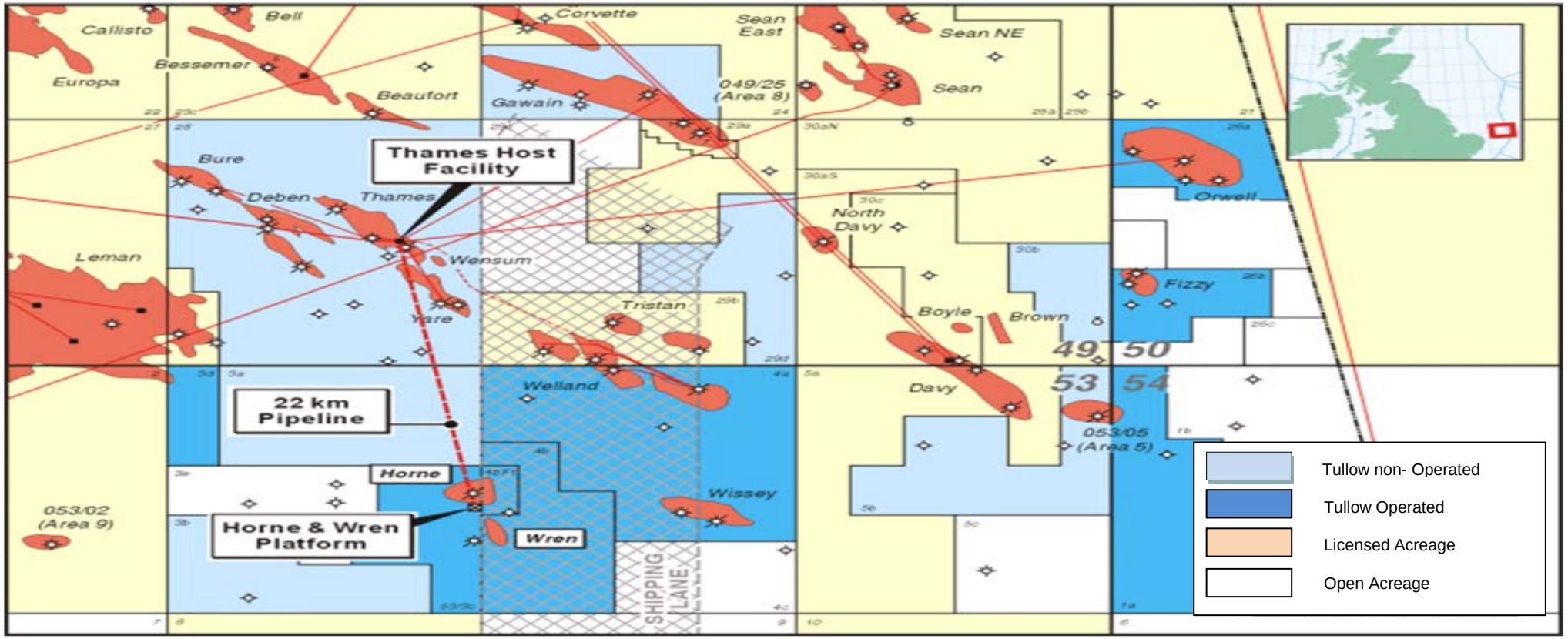


Figure 1.2: Field Layout

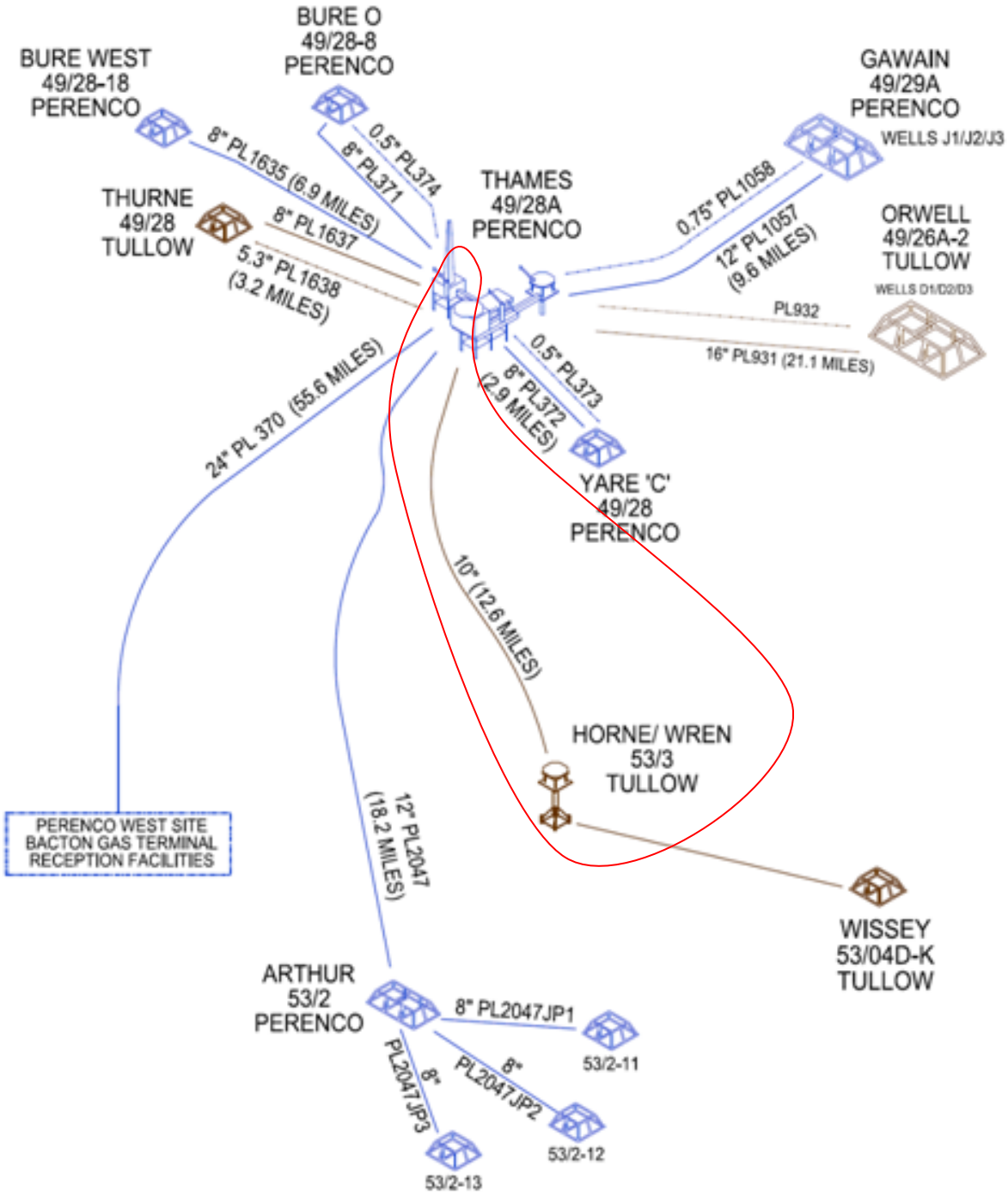


Figure 1.3 – Field layout schematic

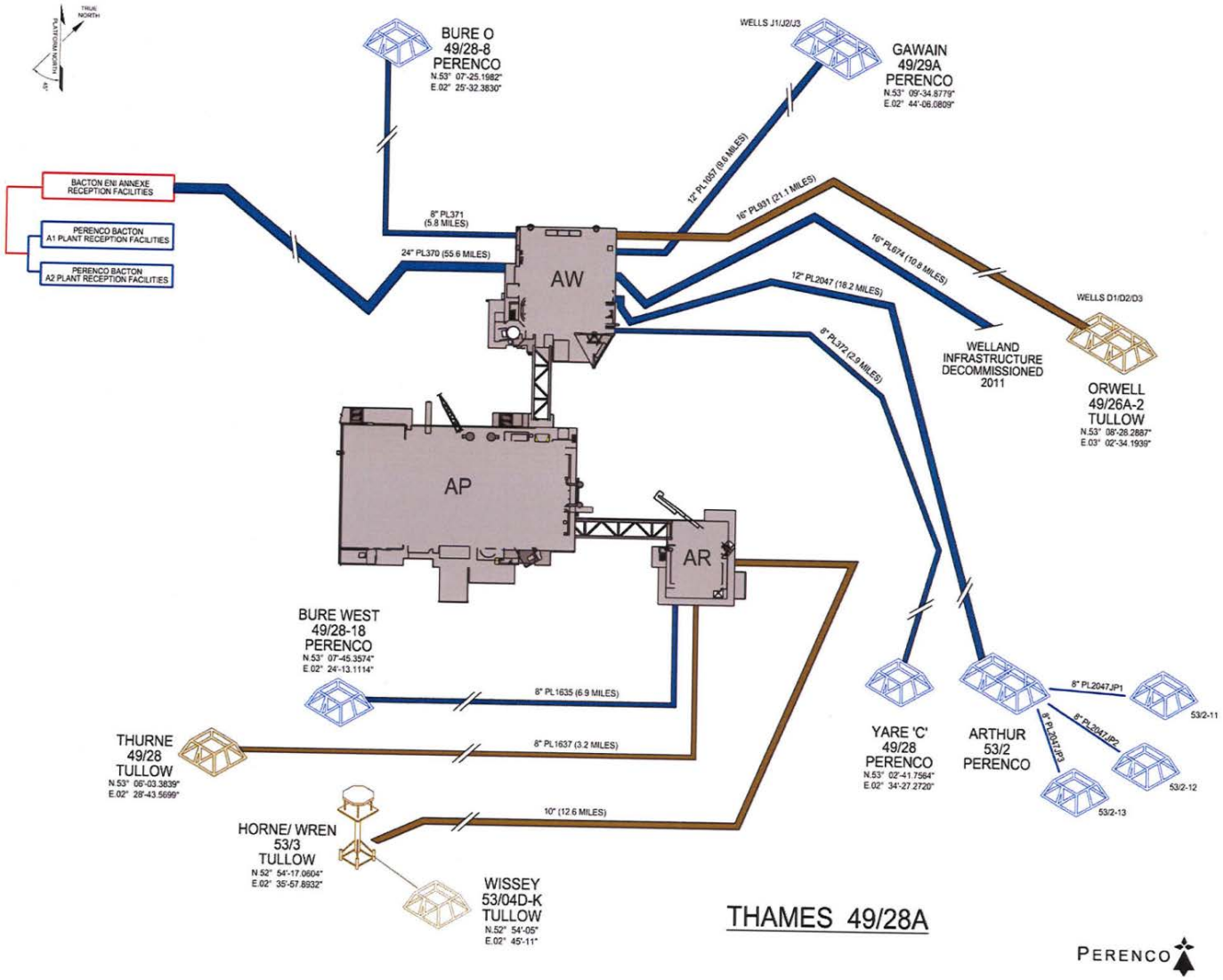
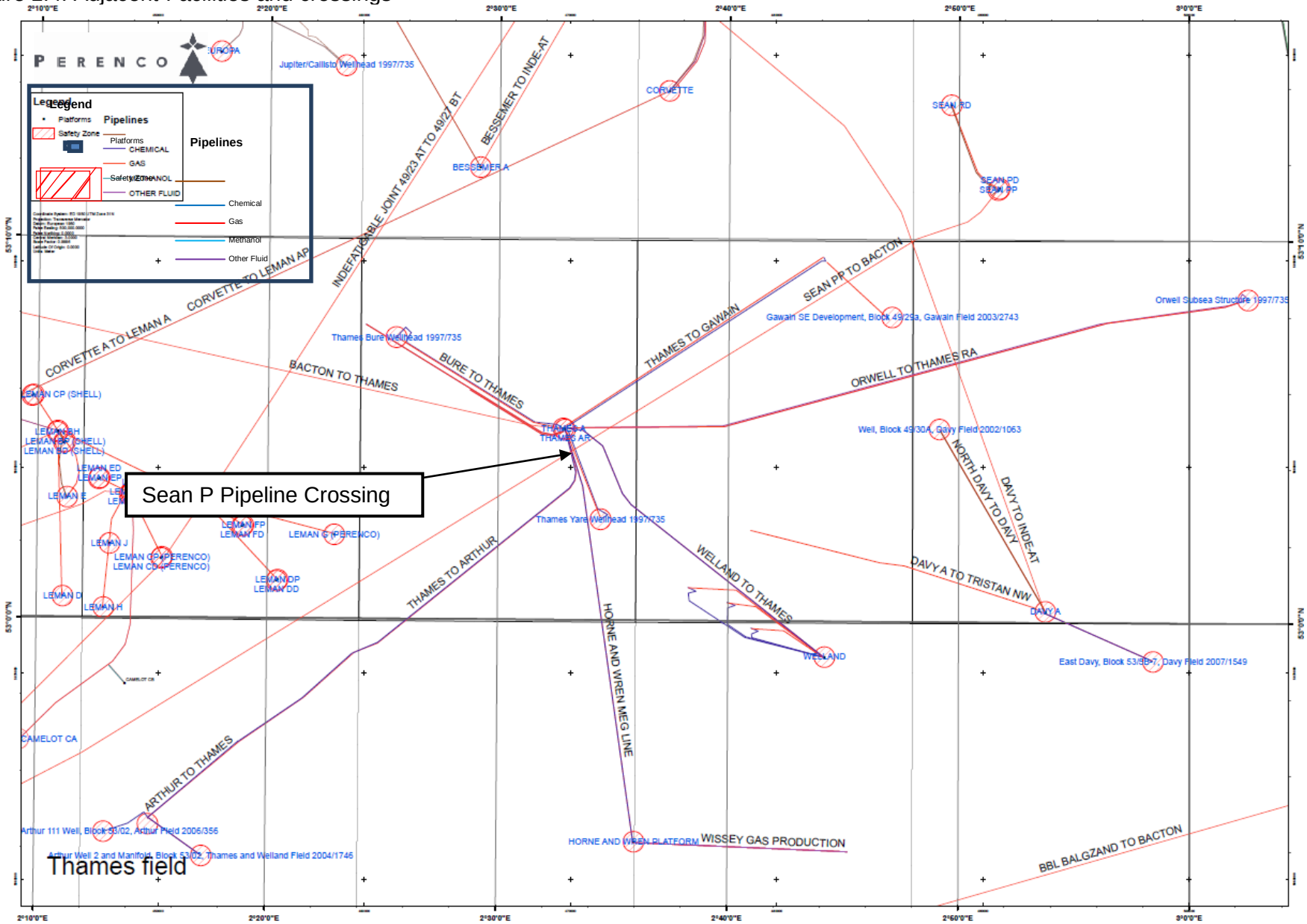


Table 1.6 List of Adjacent Facilities					
Operator	**Name**	**Type**	**Distance/Direction**	**Information**	**Status**
Unknown	Unknown	Cable	UK to Germany	Winterton to Romo	Redundant
Unknown	Unknown	Cable	UK to Germany	Winterton to Spiekroog	Redundant
Perenco	PL 1637	Pipeline	Less than 50 metres from Thames AR platform	Gas production from Thurne flows into Thames AR platform and crosses H&W pipeline close to AR platform	Operational
Tullow	Wissey	Subsea well	From Wissey to Thames is 30.9km South East of Thames 52˚ 54 05 North 02˚ 45 11 East	Gas production from Wissey flows into Horne & Wren NUI	Shut in
Perenco	PL 2047	Pipeline	Less than 50 metres from Thames AR platform	Gas production from Arthur flows into Thames AW platform and crosses H&W pipeline close to AR platform	Operational
Shell UK	PL 311	Pipeline	From Sean PP south west to Bacton Gas Terminal	H&W pipeline crosses 30" Sean PP Export line to Bacton approximately 5 km south of the Thames complex	Operational

NOTE: All Adjacent facilities will have no impact on the decommissioning proposals.

Figure 1.4: Adjacent Facilities and crossings



1.7 INDUSTRIAL IMPLICATIONS

The intent of this Decommissioning Program is to integrate the Horne & Wren scope of work into the wider ''Thames Area decommissioning project'' which encompasses all fields that tie back to the Thames complex, into discrete manageable phases.

The phases are as follows;

- Surveys
- Pipeline cleaning (base case is to flush and clean from Thames complex back to individual fields. If this is not possible, the uncompleted scopes will be included in the DSV phase).
- DSV (pipeline severance and burial, removal of stabilisation materials).
- Well Plugging & Abandonment.
- Removal of platform

The above phases will need to be planned carefully to recognise synergies and efficiencies, however the pre engineering will be completed to allow either individual projects to be completed or to fully integrate all work scopes.

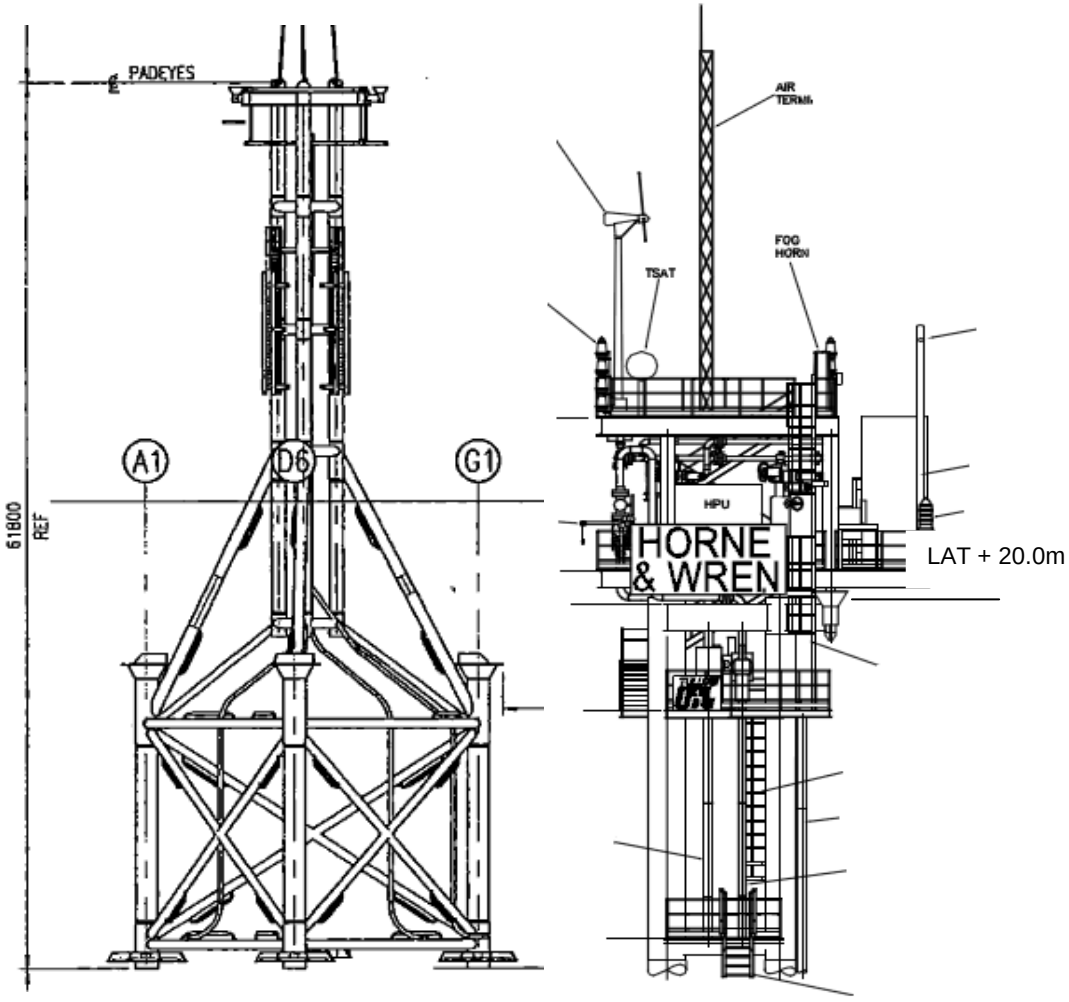
Strategically, suppliers with working vessels and assets on the UKCS will be favoured. All contracts will be competitively tendered or novated to either party.
Current operational contracts for items such as environmental permitting, rig drilling management and logistic support will be implemented to support decommissioning activities

2 DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

2.1 Surface Facilities (Topsides/Jacket)

Table 2.1: Surface Facilities Information

Name	Facility Type	Location (WGS84)	Topsides/Facilities		Jacket			
			Weight (Te)	No of modules	Weight (Te)	Number of Legs	Number of piles	Weight of piles (Te)
Horne & Wren	Fixed steel jacket	52° (54' 11.85) North, 2° (35' 54.91) East.	90	1	455	3	3	316



2.2 Subsea Installations and Stabilisation Features

Table 2.2: Subsea Installations and Stabilisation Features

Subsea installations and Stabilisation Features	Number	Size/Weight (Te)	Location(s)	Comments/ Status
Concrete mattresses	21	95	Within 500m of Thames complex (WGS84 52° (54' 11.85) North, 2° (35' 54.91) East).	From as installed drawings
Grout bags	7	0.2	Within 500m of Thames complex (WGS84 52° (54' 11.85) North, 2° (35' 54.91) East).	From as installed drawings

2.3 Pipelines/Flowlines/Umbilicals

Table 2.3: Pipeline/Flowline/Umbilical Information

Description	Pipeline No. (as per PWA)	Diameter (inches)	Length (km)	Composition[1]	Contents[2]	From – To End Points	Condition	Status[3]	Contents[4]
H&W Pipeline	PL2080	10	20.6	Steel	Gas	H&W to Thames AR	Trenched and buried. No free spans	Operational	Hydrocarbons
H&W Pipeline	PL2081	2.5	20.6	Steel	Chemicals	Thames AR to Horne and Wren platform	Trenched and buried. No free spans.	Operational	Chemicals

[1] e.g. Concrete; Steel; umbilical; Flexible; Bundle

[2] e.g. Oil; Gas; Water; Chemicals

[3] e.g. Operational; Out-of-use; Interim pipeline Regime

[4] e.g. Cleaned; Flushed; Hydrocarbons and/or Chemicals in line

Table 2.4: Subsea Pipeline Stabilisation Features				
Stabilisation Feature	**Number**	**Weight (Te)**	**Location(s)**	**Comments/ Status**
Concrete mattresses	18	70	Outside 500m zone of H & W (WGS84 52° (54' 11.85) North, 2° (35' 54.91) East).	From as installed drawings
Grout bags	36	1	Outside 500m zone of H & W (WGS84 52° (54' 11.85) North, 2° (35' 54.91) East).	From as installed drawings
Frond Mats	161	725	Outside 500m zone of H & W (WGS84 52° (54' 11.85) North, 2° (35' 54.91) East).	From as installed drawings

2.4 Wells

Table 2.5 Well Information			
Platform Wells	**Designation 1**	**Status**	**Category of Well**
53/3c-8 (Wren)	Gas Production	Shut in	PL 3-3-3
53/3c 9A (Horne)	Gas Production	Shut in	PL 3-3-3

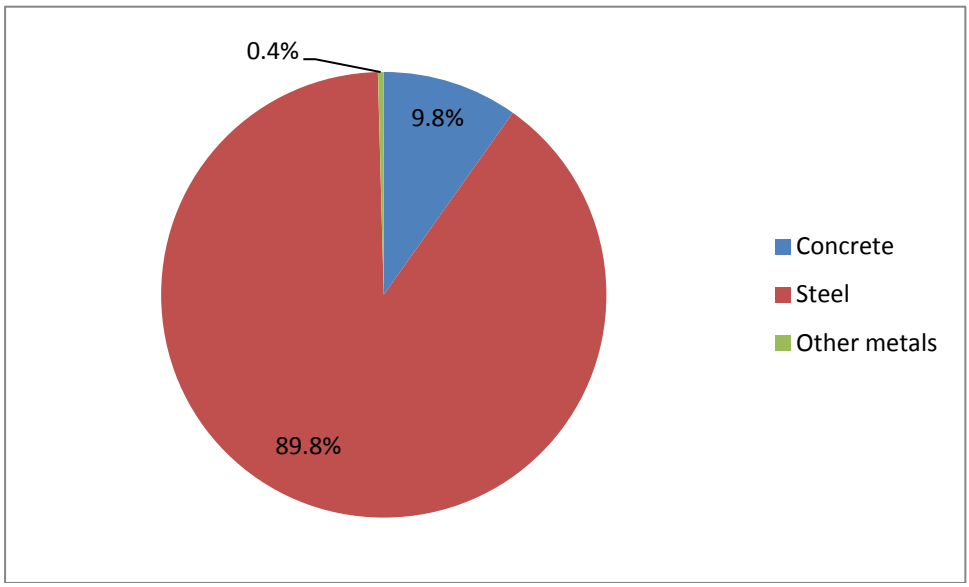
Category of well as per OGUK Guidelines for the suspension and abandonment of wells, Issue 4, July 2012.

2.5 Drill Cuttings

There are no drill cuttings associated with the Horne and Wren installation in the area. Drill cuttings that were generated during drilling activity are considered to have been distributed widely during drilling due to the local currents. There was no evidence of drill cuttings in the immediate vicinity of the wells when surveys were conducted in Q3 2013.

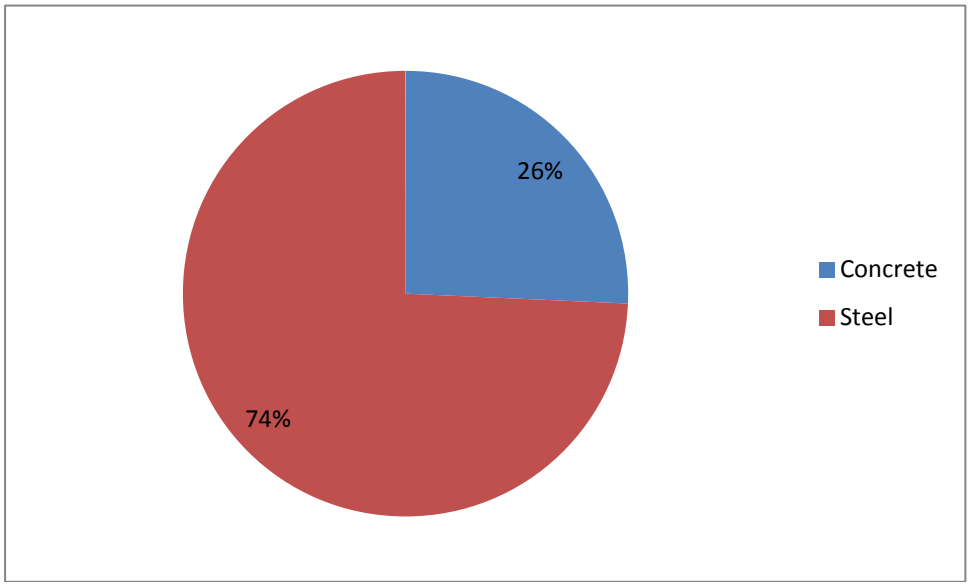
2.6 Inventory Estimates

Figure 2.1: Pie Chart of Estimated Inventories (Installations)



Total tonnes: 967

Figure 2.2: Pie Chart of Estimated Inventory (Pipelines)



Total tonnes: 3096

3. REMOVAL AND DISPOSAL METHODS

Wastes generated during decommissioning will be segregated and recorded by type and periodically transported to shore in an auditable manner through licensed waste contractors. Steel and other scrap metal are estimated to account for the greatest proportion of the materials inventory. The hierarchy for disposal will be:

1. Reuse
2. Reconditioning
3. Reconditioning of component parts
4. Recycling (partial or whole) components/materials
5. Disposal to landfill or other approved methods

The disposal routes for the subsea installations and pipeline infrastructure are shown in Tables 3.1 and 3.2.

Once the infrastructure is recovered to the vessels, it will be examined for the presence of NORM. If any contamination is found, the items will be sealed and delivered to specialist contractors for decontamination treatment and disposal. NORM contamination in H&W infrastructure would require specialised waste transport and handling processes and is regulated under the Radioactive Substances Act 1993, however, the H&W infrastructure is not expected to contain any NORM.

3.1 Topsides

Proposed Removal Method

Engineering studies have confirmed that reverse of the installation is the preferred method of removal:

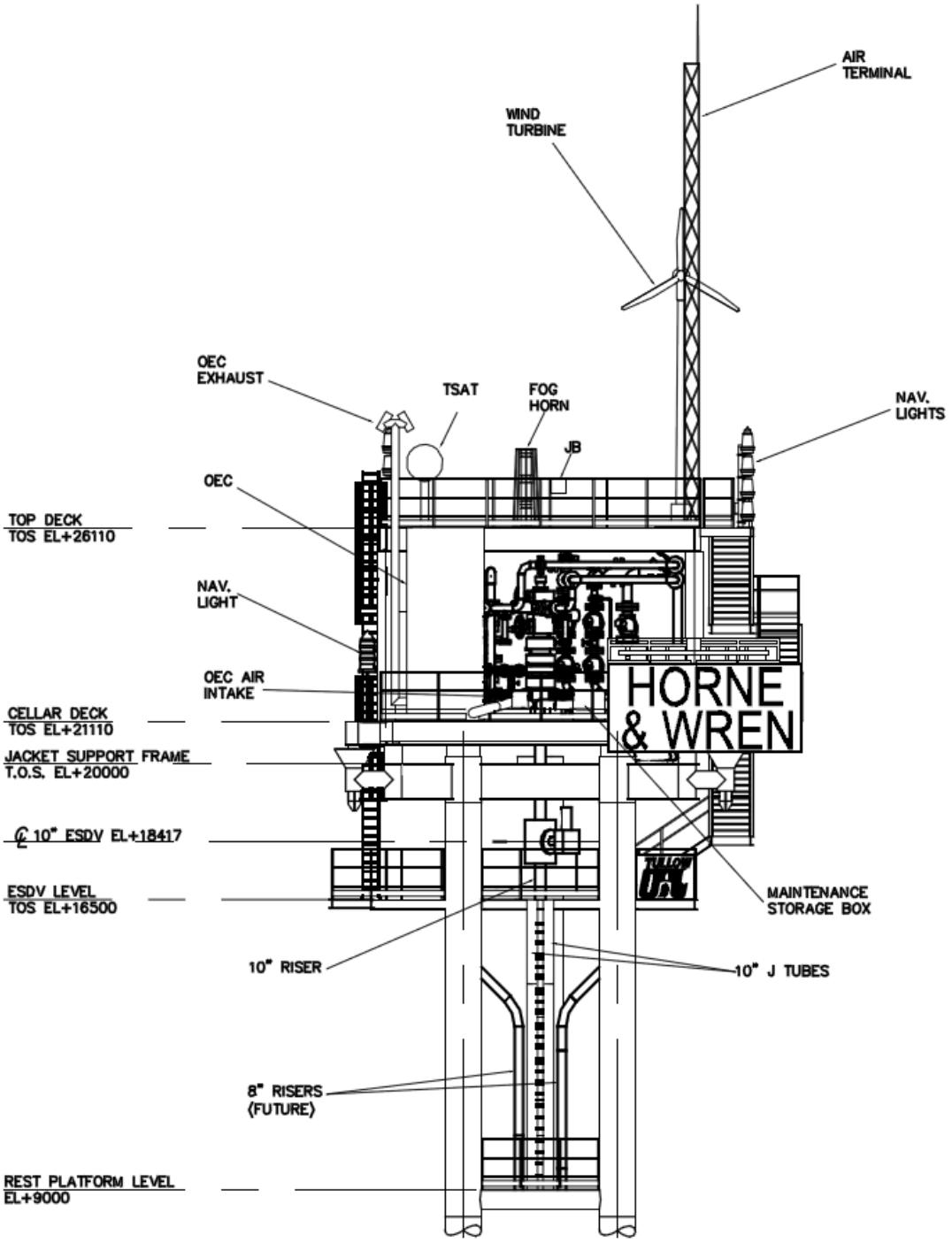
- Cut topsides deck legs at connection to jacket spreader frame.
- Lift Topsides back load and sea fasten onto barge.

3.2 Jacket

Proposed Removal Method

Engineering studies have confirmed that reverse of the installation is the preferred method of removal:

- Cut piles 3m below seabed Lift jacket off seabed, bring jacket inboard to HLV side shell. Cut pile extensions to trim
- Back load jacket onto barge with topsides and sea fasten.
- The barge will then be towed to the designated onshore location.
- Structures Preparation
- Topsides, Conductors and Jacket Removal
- Transport of removed structures to allocated onshore dismantling facility



Side Elevation of Horne/Wren Platform

The H&W structures removal can be performed using one, or a combination of the following:

Reverse Installation:

- Removal of the jacket and topsides correspondent to a reversal of the platform installation.
- Use of Buoyancy devices attached to Jacket

Offshore 'Piece-Small' dismantling:

Part or all of the structural components are dismantled in the field, e.g. Topsides dismantled offshore in unit weights that may be readily handled by a standard construction support vessel crane.

By inspection the reverse installation method is the preferred option. For the Reverse Installation method consideration will be given to the following removal scenarios:

- Topsides, Conductors and Jacket removed in separate lifts.
- Jacket and Topsides removed in integral lift,
- Jacket and Conductors removed in integral lift.

In all cases the jacket is assumed to be both lifted and back loaded in the vertical position. Upending the jacket into the horizontal position is not considered feasible, in terms of both practicality and integrity. The jacket 'on-the-hook' removal/transportation option is on initial inspection not preferred. However the option is not dismissed at this stage and is subject to further appraisal.

Each of the removal scenarios will require specific requirements in terms of hook capacity and crane geometry for the candidate heavy lift vessel.
Ideally, the jacket, topsides and conductors will be lifted by HLV onto a barge at the location. The following removal sequence is proposed.

- Lift conductors back load and sea fasten onto barge
- Cut topsides deck legs at connection to jacket spreader frame.
- Lift Topsides back load and sea fasten onto barge.
- Cut piles 3m below seabed
- Lift jacket off seabed, bring jacket inboard to HLV. Cut pile extensions to trim
- Back load jacket onto barge and sea fasten.

The barge will then be towed to the designated onshore location.
In Q1 2013 Tullow commissioned Xodus Engineering to complete a conceptual study for the removal of Horne and Wren Jacket, Topsides and Conductors.

Table 3.1: Cleaning of Topsides for Removal

Material Type	Detail	Preparatory Activity
Onboard hydrocarbons (see note below)	Process fluids, fuels and lubricants	Flushed and drained to offshore disposal wells
Other hazardous materials	Batteries	Transported ashore for re-use/disposal by appropriate methods

Note: The topside process is purposefully designed to minimise hydrocarbon inventories. Normal shutdown procedures should be followed to ensure that the asset is made hydrocarbon free. In depth cleaning is not deemed necessary.

Removal Methods:

Topsides Removal Methods

Table 3.2: Topsides Removal Methods	
1) HLV (semi-submersible crane vessel) ☑ 2) Mono-hull crane vessel ☑ 3) SLV ☑ 4) Piece small ☑ 5) Other ☐	
Method	Description
Single lift removal by SLV/HLV	Removal of topside as complete units and transportation to shore for re-use of selected equipment, recycling, break up and/or disposal. Single lift dependant on vessel availability.
Modular removal and re-use/recycle by HLV	Removal of parts/modules of topsides for transportation and reuse in alternate location(s) and/or recycling/disposal
Offshore removal 'piece small' for onshore reuse/disposal	Removal of topsides by breaking up offshore and transporting to shore using work barge. Items would then be sorted for re-use, recycling or disposal.
Proposed removal method and disposal route	**The proposed method will be the Removal of topside as complete units and transportation to shore for re-use of selected equipment, recycling, break up and/or disposal.** **The exact cutting points and removal methodology will follow a detailed engineering study**

Jacket Removal Methods

Table 3.3: Jacket Decommissioning Methods	
1) HLV (semi-submersible crane vessel) ☑ 2) Monohull crane vessel ☑ 3) SLV ☑ 4) Piece small ☐ 5) Other – (describe briefly) ☑	
Method	**Description**
Onshore disposal using HLV, Monohull crane vessel or SLV	Removal of all the jacket and transport ashore for break up and recycling of steel.
Other	A pull on barge removal method based on a submersible barge which is submerged on one end to the seabed. The jacket would then be pulled on to the barge/vessel by winch.
Proposed removal method and disposal route	**The proposed method will be the removal of topside as complete units and transportation to shore for re-use of selected equipment, recycling, break up and/or disposal.** **The exact cutting points and removal methodology will follow a detailed engineering study.**

3.3 Subsea Installations and Stabilisation Features

All subsea installations will be removed to shore for disposal. The pile cuts will be made below the seabed level (minimum 3m). The means of cutting could be diamond wire, high pressure water jet abrasive cutting or by explosives.

Table 3.4: Subsea Installation and Stabilisation Features Decommissioning

Subsea installations and stabilisation	Option	Disposal Route (if applicable)
Wellhead(s)	Remove as part of jacket and topsides	Transport ashore for disposal
Concrete mattresses	It is intended that the mattresses should be recovered to shore, however in the event of practical difficulties DECC will be consulted and a Comparative Assessment submitted.	Transport ashore for disposal
Grout bags	Remove	Transport ashore for disposal
Frond Mats	It is intended that the mattresses should be recovered to shore, however in the event of practical difficulties DECC will be consulted and a Comparative Assessment submitted.	Transport ashore for disposal

3.4 Pipelines/Flowlines/Umbilicals

Decommissioning Options:

Table 3.5: Pipeline or Pipeline Groups/Decommissioning Options			
Pipeline or Group (as per PWA)	**Status of the line or characteristics of the pipeline group**	**Decommissioning Options considered**	**Whole or part of pipeline/group being decommissioned**
PL2080	Trenched, buried	1,2,3,4,5	Whole pipeline
PL2081	Trenched, buried	1,2,3,4,5	Whole pipeline

*Key to Options

1) Completely remove the line(s);
2) Trench and bury the exposed / uncovered areas of the line(s);
3) Rock dump the line in specific areas where the line is uncovered;
4) Partial removal of uncovered sections of the line;
5) Leave in situ with continuous monitoring

Comparative Assessment Method:

The Comparative Assessment process involved a multi-disciplinary team participating in a Comparative Assessment workshop and a preliminary Quantitative Risk Assessment (QRA) of the available decommissioning options. At the Comparative Assessment workshop, each decommissioning option has been scored against a set of assessment criteria using categories derived from DECC guidance: 1. Safety; 2. Environmental; 3. Technical; 4. Societal; 5. Commercial. The Comparative Assessment can be found in Section 7, Supporting Documents, Document 2.

The Comparative Assessment concluded the pipelines will be left in situ due to difficulty to remove. They are predominantly trenched and buried. The pipelines will be periodically monitored (frequency to be agreed with DECC) and rectified as required.

Outcome of Comparative Assessment:

Table 3.6: Outcomes of Comparative Assessment		
Pipeline or Group	**Recommended Option***	**Justification**
PL2080	Option 5	Line is buried and will be safe to leave in situ (5). End sections will be removed & exposures/spans rectified as required. Monitoring will be performed to confirm pipeline remains buried. The frequency of monitoring will be agreed with DECC
PL2081	Option 5	Line is buried and will be safe to leave in situ (5). End sections will be removed & exposures/spans rectified as required. Monitoring will be performed to confirm pipeline remains buried. The frequency of monitoring will be agreed with DECC

*Key to Options

1) Completely remove the line(s);
2) Trench and bury the exposed / uncovered areas of the line(s);
3) Rock dump the line in specific areas where the line is uncovered;
4) Partial removal of uncovered sections of the line;
5) Leave in situ with continuous monitoring (frequency to be agreed with DECC).

3.5 Wells

Table 3.7: Well Plug and Abandonment
The wells which remain to be abandoned, as listed in Section 2.4 (Table 2.5) will be plugged and abandoned in accordance with Oil and Gas UK Guidelines for the suspension and abandonment of wells. A PETS WIA application will be prepared and a MCAA licence application submitted to cover well abandonment and removal of the wellhead infrastructure.

3.6 Drill Cuttings

Drill Cuttings Decommissioning Options: N / A
(Please refer to Section 2.5)

3.7 Waste Streams

Table 3.8: Waste Stream Management Methods	
Waste Stream	**Removal and Disposal method**
Bulk liquids	Discharged to disposal wells or sent to Bacton via the export line for disposal. Equipment will be drained prior to removal to shore and shipped in accordance with maritime transportation guidelines.
Marine growth	Removed offshore / onshore. Disposed of according to the Tullow Thames Field Decommissioning Waste Management Plan, and in line with relevant legislation relating to the decommissioning of offshore structures, and the management of controlled waste.
NORM/LSA Scale	Tests for NORM/LSA will occur offshore and will be dealt/disposed with according to guidelines and company policies.
Asbestos	Tests for asbestos will occur offshore and will be dealt/disposed with according to guidelines and company policies.
Other hazardous wastes	Detailed survey for other hazardous wastes will be undertaken offshore and will be dealt/disposed with according to guidelines and company policies.
Onshore Dismantling sites	Appropriate licensed sites will be selected. The chosen facility must demonstrate proven disposal track record and waste stream management throughout the deconstruction process and demonstrate their ability to deliver innovative recycling options.

Table 3.9 Inventory Disposition			
	Total Inventory Tonnage	**Planned tonnage to shore**	**Planned left in situ**
Installations	981	780	201
Pipelines	2300	300	2000

4 ENVIRONMENTAL IMPACT ASSESSMENT

4.1 Environmental Sensitivities

The main features in this section are extracts from the Thames Area decommissioning Environmental Impact Assessment that has been prepared for the entire Thames Area decommissioning and is submitted in support of this Decommissioning Programme approval.

Table 4.1: Environmental Sensitivities

Environmental Receptor	Main Features
Conservation interests	**Marine Protected Areas (MPAs):** The Horne and Wren infrastructure lies 17 kilometres south east of the nearest marine protected area; North Norfolk Sandbanks and Saturn Reef cSAC/SCI, and 20 kilometres east of the Haisborough, Hammond and Winterton cSAC/SCI. **Annex I Habitats:** Annex I shallow sandbanks and discrete populations of *S. spinulosa* were identified in the side scan sonar mosaic and using seabed imagery across the Thames Area. Overall the site survey identified some areas of 'low' to 'moderate reefiness' but no areas of high reefiness which has previously been found at the Saturn Reef to the north west of the Horne and Wren fields (outside of the current working area). Given the distance of the Horne and Wren infrastructure from the North Norfolk Sandbanks and Saturn Reef cSAC/SCI, it is unlikely that Annex I *S. spinulosa* reefs will be present. **Annex II Species:** The Annex II species that could be present in the vicinity of the Thames Decommissioning Area include: • Harbour porpoise (*Phocoena phocoena*); • Grey seal (*Halichoerus grypus*); • The harbour (or common) seal (*Phoca vitulina*).

Seabed	Seabed imagery found that much of the surveyed area comprised bare sand with some areas of gravel and shell fragments (*CMACS, 2013*). Side scan sonar data demonstrated that sand waves across large areas of the seabed. This indicates strong seabed and water column currents, and subsequently highly mobile sediments (*CMACS, 2013*) which is consistent with the southern North Sea in general. The results of the chemical testing indicate that the concentrations of the individual PAH compounds all fall below the laboratory detection limits. Similarly, the aliphatic and aromatic total petroleum hydrocarbon (TPH) compounds also fall beneath lab detection limits, along with the other organic compounds and phenols listed. The organic content of sediments was generally low, ranging from 0.47 per cent to 1.54 per cent, with no discernible trend across the survey area (*CMACS, 2013*). Of all the metal contaminants, only arsenic was present above Level 1 threshold (Cefas L1 threshold is 20 ppm) at the majority of stations. Elevated levels of arsenic can occur following geological inputs and/or industrial discharge (*CMACS, 2013*). Cadmium was the only other metal found at concentration above the Level 1 threshold with 0.4 ppm. Barium was detectable at all stations sampled with levels of between 6 and 36 ppm across the sites and no evidence of any 'hotspots' of barium concentration *(CMACS, 2013).*
Fish	There are potential fish spawning areas in Block 53/03 for mackerel (*Scomber scombrus),* plaice (*Pleuronectes platessa),* sandeel (*Ammodytes marinus)*, sprat (*Sprattus sprattus)* and whiting (*Merlangius Merlangus).* In addition, the waters of Block 53/03 act as nursery areas for mackerel, sole (*Solea solea),* sandeel, cod (*Gadus morhua),* spurdog (*Squalus acanthias)* and tope shark (*Galeorhinus galeus)* (*Coull et al., 1998; Ellis et al., 2012*).
Fisheries	Specific fishing effort and landings data for ICES Rectangles 34F2 indicated that annual fish landings were greatest in 2011 (411.1 tonnes). Conversely, annual fishing catches by tonnage were lowest during 2008 in ICES Rectangles 34F2 (35.4 tonnes) (*Marine Scotland, 2014*). Generally, fishing activity is low throughout the year in ICES rectangle 34F2. When averaged, catches by weight (tonnes) between 2009 and 2013 were highest during December. Sprat was the most commonly caught species during 2013 in ICES Rectangle 34F2.
Marine Mammals	According to Reid et al. (2003) three species have previously been sighted in the area around Block 53/03. Harbour porpoise (Annex II species), White-beaked dolphins, and minke whale. In addition, there is the potential that harbour seals (Annex II species) and grey seals (Annex II species) may be present in the vicinity of the Horne and Wren infrastructure.

Birds	Within Block 53/03, seabird vulnerability peaks to high (2 out of 4 on the JNCC scale) during February, March and December.
Onshore Communities	All waste produced during the Thames Area Decommissioning will be transferred to an onshore decommissioning and waste facility for processing. Tullow Oil will ensure the chosen facility is fully regulated and licensed with current legislation.
Other Users of the Sea	**Shipping:** Shipping movements within Block 53/03 are regarded as 'High' throughout the year.Block 53/03 is located adjacent to an International Maritime Organisation (IMO) two- way deep water routeing measure that controls and monitors the navigation of vessels in the area. **Oil & Gas:** In the vicinity of Horne and Wren Platform, Block 53/03 contains two completed gas production wells, eight plugged and abandoned (P&A) wells, and one that has been suspended. **Military Activity:** Block 53/03 lies in a Ministry of Defence (MoD) training area. **Dredging and Dumping Activity:** No commercial or capital dredging is undertaken, nor are there sites licensed for disposal of dredged material within Block 53/03. **Wind Farms:** There are no active wind farms within Block 53/03, however it falls within the East Anglia round three search area. **Archaeology:** No chartered wrecks are located in the vicinity of Block 53/03 *(Hydrographer of the Navy, 2006)*.
Atmosphere	Atmospherics emissions will be generated during the Horne and Wren Field Decommissioning operations. However, it is expected that the emissions will be localised to the area of release.

4.2 Potential Environmental Impacts and their Management

Environmental Impact Assessment Summary:

Decommissioning project activities with the potential to cause environmental impacts were identified from discussions with the Tullow project team, an informal scoping exercise with key stakeholders and from the EIA team's previous oil and gas EIA project experience.

Impacts associated with the Horne & Wren which is included in the Thames Area Decommissioning project have been grouped within the EIA under the following headings:

- Physical Presence;
- Seabed Impacts;
- Noise;
- Atmospheric Emissions;
- Marine Discharges;
- Unplanned Releases;
- Solid Wastes;
- Trans boundary Impacts;
- Cumulative Impacts.

Any relevant social-economic issues have been assessed within these sections.

In summary, all residual impacts are considered to be of minor significance, provided the proposed mitigation and management measures, as identified within the ES, are implemented during the Thames Area Decommissioning.

The exception to this is in the event of an accidental spill, where there would be a release of condensate from the pipeline or diesel fuel loss from the drilling rig / SLV; here the residual impact has been assessed as moderate. In addition, the assessment of potential cumulative impacts indicated that there would be no significant impacts and no significant trans boundary impacts are expected to occur as a result of the decommissioning operations.'

Table 4.2 Environmental Impact Assessment Summary		
Activity	**Main Impacts**	**Management**
Topsides Removal	Energy use and atmospheric emissions	Vessels will be audited as part of selection and pre-mobilisation. Work programmes will be planned to optimise vessel time in the field.
	Dropped object Accidental hydrocarbon release	A post decommissioning debris survey will be conducted and any debris recovered. As part of the OPEP Tullow Oil have specialist oil spill response services provided by Oil Spill Response Ltd. (OSRL).
	Production of waste	Materials are reused followed by recycling where possible. If either options are not possible then waste material will be sent to land fill. Compliance with UK waste legislation and duty of care.

Table 4.2 Environmental Impact Assessment Summary		
Activity	**Main Impacts**	**Management**
Jackets Removal	Energy use and atmospheric emissions Underwater noise Dropped object Accidental hydrocarbon release Production of waste Damage or loss of fishing gear Disturbance to the Seabed	Vessels will be audited as part of selection and pre-mobilisation. Work programmes will be planned to optimise vessel time in the field. Offshore vessels will avoid concentrations of marine mammals. A post decommissioning debris survey will be conducted and any debris recovered. As part of the OPEP Tullow Oil will have specialist oil spill response services provided by Oil Spill Response Ltd. (OSRL). Materials are reused followed by recycling where possible. If either options are not possible then waste material will be sent to land fill. Compliance with UK waste legislation and duty of care. Underwater cutting could be a potential source of sound, the operation of well-maintained equipment during decommissioning will ensure noise of operating machinery is kept as low as possible. Use of explosives underwater is expected to cause a significant source of sound. Consultation with JNCC and DECC will occur before agreement on any operation. Tullow Oil will also conform to 'JNCC guidelines for minimising the risk of injury to marine mammals from using explosives.' An MMO will be on board the vessel during cutting and/or explosive operation. UK Hydrographical Office and Kingfisher will be informed of all activities. Perenco will establish lines of communication to inform other sea users, including fishermen, of vessel operations during decommissioning. Tullow Oil will prepare an MCAA licence application to cover the removal of the installation jacket. Any dropped objects will be reported to DECC OGED using the PON2 reporting form.

Table 4.2 Environmental Impact Assessment Summary		
Activity	**Main Impacts**	**Management**
Subsea Installations Removal	Energy use and atmospheric emissions Underwater noise Dropped object Accidental hydrocarbon release Production of Waste Damage or loss of fishing gear Disturbance to the Seabed	Vessels will be audited as part of selection and pre-mobilisation. Work programmes will be planned to optimise vessel time in the field. A post decommissioning debris survey will be conducted and any debris recovered. Materials are reused and recycled where possible. Compliance with UK waste legislation and duty of care. Underwater cutting could be a potential source of sound, the operation of well-maintained equipment during decommissioning will ensure noise of operating machinery is kept as low as possible. Use of explosives underwater is expected to cause a significant source of sound. Use of explosives underwater is expected to cause a significant source of sound. Consultation with JNCC and DECC will occur before agreement on any operation. Tullow Oil will also conform to 'JNCC guidelines for minimising the risk of injury to marine mammals from using explosives.' If applicable a MMO will be onboard the vessel during cutting and/or explosive operation. UK Hydrographical Office and Kingfisher will be informed of all activities. Tullow Oil will establish lines of communication to inform other sea users, including fishermen, of vessel operations during decommissioning. Tullow Oil will prepare an MCAA licence application to cover the removal of subsea installations. Any dropped objects will be reported to DECC OGED using the PON2 reporting form.

Table 4.2 Environmental Impact Assessment Summary		
Activity	**Main Impacts**	**Management**
Decommissioning Pipelines (left in situ)	Energy use and atmospheric Emissions Underwater noise Damage or loss of fishing gear Disturbance to Seabed Dropped object Accidental hydrocarbon release	Pipelines have been pre-flushed with seawater and risk assessments will indicate the potential for any environmental impact. Pipeline ends and exposed areas will be buried in situ preventing the release of pipeline contents into the marine environment Rock placement will be deposited from a dedicated rock placement vessel. This will be applied for under a DEPCON application. Tullow Oil will prepare an MCAA licence application to cover the proposed deposits, removal works, and potential disturbance of the seabed. Tullow Oil will ensure that disturbance is kept to a minimum during the operations. A post decommissioning debris survey will be conducted and any debris recovered. Underwater cutting could be a potential source of sound, the operation of well-maintained equipment during decommissioning will ensure noise of operating machinery is kept as low as possible. If applicable MMO will be onboard the vessel during cutting and/or explosive operation. UK Hydrographical Office and Kingfisher will be informed of all activities. Tullow Oil will establish lines of communication to inform other sea users, including fishermen, of vessel operations during decommissioning. Any dropped objects will be reported to DECC OGED using the PON2 reporting form.

Table 4.2 Environmental Impact Assessment Summary		
Activity	**Main Impacts**	**Management**
Decommissioning Stabilisation Features	Energy use and atmospheric Emissions Underwater noise Damage or loss of fishing gear Disturbance to sea bed Dropped object Accidental hydrocarbon release	It is intended that the mattresses and grout baga should be recovered to shore, however in the event of practical difficulties DECC will be consulted and a Comparative Assessment submitted. (as per Para 3.3 Table 3.4). Tullow Oil will prepare an MCAA licence application to cover the removal of mattresses and grout bags from the seabed. Any dropped objects will be reported to DECC OGED using the PON2 reporting form.
Decommissioning Drill Cuttings	Long-term presence of hydrocarbons in sediments Leaching of hydrocarbons into the surrounding sediments and water column	There are no drill cuttings associated with the Horne & Wren installation. Should any evidence of drill cuttings be discovered, Tullow Oil will contact DECC to review findings and extent and agree any necessary remedial actions. Any dropped objects will be reported to DECC OGED using the PON2 reporting form.

5 INTERESTED PARTY CONSULTATIONS

Consultations Summary:

Table 5.1 Summary of Consultee Comments		
Who	**Comment**	**Response**
INFORMAL CONSULTATIONS		
TBA	None	
TBA	None	
TBA	None	
STATUTORY CONSULTATIONS		
NFFO	None received	
SFF	None received	
NIFPO	None received	
Global Marine Systems	None received	
DECC	None received	

6 PROGRAMME MANAGEMENT

6.1 Project Management and Verification

A Tullow Oil Project Management team will be appointed to manage suitable sub-contractors for the removal of the Horne and Wren installation and execution of the Decommissioning Programme work scopes. Tullow Oil standard procedures for operational control and hazard identification and management will be used. Where possible the work will be coordinated with other decommissioning operations in the SNS. Tullow Oil will monitor and track the process of consents and the consultations required as part of this process. Any changes in detail to the offshore removal programme will be discussed with DECC.

6.2 Post-Decommissioning Debris Clearance and Verification

A post decommissioning site survey will be carried out around 500m radius of the Horne and Wren installation, and a 200m corridor along each existing pipeline route. Oil and gas seabed debris will be recovered for onshore disposal or recycling in line with existing disposal methods. Independent verification of seabed state will be obtained by trawling the platform area. This will be followed by a statement of clearance to all relevant governmental departments and non-governmental organisations.

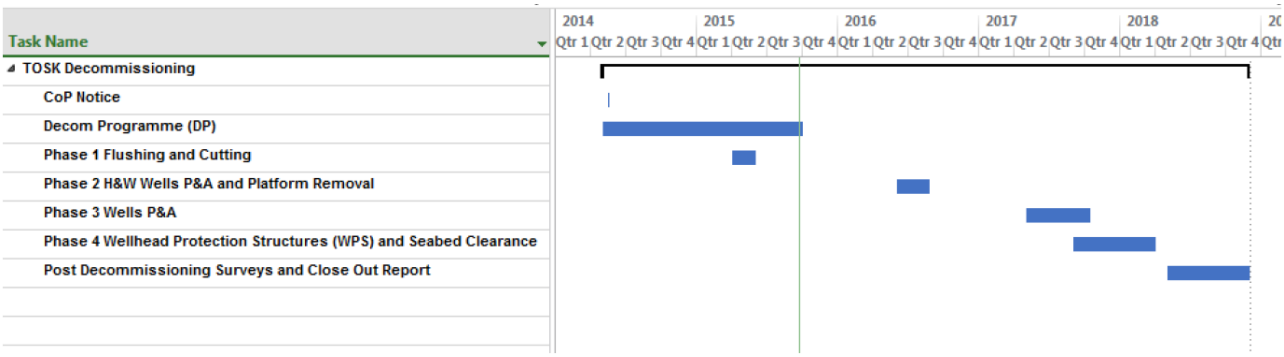
6.3 Schedule

Project Plan: The Tullow plan for decommissioning Horne and Wren and its other two operated installations in the Thames area Wissey and Orwell is estimated to be 48 months duration.

The plan below takes into account regulatory approvals and time to procure long lead items and equipment. Economic and operational benefits identified in detailed engineering through integration with the Perenco UK Ltd decommissioning of the Thames Area installations may require some future adjustment to the Tullow plan. The market availability of key vessels including a heavy lift vessel for removing structures and rigs for wells plugging and abandonment will ultimately drive the dates for completion.

Note that Horne and Wren will require remedial works in order to facilitate the programme. This activity is shown as H&W Enabling in the plan.

Figure 6.1: Gantt Chart of Project Plan



6.4 Costs

Table 6.1 – Provisional Decommissioning Programme(s) costs	
Item	**Estimated Cost (£m)**
Platform(s) /Jacket(s) - Preparation / Removal and Disposal	13
Pipeline(s) and Umbilical(s) Infrastructure Decommissioning	Inc. above
Subsea Installation(s) and Stabilisation Feature(s)	Inc. above
Well Abandonment	8
Continuing Liability – Future Pipeline and Environmental Survey Requirements	0.5
TOTAL	**21.5**

6.5 Close Out

In accordance with the DECC Guidelines, a close out report will be submitted to DECC explaining any variations, from the Decommissioning Programme (normally within 4 months of the completion of the offshore decommissioning scope) including debris removal and independent verification of seabed clearance and the first post-decommissioning environmental survey.

6.6 Post-Decommissioning Monitoring and Evaluation

A post decommissioning seabed survey at the H & W installation will be carried out. The survey will focus on chemical and physical disturbances of the decommissioning and compared with the pre-decommissioning survey, conducted by OSIRIS Ltd in Q3 2013 (Osiris 02029-OSI-PL-RPT-001). Results of this survey will be available once the work is complete, with a copy forwarded to DECC. All pipeline routes and structure sites will be the subject of surveys when decommissioning activity has concluded. The survey will include the 200 metre corridor along the pipeline routes and the platform 500 metre zone. After the surveys have been sent to DECC and reviewed, the post-decommissioning monitoring regime to be discussed and agreed with DECC

7 SUPPORTING DOCUMENTS

Table 7.1: Supporting Documents	
Document Number	**Title**
PER-SNS-DECOM-THA-005	Environmental Impact Assessment
PER-SNS-DECOM-THA-001	Comparative Assessment
02029-OSI-PL-RPT-001	Environmental Survey
02029–XOD–SU-RPT-RPT001	Xodus report – Facilities and pipeline removal conceptual report
02029–INR–EG-RPT-0001	Interact report – Wells plug and abandonment conceptual report

8. PARTNER(S) LETTER(S) OF SUPPORT

centrica energy

5th Floor
IQ Building
15 Justice Mill Lane
Aberdeen
AB11 6EQ
www.centrica.com

Department of Energy & Climate Change
Offshore Decommissioning Unit
3rd Floor
Atholl House
86 -88 Guild Street
Aberdeen
AB11 6AR

F.A.O. Alex Mateo, Decommissioning Manager

3 November 2015

RE: HORNE & WREN FIELD DECOMMISSIONING PROGRAMME

Dear Sir/Madam,

We acknowledge receipt of your letter dated 22 October 2015 with reference 12.04.06.08/56c.

We, Centrica (Horne & Wren) Limited, as a licensee in Licences P.786 (Block 53/3c) and P.852 (Block 53/4b), which contain the Horne and Wren Field confirm that we authorise Tullow Oil SK Limited to submit on our behalf the Final Decommissioning Programme for the Horne & Wren Field dated 22 October 2015, as directed by the Secretary of State on 22 October 2015.

We confirm that we support the proposals detailed in the Final Horne & Wren Field Decommissioning Programme dated 22 October 2015, which will be submitted by Tullow Oil SK Limited as required by section 29 of the Petroleum Act 1998.

Yours faithfully,

For and on behalf of Centrica (Horne & Wren) Limited

Name: MATT NICOL
Title: DIRECTOR, PRODUCTION & NON-OPERATED ASSETS

Tullow Oil plc

9, Chiswick Park, 566 Chiswick High Road, London, W4 5XT
Tel: +44 (0)203 249 9000 Fax: +44 (0)203 249 8801

Department of Energy & Climate Change
Offshore Decommissioning Unit
3rd Floor
Atholl House
86 -88 Guild Street
Aberdeen
AB11 6AR

F.A.O. Alex Mateo, Decommissioning Manager

22 October 2015

RE: HORNE & WREN FIELD DECOMMISSIONING PROGRAMME

Dear Sir/Madam,

We acknowledge receipt of your letter dated 22 October 2015 with reference 12.04.06.08/56c.

We, Tullow Oil plc, confirm that we authorise Tullow Oil SK Limited to submit on our behalf the Final Decommissioning Programme for the Horne & Wren Field dated 22 October 2015, as directed by the Secretary of State on 22 October 2015.

We confirm that we support the proposals detailed in the Final Horne & Wren Field Decommissioning Programme dated 22 October 2015, which will be submitted by Tullow Oil SK Limited as required by section 29 of the Petroleum Act 1998.

Yours faithfully,

For and on behalf of Tullow Oil plc

Signed.....
Name: ALAN GRAHAM MARTIN
Title: Director