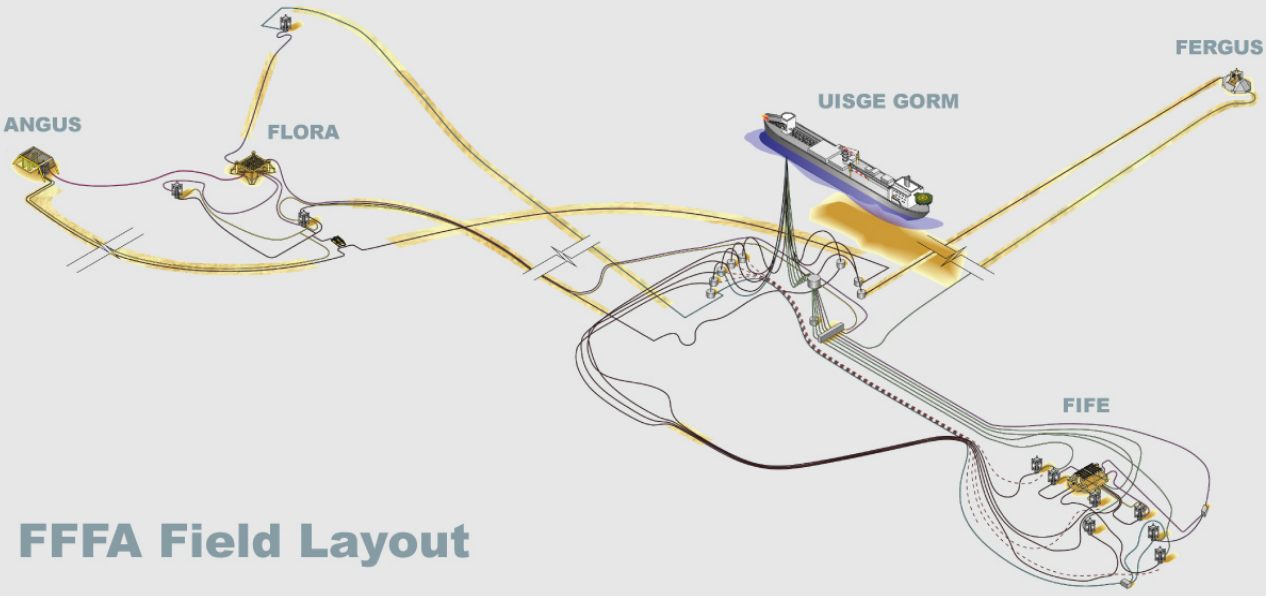
Fife, Fergus, Flora and Angus Fields
Decommissioning Programmes



FFFA Field Layout

16th February 2012

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ABBREVIATIONS :

ABBREVIATIONS

BERR	(Department for) Business, Enterprise and Regulatory Reform (now DECC)
BES	Bluewater Energy Services
BODC	British Oceanographic Data Centre
BT	British Telecom
CBM	Choke Base Manifold
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CHARM	Chemical Hazard Assessment and Risk Management
CI	Chemical Injection
CSV	Construction Support Vessel
DBB	Double Block and Bleed (valve)
DECC	Department of Energy and Climate Change (formerly BERR)
DP	Dynamic Positioning
DPR	Decommissioning Programme Reference
DSV	Diving Support Vessel
DWT	Deadweight Tonnage
ECD	Early Consultation Document
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EMS	Environmental Management System
ENVID	Environmental Issues Identification
ES	Environmental Statement
FFFA	Fife, Fergus, Flora and Angus
FPSO	Floating Production, Storage and Offloading (vessel)
GWP	Global Warming Potential
HAT	Highest Astronomical Tide
HP	High Pressure
HSE	Health and Safety Executive
ICES	International Council for the Exploration of the Sea
IMO	International Maritime Organisation

ABBREVIATIONS :

JIP	Joint Industry Project
JNCC	Joint Nature Conservation Committee
JOA	Joint Operating Agreement
KPI	Key Performance Indicator
LAT	Lowest Astronomical Tide
LSA	Low Specific Activity (scale)
MDSS	Measured Depth Subsea
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MODU	Mobile Offshore Drilling Unit
MWB	Mid-water Buoy
NFFO	National Federation of Fishermen's Organisations
NIFF	Northern Ireland Fishermen's Federation
NORM	Naturally Occurring Radioactive Material
OBM	Oil-based Mud
OCNS	Offshore Chemical Notification Scheme
OD	Outside Diameter
OPEP	Oil Pollution Emergency Plan
OPPC	Oil Pollution Prevention Control
OSCP	Oil Spill Contingency Plan
PAH	Polycyclic Aromatic Hydrocarbons
PEC	Predicted Environmental Concentration
PLONOR	Poses Little Or No Risk
PNEC	Predicted No Effect Concentration
PON	Petroleum Operations Notice
ROV	Remotely Operated Vehicle
RQ	Risk Quotient
RSPB	Royal Society for Protection of Birds

ABBREVIATIONS :

SAC	Special Area of Conservation
SAM	Subsea Accumulator Modules
SBV	Standby Vessel
SCM	Subsea Control Module
SDU	Subsea Distribution Unit
SEPA	Scottish Environment Protection Agency
SFF	Scottish Fishermen's Federation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SUT	Subsea Umbilical Termination
te	Metric Tonnes
THC	Total Hydrocarbon Concentration
TIVP	Tree Isolation Valve Panel
TPP	Tree Parking Plate
UKCS	United Kingdom Continental Shelf
UPS	Umbilical Protection Structure
WBM	Water Based Mud
WI	Water Injection
WIDH	Water Injection Distribution Head

SECTION 29 NOTICE HOLDERS

In February 2010 and in accordance with the requirements of the Petroleum Act 1998, the Department of Energy and Climate Change (DECC) issued Section 29 Notices for the submarine pipelines and offshore installations associated with the FFFA Development facilities. For the Fife Field, these Notices were issued to:

- Bluewater Operations (UK) Limited
- Hess Limited (formerly Amerada Hess Limited)
- Premier Oil Exploration Limited

For the Fergus, Flora and Angus fields, the Section 29 Notices were issued to:

- Hess Limited (formerly Amerada Hess Limited)
- Premier Oil Exploration Limited

The Section 29 Notice Holders for the individual fields within the FFFA Development each confirm that they authorise Hess Limited, as operator of the fields, to submit a Decommissioning Programme relating to the field facilities, as directed by the UK Secretary of State. Each Notice Holder confirms that they support the proposals detailed in these Decommissioning Programmes submitted by Hess Limited.

Letters from the Section 29 Notice Holders confirming this agreement are presented in Appendix J.

1 INTRODUCTION

1.1 The FFFA Development

The FFFA development comprises the Fife, Fergus, Flora and Angus fields. The co-venturers in the FFFA fields are Hess Limited (Hess) formerly known as Amerada Hess Limited and Premier Oil Exploration Limited (Premier) in the following ratios:

Table 1.1: FFFA Co-venturers

Field	Hess	Premier
Fife, Flora and Angus fields	85%	15%
Fergus Field	65%	35%

Hess is the Operator for the four fields. Bluewater Energy Services (BES) own and supplied the FPSO *Uisge Gorm* and operated the four fields as Duty Holder, under contract to Hess.

Collectively, the FFFA fields have produced approximately 100 mmbbl oil but, having reached maturity, they are no longer economically viable and are ready to be decommissioned. Production from the FFFA development was suspended in March 2008, with full decommissioning to follow if a redevelopment or sale option was not put forward by co-venturer Premier (Section 1.2).

The FFFA fields are located in the central North Sea, in Blocks 31/21, 31/26, 31/27a, 39/1 and 39/2, of the UK Continental Shelf (UKCS), approximately 330 km east-south-east of Aberdeen, in a water depth of approximately 71m.

Angus was originally developed in 1991 as a stand-alone project with two subsea wells produced via the Floating Production, Storage and Offloading (FPSO) vessel *Petrojarl 1*. This initial phase of production ceased in 1993, but after lying dormant for eight years Angus was redeveloped in 2001 and tied back to the Fife, Fergus and Flora FPSO. The Fife, Fergus and Flora fields, located approximately 18 km south-east of Angus, came on stream between 1995 and 1998 and produced to another FPSO – the *Uisge Gorm* - which operated at the location for 13 years. Table 1.2 provides an overview of the fields that make up the development, and Figures 1.1 to 1.3 provide a schematic overview of the location and layout of the fields.

Table 1.2: Overview of the FFFA Development

Field	Block	Average Water Depth	Distance from FPSO	Production Life	Oil Production Wells	Water Injection Wells
Fife	31/26a, 31/27a 39/1a 39/2a	70 m	1.5 km	1995 – 2008	P3, P8, P10, P13, P15	I3, I16
Fergus	39/2a	71 m	7.25 km	1997 – 2008	F7	None
Flora	31/26a, 31/26c	71 m	8 km	1998 – 2008	F01, F03	F02
Angus	31/21a, 31/21b 31/26g	72 m	18 km	2001 – 2006	A14	None

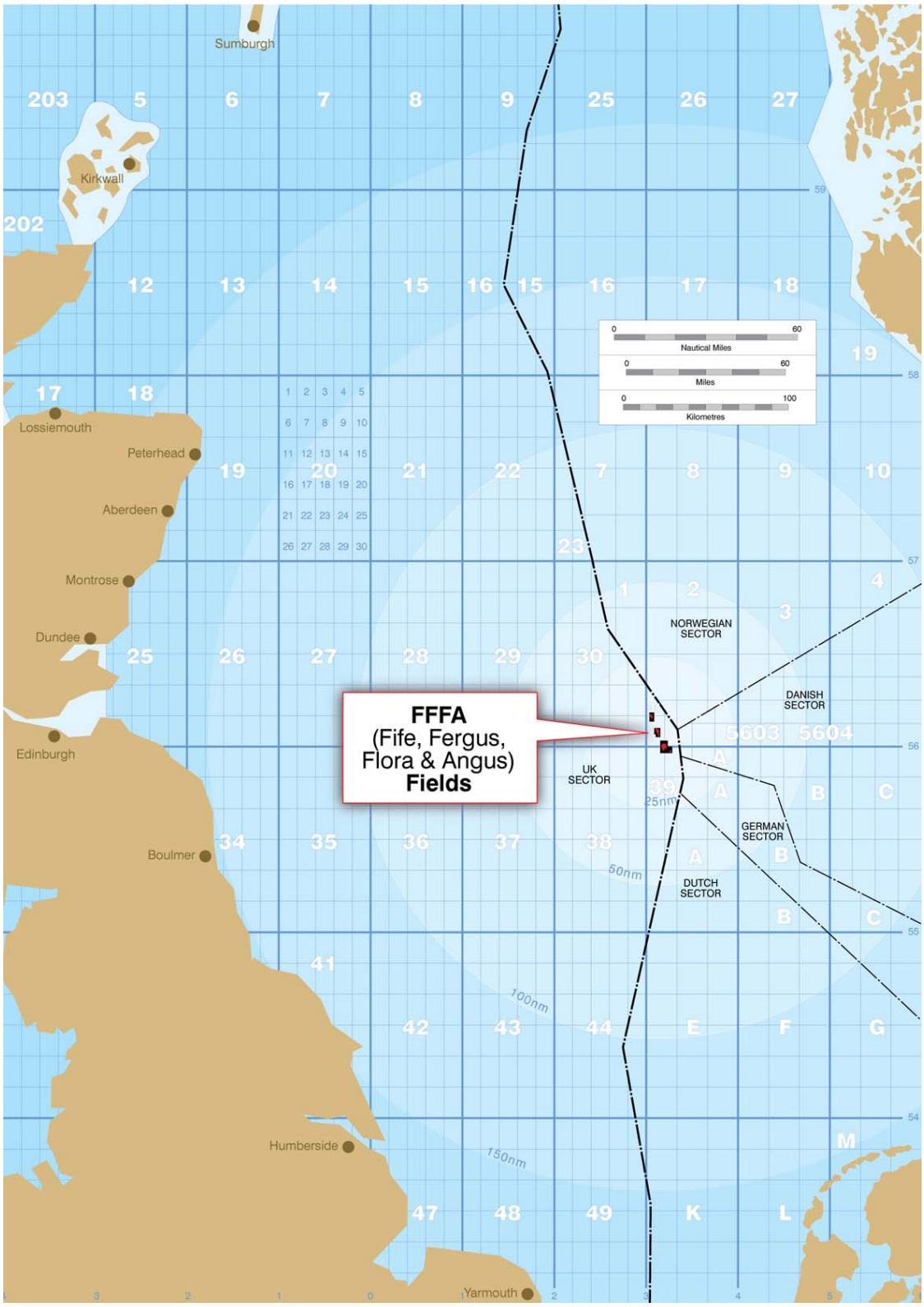


Figure 1.1: Location of the FFFA Development

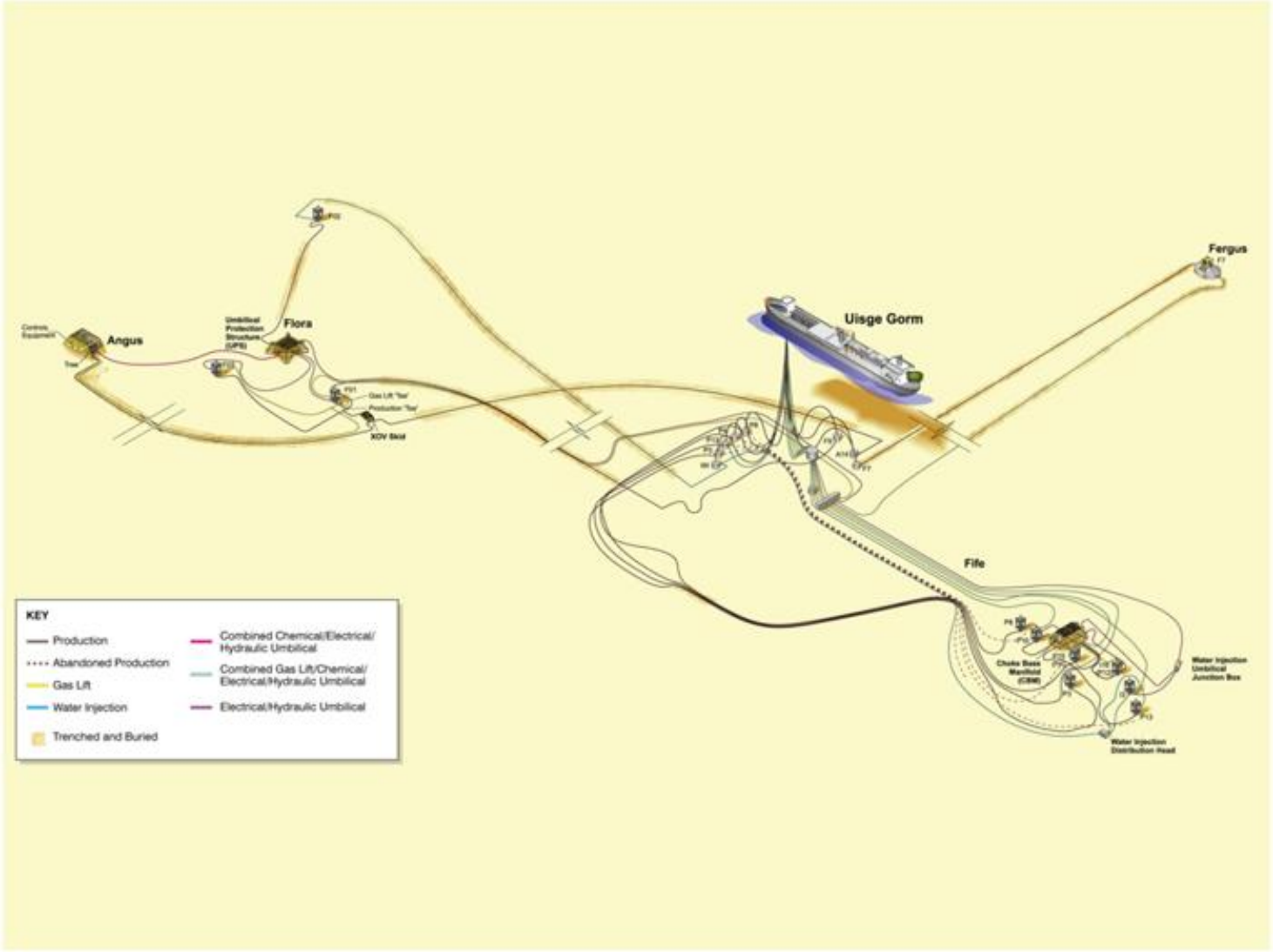


Figure 1.2: FFFA Development Layout

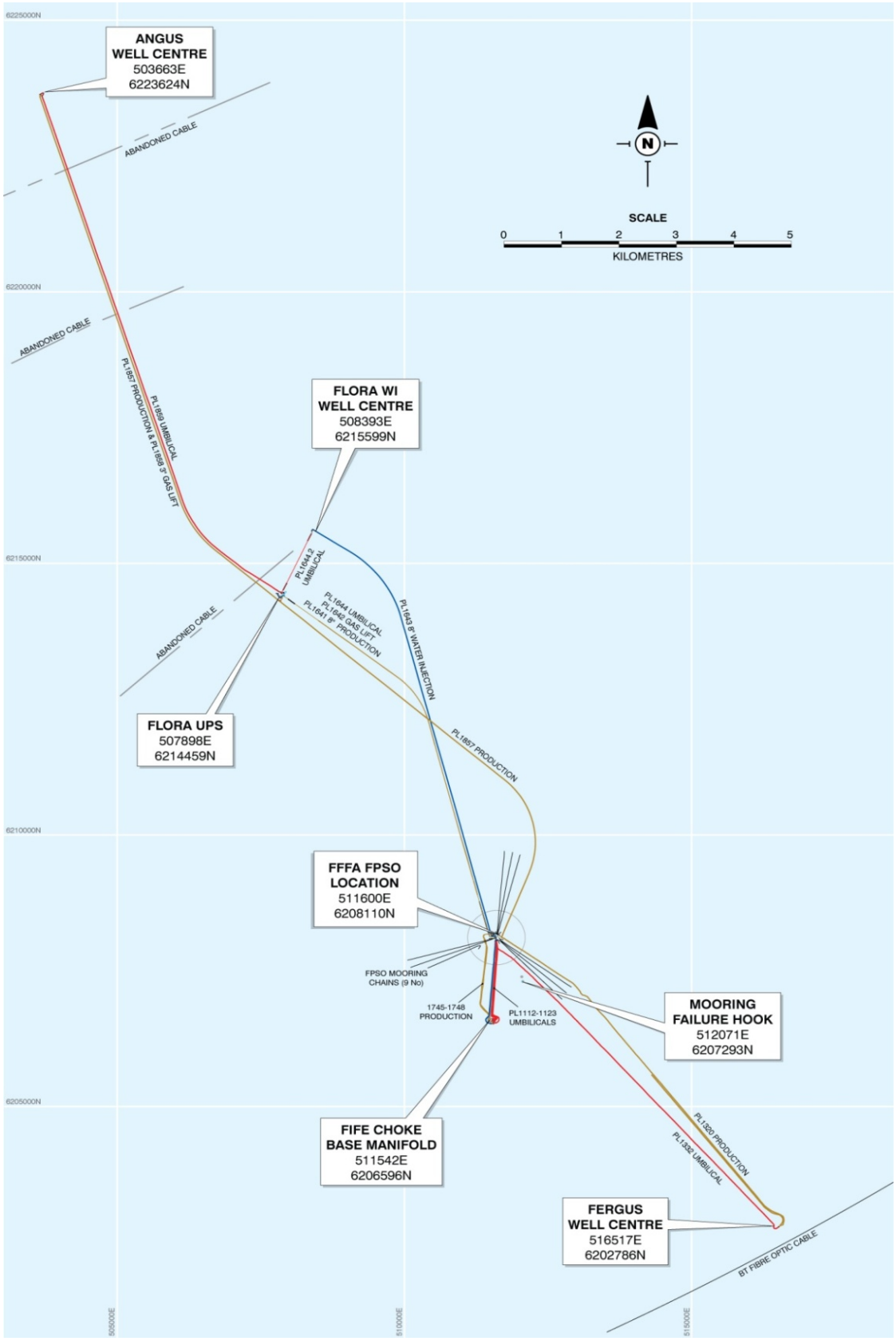


Figure 1.3: Chart showing Relative Location of Fields and Structures

Projection:UTM Projection Zone 31 (Central Meridian 3° East) International Spheroid ED 50.

1.2 Potential Redevelopment Options

The co-venturers of the FFFA development explored all available options for continuing production from the fields using the FPSO *Uisge Gorm*, but concluded that none was economically viable.

They also considered the potential for redevelopment of oil and gas resources in the vicinity of the FFFA fields. Hess decided not to pursue the redevelopment of these fields but Premier wished to maintain the option of redevelopment, subject to further studies. In February 2008, Hess and Premier therefore agreed and proposed:

'That pursuant to each of the FFFA fields' Joint Operating Agreements (JOAs), a unified recommendation has been made to the Department for Energy and Climate Change (DECC) for Phase 1 – Removal of the FPSO *Uisge Gorm* and safe suspension of the FFFA fields and facilities.'

In April 2008, Hess wrote to DECC outlining their proposals for removal of the FPSO *Uisge Gorm* and suspension of the FFFA fields. DECC replied in September 2008, stating that they were 'content with Hess's proposals in relation to this matter'. In addition, DECC advised that Premier had been given a 2-year period, with a possible extension to 4 years, to enable redevelopment opportunities to be investigated. In order to accommodate this period, a 5 year design life was adopted for the suspension criteria, equipment and preservation chemicals.

Originally, part of the subsea infrastructure (riser bases, flowlines and umbilicals) for the Fife and Fergus fields was installed and owned by Bluewater. As part of the agreement to demobilise the FPSO and suspend the fields, the ownership of this infrastructure was transferred to Hess and Premier.

Premier Oil UK completed field redevelopment studies in December 2010 and concluded that no viable opportunities for redevelopment exist. Accordingly, they released the fields to the joint venture for full decommissioning.

1.3 Decommissioning of the FFFA Development

As no further development solution has been found, Hess, on behalf of the co-venturers, has prepared Decommissioning Programmes for all the fields in accordance with the requirements of the Petroleum Act 1998. Options for the decommissioning of the FFFA development have been evaluated and assessed through a combined Comparative Assessment and Environmental Impact Assessment process, the results of which are presented here.

Phase 1 of the decommissioning project was completed in 2008 with the suspension of the fields and the removal of the *Uisge Gorm* FPSO. The disconnected risers were retrieved in two campaigns carried out in 2008 and 2009. Information on the Phase 1 activities to suspend the fields is contained in Appendix B.

The present document describes the proposed Phase 2 activities for full field decommissioning.

1.4 Scope of Document

This document presents the Decommissioning Programmes for each of the Notices served under Section 29 of the Petroleum Act 1998 for the FFFA fields.

The decommissioning of the FFFA fields will be managed as one project and the possible decommissioning options and associated impacts have been assessed collectively.

The Sections presented in this document therefore reflect a combined assessment and management approach. However, as each field is subject to separate Section 29 Notices under the Petroleum Act, a separate Appendix for each field, containing the relevant Decommissioning Programmes, is also presented here.

1.5 Structure of Document

For each of the four FFFA fields there are two Section 29 Notices, one for the subsea facilities and one for the pipelines. Eight Decommissioning Programmes are therefore presented in this document and they have been assigned Decommissioning Programme Reference (DPR) numbers as shown in Table 1.3.

Table 1.3: Decommissioning Programme Reference (DPR) numbers for FFFA Fields

Field	Decommissioning Programme Reference (DPR)	Section 29 Notice Reference	Section 29 Notice Holders	Items
Fife	1	RDBF/001/00068C	Hess, Premier, Bluewater	Offshore Installation (FPSO) + subsea facilities
	2	01.08.07.05/81C	Hess, Premier, Bluewater	Pipelines
Fergus	3	RDBF/001/00067C	Hess, Premier	All subsea equipment associated with the Fergus field
	4	01.08.07.05/80C	Hess, Premier, Bluewater	Pipelines
Flora	5	RDBF/001/00046C	Hess, Premier	All subsea equipment associated with the Flora field
	6	RBDF/002/00056C	Hess, Premier	Pipelines
Angus	7	RDBF/001/00155C	Hess, Premier	All subsea equipment associated with the Angus field
	8	RBDF/002/00248C	Hess, Premier	Pipelines

Table 1.4 shows the sections in this document that refer to each of these Programmes. This arrangement has been used to show clearly which structures or items fall within each programme, and to reflect the fact that for technical, logistical and commercial reasons, parts of several programmes may in reality be undertaken concurrently or consecutively, in order to maximise the use of available vessels and complete the programmes in the most efficient way.

The Appendices relating to the individual fields present the background to each field, the description of items in that field relating to the Section 29 Notices and the inventory of the materials of those items.

Table 1.4: The Decommissioning Programmes Presented in this Document

Section Number	Title	Decommissioning Programme Reference (DPR)							
		1	2	3	4	5	6	7	8
1	Introduction	Combined							
2	Executive Summary	Combined							
3	Background Information	Combined							
4	Removal and Disposal Options for the Pipelines and Umbilical	Combined							
5	Selected Removal and Disposal Options	Combined							
6	Well Decommissioning	Combined							
7	Drill Cuttings	Combined							
8	Environmental Impact Assessment	Combined							
9	Interested Party Consultations	Combined							
10	Costs	Combined							
11	Schedule	Combined							
12	Project Management and Verification	Combined							
13	Debris Clearance	Combined							
14	Pre- and Post-decommissioning Monitoring and Maintenance	Combined							
15	Supporting Studies	Combined							
APPENDIX A: Correspondence Regarding Phase 1 – Field Suspension		✓							
APPENDIX B: Phase 1 Operations – Field Suspension		✓							
APPENDIX C: The Fife Field		✓	✓						
APPENDIX D: The Fergus Field				✓	✓				
APPENDIX E: The Flora Field						✓	✓		
APPENDIX F: The Angus Field								✓	✓
APPENDIX G: Summary of FFFA Development Materials and Fates		Combined							
APPENDIX H: Example Public Notice		Combined							
APPENDIX I: Example Letter Accompanying Document to Consultees		Combined							
APPENDIX J: Section 29 Notice Holders Correspondence regarding submission of the Decommissioning Programmes		Combined							

2 EXECUTIVE SUMMARY

2.1 Status of the Development and the need for Decommissioning

The FFFA development is located in Blocks 31/21, 31/26, 31/27, 39/1 and 39/2 of the UKCS, 295 km from the UK coast and 10 km from the median lines with both Denmark and Norway. Hess and co-venturers Premier have determined that there are no viable alternative uses for the FFFA facilities in their present location and have concluded that the fields should be decommissioned. These Decommissioning Programmes have therefore been prepared in accordance with the requirements of the Petroleum Act 1998 and the DECC Guidance Notes. The assessments and recommendations in them have been informed by technical studies and informal consultation with stakeholders.

2.2 Phase 1 – Field Suspension and FPSO Removal

In order to suspend the FFFA development, the FPSO *Uisge Gorm* and the eight flexible production and water injection risers were removed in 2008 and 2009 (Appendix B). Correspondence with DECC regarding the removal of the FPSO is presented in Appendix A.

2.3 Phase 2 – Full Field Decommissioning

Full field decommissioning will involve the decommissioning and removal or making safe of the remaining subsea infrastructure which comprises pipelines, umbilicals, protective structures on the seabed, and the wells. Options for the decommissioning of subsea flowlines and umbilicals were the subject of a Comparative Assessment study, as required under the Petroleum Act 1998. Factors such as complexity/technical risk, risks to personnel, environmental impact, effect on other users of the sea and economics were considered for each option. The options were then scored and ranked to identify the preferred decommissioning solution.

Pipelines and umbilicals lying on the seabed will be completely removed and taken to shore for recycling or disposal, as appropriate. Where pipelines or umbilicals are already buried, their exposed end sections will be cut off and returned to shore for recycling or disposal. The exposed cut ends of these lines will be buried to the full depth of the existing trench by water-jetting.

Protective structures on the seabed will be recovered and returned to shore for recycling or disposal. Where such structures have been piled, the piles will be cut at least 0.6m below the seabed. If necessary, the piles of the FPSO mooring assembly shall also be cut to ensure that they are at least 0.6m below the seabed. The mooring chains and anchors will be retrieved and disposed of as appropriate.

In accordance with the 'UKOOA Guidelines for the Suspension and Decommissioning of Wells', the wells will be plugged and abandoned, the casing strings will be cut at least 10 ft (3m) below the seabed and the casings and Xmas trees will be taken to shore for reuse or recycling. These activities will be consented under the appropriate permits.

As the drill cuttings piles do not exceed the OSPAR 2006/5 thresholds for oil loss or persistence, they will be left on the seabed to degrade naturally.

2.4 Environmental Sensitivities

There are no particular environmental sensitivities within the FFFA development. The seabed in the area of the FFFA fields is uniform and smooth with no significant irregularities. The sediments in this area of the central North Sea are predominantly of well sorted dense to very dense sands with low carbonate content. They typically support infaunal communities dominated by polychaete worms and burrowing brittlestars.

There are no designated offshore SACs in the area of the FFFA fields. The closest offshore conservation area is the Dogger Bank draft SAC, approximately 70 km to the southwest. The nearest UK protected coastal conservation area and other statutory and non-statutory conservation sites along the Scottish and northeast England coasts are some 295 km from the development.

Fulmar, gannet, kittiwake, guillemot and puffin are commonly seen in the area around the FFFA development. Other species which may occur in low numbers include razorbill, herring gull and lesser black-backed gull. In the area around the FFFA fields, the vulnerability of seabirds and waterfowl to oil pollution is high in January and September, and low to moderate for other months. The coastlines of Denmark and Norway, which are of national and international conservation importance on account of numerous bird breeding colonies, wintering seabirds and areas used by marine mammals, are approximately 310 km from the FFFA development.

Mammals present in the central North Sea include long-finned pilot and killer whales, and bottlenose, Risso's, Atlantic white-sided and common dolphins. Minke whales, white-beaked dolphins and harbour porpoises have also been sighted in or around the FFFA area. All three species are present in the North Sea year-round, but sightings peak in the summer months.

The FFFA development lies within spawning grounds for mackerel, whiting, sprat, lemon sole and cod, and also within or close to year-round nursery areas for haddock and whiting. Fishing effort around the FFFA fields is classed as relatively low compared with other areas in the North Sea.

The central North Sea is an area of intensive oil and gas activity, and the FFFA development is sited on the southern edge of this extensive zone of development. The closest subsea pipeline passes within approximately 5 km of the Angus Field and follows the international boundary between the UK, Norwegian and Danish sectors. There are three subsea cables close to the FFFA development. The nearest field development to FFFA is the former Ardmore field, approximately 30 km to the northwest, but it is now under redevelopment. There are no renewable energy developments in the vicinity of the FFFA fields.

2.5 Environmental Impact of Decommissioning

The potential environmental impacts of the proposed decommissioning activities have been the subject of a full environmental impact assessment. A number of potentially significant impacts were identified and considered in the environmental impact assessment. On further assessment, with the assumption that established and proven industry controls would be applied to manage these impacts, the majority were assessed as being of low potential impact; where in most cases the effects will be localised and there is a good prospect of full recovery over time. These included the presence of vessels affecting fishing, and the disturbance to drill cuttings during seabed operations.

The most likely environmental impact during the removal of pipelines, the placement of rig spud cans or anchors during well decommissioning, and water jetting operations to bury cut pipeline ends, will be disturbance to the seabed. These impacts will be highly localised and temporary in nature with strong potential for recovery. The removal of the surface subsea infrastructure by these operations will allow the seabed habitat to recover fully from oil and gas production activities and allow fishing to resume in the area.

In terms of unplanned events, the only potentially significant impact identified was a large oil spill caused by a loss of well control during the well abandonment operations. However, the probability of such a spill is very low, and Hess will have mitigation and management procedures in place to prevent this from happening, as well as adequate resources to deal with any such spill should it occur.

Overall, it is therefore concluded that the proposed FFFA fields decommissioning operations will not cause any significant environmental effects

2.6 Long-term Environmental Impacts

The proposed decommissioning of the FFFA development will result in the removal of all structures lying on the seabed. Infrastructure that is to be left in situ will either be cut at least 0.6m below the seabed (eg driven piles) or buried to this depth (eg cut ends of flowlines). All of the techniques and procedures that would be employed are routinely used in oil and gas development or decommissioning projects.

The long-term presence of buried items is unlikely to cause any impact to other users of the sea (eg fishermen) due to the depth of burial and the low level of trawling activity in the area. The post-decommissioning monitoring programme that will be agreed with DECC will allow any required remedial action to be identified and implemented in a timely manner.

2.7 Estimated Schedule and Cost

It is intended that the main decommissioning activities will be performed during 2012-2015.

The cost of the decommissioning project will be influenced by a number of factors, eg market rates of vessels and equipment and engineering studies required prior to the work commencing.

The entire decommissioning programme will be managed by Hess. All measures to minimise and mitigate environmental impact, as described in the environmental impact section, will be delivered by the project through the Decommissioning Project Environmental, Health and Safety (EHS) Plan (ADP-018) which will implement the requirements of the Hess Environmental Management System (EMS) for this specific project.

2.8 Monitoring and Maintenance of Remains

Discussions have yet to take place on the post-decommissioning survey requirements for the FFFA development. It is likely that as-left surveys will be completed at each stage of work and reported to DECC. Monitoring of the buried items will then take place following decommissioning of the development, taking into account the local oceanographic conditions and potential for buried items to become exposed.

3 BACKGROUND INFORMATION

3.1 Current FFFA Facilities

The FFFA fields are located in the central North Sea. They are aligned from northwest to southeast across Blocks 31/21, 31/26a, 31/27a, 39/1 and 39/2, approximately 295 km to the east of the nearest UK coastline. Angus, the most northerly field, is approximately 23 km from Fergus, the most southerly field. The two closest fields, Fife and Fergus, are 3 km apart. Detailed descriptions of the facilities associated with each FFFA field are presented in Appendices C to F.

A more detailed description of the environmental conditions experienced at the FFFA Development can be found in the supporting environmental statement for the decommissioning of the FFFA Development (ADP-004).

3.2 Metocean Data

Table 3.1 summaries the metocean conditions at the FFFA development.

Table 3.1: Metocean Conditions at FFFA

Average water depth		70m LAT
Tidal ranges		
	Highest Astronomical Tide (HAT)	+1.10 m
	Mean High Water Springs (MHWS)	+1.01 m
	Mean Tide Level	+0.58 m
	Mean Low Water Springs (MLWS)	+0.14 m
Current speed (Return period of 50 years)		
	Surface	140 cm/s
	20m below surface	69 cm/s
	20m above seabed	67 cm/s
	0.5m above seabed	46 cm/s
Waves (Return period *Hs*)		
	1 year	9.8 m
	10 year	12.0 m
	50 year	13.5 m
Wind (Return period, wind speed – 10 minute mean at 10m above sea level)		
	1 year	27.5 m/s
	10 year	30.7 m/s
	50 year	32.8 m/s

3.3 Seabed

The seabed in the area of the FFFA development consists of dense to very dense sand with low carbonate content. These sediment characteristics have previously been described in the Fife and Angus environmental surveys (ADP-015). The seabed across the area of the fields is virtually flat, with water depths ranging from 67m to 72m.

Total hydrocarbon concentrations (THC) and the concentrations of polycyclic aromatic hydrocarbons (PAH) and heavy metals were recently measured in seabed sediments within the FFFA area. Concentrations were found to be higher in the vicinity of the well locations, declining to background levels approximately 200m away. An assessment of the FFFA cuttings piles concluded that they are unlikely to exceed the thresholds for oil loss rate and persistence established by OSPAR Recommendation 2006/5 (ADP-015). Further details are presented in Section 7.

3.4 Biological Environment

3.4.1 Plankton

The plankton community in the waters around the FFFA fields is characteristic of that found over a wide area of the central North Sea.

3.4.2 Benthos

The sandy sediments in the FFFA area of the central North Sea typically support infaunal communities dominated by polychaete worms and burrowing brittlestars. In 1993, a post-abandonment survey in the Angus Field observed a heavily modified infaunal community around the wellhead, dominated by opportunistic polychaete worms. The environmental baseline study conducted for the Fife Field that same year showed a high degree of uniformity in community structure, with no significant signs of industry-related physical or chemical disturbance.

3.4.3 Fish and Shellfish

The FFFA area contains fish stocks of both commercial and non-commercial importance. Demersal fish species include gadoids such as cod, haddock and whiting, and flatfish such as plaice and lemon sole. The main pelagic species present are herring and mackerel. The sandy sediments are likely to support sandeels but are unsuitable for *Nephrops* and this species would not be expected to occur in the FFFA area. The FFFA development lies within spawning grounds for mackerel, whiting, sprat, lemon sole and cod, and within or close to year-round nursery areas for haddock and whiting.

3.4.5 Seabirds

The coastline nearest to the FFFA development provides important breeding and over-wintering sites for seabirds. Seabirds are found in lower densities offshore and their distribution becomes patchy. The abundant bird species in and around the FFFA area are fulmar, gannet, kittiwake, guillemot and puffin. Other species which may occur in low numbers in the vicinity of the FFFA fields include razorbill, herring gull and lesser black-backed gull (BODC, 1998). In the area around the FFFA fields, the vulnerability of seabirds and waterfowl to oil pollution is regarded as low to moderate for much of the year, although it is high in January and September (JNCC, 1999).

3.4.6 Marine Mammals

Several species of whale, dolphin and porpoise have been recorded in the central North Sea, including the long-finned pilot and killer whales, and bottlenose, Risso's, Atlantic white-sided and common dolphins. Minke whales, white-beaked dolphins and harbour porpoises have also been sighted in or around the FFFA area.

Breeding and haul-out sites for both grey and common seal are found along the east coast of Scotland and the northeast coast of England. Since these sites are all nearly 300 km from the FFFA area, it is unlikely that either of these species would be present in significant numbers in the region of the FFFA development.

3.5 Conservation Interests

The FFFA development is in an area of the North Sea where seabed features of conservation interest are not regularly encountered. Regional and site-specific survey data, and knowledge of the distribution of such features on the UKCS, inform the view that such features are unlikely to occur in the FFFA area.

The nearest UK coast and the areas of conservation importance for seabirds and coastal environments are approximately 295 km away from the FFFA development. There are no designated offshore SACs in the area of the FFFA fields. The closest offshore conservation area is the Dogger Bank draft SAC, approximately 70 km to the southwest. A review of the sediments and seabed features in the area has shown that neither pockmarks nor sandbanks, two of the main features of conservation importance in the North Sea, are likely to be present. Video surveys of fouling growth on the FFFA subsea infrastructure have not found evidence of the cold water reef-forming coral *Lophelia pertusa*. ROV surveys around the FFFA infrastructure have not recorded any *Sabellaria* reefs.

3.6 Fishing, Shipping and other Commercial Activities

The HSE and the Seabed Data Centre (Oil and Gas) at the United Kingdom Hydrographic Office have been informed that the FPSO *Uisge Gorm* has left the field. Subsequently, Hess applied for and was granted a subsea safety zone named 'FFFA Centre', centred on the former location of the FPSO. The subsea safety zones around the FFFA wells continue to be valid until such time as the fields are fully decommissioned.

3.6.1 Fishing Activities

The grounds around the FFFA fields support mixed fish stocks of commercial importance, mainly demersal species such as cod, haddock, plaice, lemon sole and, to a lesser extent, pelagic species such as herring and mackerel.

The FFFA development lies in ICES statistical rectangles 40F3 and 41F3 and adjacent to 40F2 and 41F2. Data for catches landed by UK vessels (Scottish Government Marine Directorate 2007) indicated that demersal fisheries dominate this area with an annual catch in 2007 of 705 tonnes, with a value of £1.23 million. The main species caught were lemon sole and plaice. The shellfish fishery in these rectangles comprises mainly whelks, squid and occasionally *Nephrops*, with a cumulative catch of about 90 tonnes since 2004. Pelagic fishery activity in this area is very low. The only data available for foreign fishing vessels was relative to those landing in UK ports and showed a low, mainly demersal activity in the four rectangles.

Fishing effort around the FFFA fields is classed as relatively low compared with other areas in the North Sea. Coull *et al*., (1998) rated fishing effort in these four rectangles (demersal, beam trawl, North Sea beam trawl, *Nephrops*/shrimp and static gears) as low to moderate.

As part of the agreement to suspend the fields for a period, a fishing vessel has been contracted to act as a guard boat in the fields to warn vessels of the locations of the seabed infrastructure.

3.6.2 Shipping

There are 25 routes within 20 nautical miles of the location of the *Uisge Gorm*, with an estimated 3,855 vessels per annum (approximately 11 vessels per day). The majority of these are tankers (40%) and cargo ships (53%) in the 1,500 – 5,000 Deadweight Tonnage (DWT) range. No route passes closer than 2 nautical miles from the former location of the *Uisge Gorm*.

3.6.3 Oil and Gas Developments

The central North Sea is an area of intensive oil and gas activity, and the FFFA fields are sited on the southern end of the main zone of development in the UK sector. Most of the developments nearby therefore lie to the north, in the UK sector, or to the east, in the Norwegian and Danish sectors.

The Ardmore Field, which has ceased production, is now being redeveloped by Enquest and the Uisge Gorm will be redeployed to that location. The closest fields in the Norwegian sector are about 50 km to the north in the Ekofisk area, and comprise the active fields Ekofisk, Eldfisk, Embla and Tor, together with the Albuskjell, Hod, Edda and West Ekofisk fields that have ceased production.

3.6.4 Cables, Pipelines and Seabed Obstructions

There are three subsea cables close to the FFFA area, excluding the disused lines that used to connect the UK and Norway, and the disused UK 'Denmark 4' cable which belongs to British Telecom (BT). The presence or absence of remains of these cables on the seabed has not been confirmed, but some are not marked on the relevant cable awareness chart (Kingfisher, 2008). The nearest cables still in use run south of the FFFA area, within approximately 3 km of the Fergus Field. These are CANTAT 3 F4 belonging to BT and, in the same corridor, the telecommunications cable PANGEA North which links UK with Denmark (Kingfisher, 2008). The NORSEA COMS cable runs just outside the UK/Norway transboundary line, approximately 4 km east of the Fergus Field. The closest subsea pipeline is the Zeepipe, running between the Sleipner and Zeebrugge fields, which comes within approximately 5 km of Angus Field and follows the international boundary between the UK, Norwegian and Danish sectors (Hydrographer of the Navy, 1997).

An operational BT fibre-optic communications cable is located approximately 314m south-south-east of the Fergus wellhead. The cable is trenched and buried, and is orientated approximately east-south-east/west-south-west. BT will be notified of the decommissioning schedule. The closest marked wreck in the UK sector is located some 40 km to the west of the FFFA area.

3.6.5 Military Activity

Aircraft, ships and submarines from several countries use the North Sea as a training ground and for routine operations. The distribution and frequency of these operations is unknown. A number of UK Royal Navy submarine exercise areas are designated in the central North Sea; the closest is some 60 nautical miles (~111 km) to the north-west of the Angus Field (Hydrographer of the Navy, 1997), although its boundaries and extent are not defined.

SECTION 4 : REMOVAL AND DISPOSAL OPTIONS FOR THE PIPELINES AND UMBILICALS

4 REMOVAL AND DISPOSAL OPTIONS FOR THE PIPELINES AND UMBILICALS

4.1 Introduction

Each pipeline and umbilical in the FFFA development was assessed to identify the most appropriate decommissioning option for it, considering the complexity and associated technical risk, risks to personnel, environmental impact, effects on safety of navigation / other uses of the sea, and economics. This section presents the options considered for the decommissioning of the pipelines and umbilicals, and the results of the Comparative Assessment of these options. The full description of the Comparative Assessment procedure is presented in the report FFFA-Decomm-HSE-RP-410 Rev 0.

4.2 Comparative Assessment Method

The DECC Guidance Notes require that all feasible options for the decommissioning of a pipeline or umbilical should be evaluated by means of a formal Comparative Assessment. The information in this section is based on the full Comparative Assessment Report (FFFA-Decomm-HSE-RP-410 Rev 0).

For the FFFA lines, Hess evaluated options against the 5 main criteria recommended by DECC. These in turn were broken down into 12 sub-criteria, some of which could be evaluated qualitatively and some quantitatively. The assessment criteria used and their respective weightings were:

- Complexity and associated technical risk (15% weighting).
- Risks to personnel (25% weighting).
- Environmental impact (20% weighting).
- Effect on safety of navigation and other uses of the sea (20% weighting).
- Economics (20% weighting).

The qualitative and quantitative data required to inform the Comparative Assessment were gathered in two separate phases of work. Firstly, desk top studies were undertaken to generate data for those criteria that could be assessed quantitatively; these were atmospheric emissions and energy use, safety, and economic costs. A workshop was then held at the Hess office in Aberdeen, where technical and environmental experts from Hess and ERT (Scotland) Limited discussed all the criteria, and scored the performance of each option on a scale of 1-5 where a score of 5 represents the most desirable outcome for the assessment criterion in question.

4.3 Subsea Flowlines and Umbilicals

The removal options considered for various categories of flowlines and umbilicals are summarised in Table 4.1.

Table 4.1: Removal Options for Flowlines and Umbilicals

Items to be Decommissioned	Options			
	1	2	3	4
A - Flexible and rigid flowlines and umbilicals lying on the seabed	Leave all lines in place. Use existing mattresses and additional rock dumping to cover those lying on the surface.	Remove all surface lines, and recycle or dispose of onshore.	Bury all surface lines by water-jetting.	N/A
B - Buried flexible and rigid flowlines and umbilicals (the ends of these lines are on the seabed)	Leave all lines in place. Use existing mattresses and additional rock dumping to cover sections lying on the surface.	Remove all surface lines at trench transition and bury the cut ends by rock dumping. Recycle or dispose of retrieved material onshore.	Remove all surface lines at trench transition and bury the cut ends by water-jetting. Recycle or dispose of retrieved material onshore.	Remove all surface and buried sections of lines. Recycle or dispose of retrieved material onshore.

4.3.1 A - Flexible and Rigid Flowlines and Umbilicals Lying on the Seabed

Option A1 - Leave all lines in place – use existing mattresses and additional rock dumping to cover those lying on the surface

The primary operation involved in this option would be rock dumping to cover surface flowlines and umbilicals. This would involve up to 25 km of rock dumping along the flowlines and umbilicals, using a dedicated rock dumping vessel. The technology involved is well developed and has been used regularly in the industry to fulfil equivalent objectives in previous operations. However, with this option there would be an obligation to conduct extensive long-term monitoring of the decommissioned infrastructure to ensure that no navigational hazards developed. Maintenance may be required to remedy such hazards, depending on monitoring results.

With the exception of the diving operations, the risks to personnel in this option are due to the relative length of the operation rather than the particular risk inherent in the tasks involved.

The dumping of rock material would have a direct physical impact on the seabed by crushing any benthic organisms present and altering the local composition of the sediment. It would cause some remobilisation of seabed sediments in affected areas, resulting in a temporary increase in turbidity of the water column. Although re-colonisation would take place, the sections of seabed covered by rock would be colonised by communities that were different from those present in the surrounding finer sediments. The area of seabed affected in this way would, however, be small compared to the total surrounding area available for more typical community types.

As none of the infrastructure would be removed, there would be no onshore waste disposal requirements. However, leaving all the lines in place would result in a loss of materials that could be reused or recycled. The emissions and energy requirements for replacing this lost material would add to the overall environmental impact of the option.

As noted, the rock-dumped lines would have to be surveyed to ensure there were no subsequent hazards to navigation for surface vessels or fishing gear. The option would have significant operational costs, due primarily to the extensive use of a rock dumping vessel and the length of operations. As this option would result in infrastructure remaining *in situ* (approximately 1,160 tonnes of steel) there would also be a cost associated with the ongoing monitoring programme required, although there would be no waste disposal costs to take into account.

Option A2 - Remove all surface lines and recycle or dispose of onshore

In this option all the surface flowlines and umbilicals would be prepared for removal by divers working from a diving support vessel (DSV). They would then be pulled from the seabed over a chute and onto the deck of a vessel fitted with a cable tensioner or linear winch. Once on deck, the lines would be stored on a powered reel or carousel or cut into manageable lengths. A total of ~25 km of surface lines would be removed in this way. As with option A1, the procedures involved in this option have a proven record in maritime operations elsewhere and are expected to fulfil the objectives of the programme.

The main risk in this option is associated with the use of divers to prepare the lines for removal onto the pipelay vessel.

The removal of flowlines and umbilicals would cause some remobilisation of sediments when the lines were lifted from the seabed although it is unlikely that these effects would be noticed against natural variation. This would also expose the underlying seabed, allowing sediment resettlement and re-colonisation by benthic communities. The removal of lines would require the involvement of onshore waste carriers and waste disposal contractors. As all the steel from the pipelines would be recycled (approximately 1,160 tonnes) there would be considerable conservation of non-renewable resources and this option would therefore consume less energy in overall terms than options which leave the material on the seabed.

The principal costs associated with this option are the use of a DSV and a pipelay vessel to remove the flowlines and umbilicals. There would also be a notable cost associated with the waste disposal of the material returned to land. However, this would be offset to some degree by the fact that there would be no lasting interference with fishing or navigation, and no long-term monitoring and maintenance requirements or costs.

Option A3 - Bury all surface lines by water-jetting

In this option, trenches would be dug around the surface flowlines and umbilicals (~25 km total length) by a trenching vessel, and the pipelines disconnected by divers. A hydraulic jetting tool would then be used by the divers or an ROV to backfill the trenches and bury the pipelines. Although this technique has had only limited use in the oil and gas industry, it is widely used in other marine industries and should be sufficient to fulfil the objectives of the decommissioning programme. The trenched and buried lines would require some long-term monitoring, but because they would be buried, the monitoring programme might not be as extensive or onerous as that for Option A1.

As with Option A2, the risks associated with this option relate chiefly to use of divers to prepare the lines.

Trenching operations would impact benthic communities along the corridor surrounding the pipelines. Trenching and jetting would also remobilise sediments and cause an increase in turbidity for a short time but there would be a good potential for recovery. As no material would be returned to shore there would be no onshore waste disposal issues but there would be an associated loss of potentially reusable resources (about 1,160 tonnes of steel), and this would result in an increase in the overall energy use and gaseous emissions associated with this option.

As the pipelines would be trenched, there would be no subsequent interference with trawling or navigation. The costs of this option are primarily driven by the duration of DSV and diver operations.

4.3.2 B - Buried Flexible and Rigid Flowlines and Umbilicals

Option B1 - Leave all lines in place – use existing mattresses and additional rock dumping to cover sections lying on the surface

All buried flowlines and umbilicals would be left in place with their exposed end sections (approximately 3.5 km in total), buried by rock-dumping. The feasibility of this option, and the performance of the technology, are the same as Option A1. This option would also necessitate long-term monitoring; the pipelines would be left in place and material which may present a hazard to other users, eg fishing vessels, would be placed on the seabed.

The principal risks to personnel in this option arise from the use of divers and the DSV.

The environmental impacts resulting from the rock dumping would be similar to those described for Option A1. Although colonisation would take place, the sections of seabed covered by rock would be re-colonised by communities that would be different from those present in the surrounding finer sediments. The area of seabed affected in this way would be small compared to the total surrounding area available for more typical community types. With only around 3.5 km of pipeline to be covered instead of 25 km, these impacts would be confined to a smaller area than that affected in Option A1.

As none of the infrastructure would be removed, there would be no onshore waste disposal requirements. Approximately 4,327 tonnes of steel that could potentially be reused or recycled would be lost, and its theoretical replacement would use energy and generate gaseous emissions that would be attributable to this option.

The dumped rock would be surveyed at the end of operations to ensure it did not pose any hazards to navigation for surface vessels or fishing gear.

Economically, the principal costs associated with this option are derived from use of the rock dumping and diving support vessels.

Option B2 – Remove all surface lines at trench transitions and bury the cut ends by rock dumping. Recycle or disposal of retrieved material onshore

At the sites where they emerge from the seabed, all pipes and umbilicals would be cut by divers using a hydraulic cutting tool. Recovery heads would be fitted by divers to the cut ends of the surface sections (approximately 3.5 km total length), an ROV would be used to hook-up the lines to a pipelay vessel, and the lines would be pulled from the seabed over a chute and onto the deck of the vessel. Once on deck, they would be stored on a powered reel or carousel, or cut into manageable lengths. The exposed cut ends of the buried sections on the seabed would then be rock dumped.

The technology involved is well developed and widely used, but as some lines would be left *in situ*, long-term monitoring would be required, although not to the same extent as in Option B1. Risks associated with this option are similar to those in B1, but diving would be used more extensively.

In this option, only small lengths of pipeline (a few tens of metres) would be rock-dumped, with the same associated impacts as described in options A1 and B1 but on a smaller scale. All surface sections of these lines would be removed to shore and recycled, and recovery of this non-renewable material (approximately 149 tonnes of steel) would improve the overall energy and emissions profile of operations compared to leaving all the material *in situ.*

This option would be expected to result in a low level of disruption to other users of the sea, similar to option B1. The total cost associated with this decommissioning option would include the rock dumping vessel, a DSV, and a pipelay vessel, as well as limited expenditure for the waste disposal of the material returned to shore.

Option B3 - Remove all surface lines at trench transitions and bury the cut ends by water-jetting. Recycle or dispose of retrieved material onshore

This option is identical to B2 in the activities involved except that the cut ends of lines would be buried using a jetting tool rather than by rock dumping. As with the first two options for buried flowlines and umbilicals, the technologies involved are used widely in marine industries and have a good record. The buried areas would require some monitoring after decommissioning.

The principle risks to personnel associated with this option arise from the use of divers and a DSV.

Impacts to the seabed and associated fauna resulting from lifting and jetting activities would be transitory and localised, and are not expected to be measurable against background variation. Treatment before recycling would be the same as for option B2. Again, recovery of non-renewable materials (approximately 149 tonnes of steel) would improve, to some extent, the overall energy cost and associated atmospheric emissions.

As any exposed ends would be jetted-in, there should be no disruption to fishing or other activities once decommissioning has been completed. Economically, the greatest cost is associated with the diving operation. However, there is also an expense attached to the disposal of the waste material brought to land.

Option B4 - Remove all surface and buried sections of lines. Recycle or dispose of retrieved material onshore.

The buried flowlines and umbilicals would be excavated by a trenching vessel, and the pipelines then prepared for removal by divers working from a DSV before being lifted onto a pipelay vessel. A total of approximately 90 km of lines would be removed. Some areas may prove more difficult to excavate as they have been rock-dumped, and although the processes involved have been used before, their use in the marine industry is limited and their performance has been mixed. If all lines were removed successfully, there would be no requirement for any long-term monitoring of the area.

The main risk associated with this option comes from the use of divers.

The excavation and lifting of all buried flowlines and umbilicals would result in noticeable local disturbance to the seabed, water column and local fauna although there should be good potential for recovery once operations had been completed. Since all seabed pipelines would be returned to shore, this represents a considerable amount of material to be recycled (approximately 4,327 tonnes of steel) in comparison to the other options. There would therefore be considerable conservation of non-renewable resources in this option.

4.4 Comparative Assessment Results

The results of Comparative Assessment discussions and calculations for the subsea flowlines and umbilicals are presented in Table 4.3 which shows the evaluation matrix populated after each option has been scored against the assessment criteria.

4.5 Comparative Assessment Selection and Conclusion

The structured approach of the Comparative Assessment methodology defined in Section 4.2 results in a fully quantified and repeatable selection of a single option. This evaluation takes into account the overall balance between the practicability of the operation, the risks to personnel involved, the impacts on the environment, the effects on other users of the sea and the economic costs.

For the flowlines and umbilicals that are on the seabed, the assessment shows that, with an overall Comparative Assessment score of 3.93, the preferred option would be complete removal from the seabed surface (Table 4.3). This compares to a score of 2.88 for Option 1 (leave *in situ* and rock dump to cover) and 3.68 for Option 3 (leave *in situ* and jet-in to bury).

For all buried flowlines and umbilicals, the assessment indicates that leaving them in place, whilst removing the surface components, is the preferred option. This option had an overall Comparative Assessment score of 3.81. This compares with scores of 3.28, 3.41 and 3.58 for Options 1 (leave *in situ* and rock dump ends), 2 (remove surface components, leave buried *in situ* and rock dump cut ends) and 4 (remove all) respectively.

Consequently, all flowlines and umbilicals that have been laid on the seabed will be removed. The trenched and buried pipelines/umbilicals summarised in Table 4.2 will be cut at their trench transitions and the free sections will then either be lifted and recovered onto a reel, or cut into lengths and recovered 'piece small'. The section of flowline remaining at the trench transition will be buried to at least 0.6m by water-jetting.

Table 4.2: Trenched and Buried Pipelines that would be Left in Place

DPR	Field	Pipeline ID	Size (in)	Description
4	Fergus	PL1320	6 / 7	Oil production flowline (Fergus well – Riser Base)
4	Fergus	PL1320_X	7	Abandoned oil production flowline (Fergus well – Mid Line)
4	Fergus	PL1322	4	Umbilical (Riser Base – Fergus well)
6	Flora	PL1641	8	Oil production flowline (Well F01 – Riser Base)
6	Flora	PL1642	3	Gas lift flowline (Well F01 - Riser Base)
6	Flora	PL1643	8	Water injection flowline (Riser Base – Well F02)
6	Flora	PL1644	5	Umbilical (Riser Base – UPS)
6	Flora	PL1644.2	5	Umbilical (UPS – Well F02)
8	Angus	PL1857	8	Production flowline (Well A14 – Riser Base)
8	Angus	PL1858	3	Gas lift flowline (Well A14 – Flora 'T')
8	Angus	PLU1859	4	Umbilical (Flora UPS – Well A14)

Table 4.3: Results of Comparative Assessment for Flowlines and Umbilicals

Decommissioning Option		Complexity and associated technical risk (15%) S_{ctr}				Risk (25%) S_{risk}	Environmental Impact (20%) S_{Env}				Effect of safety of other users of the sea (20%) S_{Users}	Economics (20%) S_{Ec}		Comparative Assessment Score
		Technical feasibility - the design or implementation stage of the technology or system.	**Usage** - the application of the technology or system within marine industry at the water depth at FFFA.	**Performance** - the success or potential of the technology in meeting and exceeding the objective.	**Monitoring and maintenance** - requirements of FFFA subsequent to undertaking of selected decommissioning option.	**Safety** - the potential effect on injury and plant accident frequency.	**Environmental impact environmental impact –** from decommissioning operation, in particular impact on benthos and fish populations.	**Waste disposal** - consideration of onshore waste disposal issues including landfill.	**Energy use n**- conservation of non renewable resources.	**Atmospheric emissions**	**Socio-economic impact** - impact on other sea users in particular commercial fisheries. Risk to those on land.	**Decommissioning costs** - cost of undertaking decommissioning operation with selected option technology.	**Operational & Maintenance cost** - costs of any required ongoing maintenance or monitoring programme following implementation of selected option.	
A	**Flexible and Rigid Flowlines and Umbilicals on Seabed.**													
A1	Leave all lines in place – existing mattresses and additional rock dumping to cover surface ones.	5	5	3	1	3	3	5	3	3	2	2	3	**2.88**
A2	Remove (reel) all surface lines (for onshore disposal or recycling).	5	5	3	5	3	4	2	4	4	5	3	5	**3.93**
A3	Jet in all surface lines.	5	4	3	2	3	3	5	4	4	4	4	4	**3.68**
B	**Flexible and Rigid Flowlines and Umbilicals Buried**													
B1	Leave all lines in place – existing mattresses and additional rock dumping to cover surface sections.	5	5	3	1	3	3	5	3	3	3	4	3	**3.28**
B2	Remove (reel) all surface sections at trench transition (for onshore disposal or recycling), and bury cut ends by rock dump.	5	5	3	2	3	4	3	3	4	3	4	4	**3.41**
B3	Remove (reel) all surface sections at trench transition (for onshore disposal or recycling), and bury cut ends by jetting.	5	5	3	2	3	4	3	3	4	5	4	4	**3.81**
B4	Remove all surface sections and buried sections of lines, for onshore disposal or recycling.	5	2	2	5	3	3	1	4	4	5	2	5	**3.58**

5 SELECTED REMOVAL AND DISPOSAL OPTIONS

5.1 General

This section presents the proposed programme of work that will be carried out offshore to decommission the subsea infrastructure remaining in the field following the Phase 1 suspension activities. The programmes of work for the plugging and abandonment of the wells and for the removal of seabed debris are described in Section 6 and Section 13 respectively. All information regarding the field suspension, removal of the FPSO and dynamic flowlines is presented in Appendices A and B.

It is Hess's intention to invite competitive tenders for the removal and disposal of the facilities, pipelines and umbilicals. Therefore, the final solution adopted in each case will depend upon the contractor(s) chosen and their available vessels and equipment, although the general proposals outlined in this section will be the guiding principles and philosophy.

5.2 Phase 2 Activities

5.2.1 Flexible Umbilical Risers

During Phase 1, and working within the constraints of vessel availability and the requirement to release the FPSO from the field, the umbilical risers were lowered to the seabed and cut into lengths and remain in the vicinity of the riser base. During the Phase 2 activities, these lengths will be lifted to a recovery vessel and returned to shore for recycling and disposal.

The majority of the chemical lines have been displaced to potable water and the potential discharge for the remaining, blocked, chemical cores and the hydraulic control lines will be subject to a PON15C application.

5.2.2 Mid-water Buoy

The mid-water buoy, presently lying on the seabed, will be recovered in one or more pieces; with the final choice being determined by the available vessels and equipment.

5.2.3 Seabed Structures

All of the subsea infrastructure will be removed and returned to shore for reuse/recycling or disposal, as appropriate. Whether the items will be removed in a single lift or cut into pieces before removal will depend upon detailed engineering reviews based on the successful contractor's available vessel, crane capacity and equipment. In general, the small items will be lifted in one piece but some of the larger structures may need to be cut into smaller or lighter pieces before being lifted.

All driven piles will be cut at least 0.6m below the seabed, probably using a grit-entrained HP water jet. It is envisaged that the suction pile type riser bases will be released from the seabed using a reverse installation technique, ie fitting a pump/hoses to create an internal pressure to force the pile out of the seabed.

The flowlines within the manifolds were flushed and left filled with inhibited seawater as part of the FPSO removal preparations; any potential discharges during flowline/jumper/umbilical disconnection will be covered by an OPPC Term Permit and PON15C.

These structures are primarily carbon steel (with some small quantities of Al-Zn anodes, stainless steel inlays, and electronic control modules) which should allow a high percentage of recovered material to be recycled.

The retrieved equipment and flowlines will be checked for the presence of NORM contamination. Should evidence of contamination be found, the items will be disposed of onshore using a licensed contractor, appropriate disposal routes for such material and according to the relevant legislation.

5.2.4 Mattresses and Grout Bags

It is anticipated that a subsea basket will be used to lift the mattresses from the seabed as this is likely to be the safest and most practical option. It is intended that all mattresses will be recovered. If it is found, however, that the mattresses or grout bags have deteriorated to such an extent that it is impractical or unsafe to remove the remaining 'rubble', discussions will be held with DECC to decide a course of action.

Once the schedule for removal has been finalised, alternative methods of recycling mattresses will be investigated (eg for use by local authorities in construction/civil engineering projects, coastal defence work, or the construction/reinforcement of breakwaters around harbours and marinas). Parts of the mattresses could also have a potential use as moorings. Ultimately, the concrete could be broken up to supplement aggregate used in roads or other construction projects.

5.2.5 Mooring Chains and Piles

Since the tops of the mooring piles are 1m below the seabed, these items will be decommissioned *in situ*.

At present, the mooring chains are predominantly on the seabed. Therefore, in order to minimise disruption to the seabed and eliminate the requirement for ongoing inspection, the sections lying on the seabed will be cut free and removed to shore for recycling, rather than being trenched and buried. The short length attached to the mooring pile will be water-jetted to give at least 0.6m cover of sediment.

5.2.6 Xmas Trees

The Xmas trees will be removed and the casing strings cut at least 10 ft below the seabed.

Once returned to shore, it is likely that the Xmas trees will be recycled. However, it is possible that, depending upon their condition, there may be a potential to refurbish and sell the trees for re-use and this option will be explored in detail at the time.

5.2.7 Subsea Flowlines and Umbilicals

As described in Section 4.5, those pipelines and umbilicals which lie on the seabed will be completely removed and returned to shore for recycling/reuse/disposal. Buried flowlines and umbillicals will be left in place, with any unburied sections severed at the trench transition and removed from the seabed in single or multiple sections. The cut ends will be buried to at least 0.6m depth.

5.2.8 Drill Cuttings

The decommissioning programme for drill cuttings is presented in Section 7.

5.2.9 NORM (Naturally Occurring Radioactive Material)

There is no historic evidence of the presence of NORM - in the form of low specific activity (LSA) scale - in the pipelines or FPSO production equipment of the FFFA development. The items removed in Phase 1 were checked and no traces of LSA scale were found.

5.2.10 Use of Explosives

There is no intention to use explosives during the decommissioning activities. In the unlikely event that explosives were required, and as part of the programme to manage the potential environmental impacts of decommissioning, the JNCC guidelines on minimising the risk of disturbance and injury to marine mammals would be followed (https://www.og.decc.gov.uk/environment/jncc_ex_guide.pdf).

5.2.11 Details of Remains on the Seabed After Decommissioning

With the exception of trenched and buried sections of flowlines and umbilicals, piles that have been driven below the seabed, and areas of rock dump over pipelines, all of which will remain *in situ*, all other items on the seabed will be removed for onshore disposal or recycling.

5.2.12 Subsequent Water Clearance Above Remains

The 'water clearance above remains' is planned to be the water depth at the field locations, ie 70 - 72m.

6 WELL DECOMMISSIONING

6.1 Description of Wells

All recently suspended wells throughout the FFFA development share a number of common features:

- All are subsea wells with Vetco dual bore Xmas trees tied by flowlines to a series of riser bases where the FPSO was located.
- The Flora, Fergus, and Angus wells have flow bases. The Fife wells do not have flow bases.
- All the wells (except 31/26a-A12z) have Vetco SG5 18 ¾ inch wellhead systems. 12z has a National wellhead and a Vetco Xmas tree. In addition, Fergus has a Drill Quip wellhead.
- 10 of the wells have a conventional 5 string casing configuration – Fergus 39/2-2 misses out the 20 inch casing string, and Fife 31/26a-A1 misses out the liner.
- All wells have 5 ½ inch completion tubing hanging from a twin-bore Vetco tubing hanger. The production wells all have gas lift mandrels accessed via the annulus. The completion packer is set just above the 7 inch liner hanger in the 9 5/8 inch casing.
- All production wells have a pressure sensing mandrel above the packer with an electric cable back up to the tubing hanger.

During the 3rd quarter of 2008, the wells were suspended with the Xmas tree hydraulic valves closed. The production, water injection and gas lift flowlines were disconnected and blind flanges with double block and bleed valves were fitted to the Xmas tree flanges and leak tested. The umbilicals and associated parking plates were removed from all seven trees at Fife and laid on the seabed. All electrical cables at these Fife wells were either cut or disconnected from the trees and also laid on the seabed. At the Fergus, Flora and Angus trees, the umbilicals and electrical cables remain connected to the trees. The hydraulic and chemical lines at these trees also remain connected to the trees via parking plates.

Further information on the individual Field Wells is included in the Appendices, as follows:

- Fife (Appendix C, Sections C.3.1.4 and C.4.1.4).
- Fergus (Appendix D, Sections D.2.1.3 and D.3.1.3).
- Flora (Appendix E, Sections E.2.1.3 and E.3.1.3).
- Angus (Appendix F, Sections F.2.1.3 and F.3.1.3).

6.2 Well Decommissioning

The wells will be decommissioned in accordance with Hess Wells Policies and Procedures. Well decommissioning will involve flushing and cleaning the wells, pulling completions to access the wellbores and placing permanent cement barriers at the appropriate depths according to the specific features of each well/reservoir. The fluids generated from the flushing will be contained and disposed of in compliance with applicable legislation.

The number and type of barriers will be designed in accordance with the Oil & Gas UK Guidelines for the Suspension and Abandonment of Wells, Issue 3, which was published in January 2009. Once all the deep-set reservoir barriers have been established, a shallow cement plug will be placed and the casing strings cut a minimum of 10 ft. below the seabed and recovered to surface, such that no well component is left sitting proud of the seabed. A seabed survey will then be undertaken using an ROV, to check for debris.

All well abandonment activities will be consented, completed and reported under current UK permitting legislation, eg Petroleum Operations Notices for the use and discharge of chemicals during abandonment, OPPC permit for the discharge of reservoir hydrocarbons during abandonment operations.

Individual close-out reports will be prepared for each well and these will be submitted to and stored in the UK National Hydrocarbon Data Archive.

Previously abandoned well activities were carried out in accordance with the legislative requirements and appropriate guidance at the time of abandonment.

6.3 Summary of Wells to be Decommissioned

Table 6.1: Wells Summary

Fife

Hess Well ID	Old Hess Well No.	DECC Well No.	Completion Date	Function	Max Angle	Well Type	Depth (ft MDSS)
P-3	N/A	31/26a-A8	Jul 1996	Oil producer	58°	Deviated producer	9,687
P-8	N/A	31/26a-A9z	Dec 1997	Oil producer	65°	Deviated producer	11,565
P-10	N/A	31/26a-A10	Jan 1999	Oil producer	46°	Deviated producer	9,629
P-13	P-6	31/26a-A11z	Nov 2000	Oil producer	Horizontal	Deviated producer	11,511
P-15	P-4	31/26a-A13x	Feb 2002	Oil producer	Horizontal	Deviated producer	13,157
I3	N/A	31/26a-A1	May 1995	S-shape	65°	Water injector	12,062
I16	P-12	31/26a-A12z	Jan 2001	S-shape	52°	Deviated producer. Converted to injector Apr 2003	9,843

Fergus

Hess Well ID	Old Hess Well No.	DECC Well No.	Completion Date	Function	Max Angle	Well Type	Depth (ft MDSS)
F7	N/A	39/02-2z	July 1996	Oil producer	31°	Deviated producer	9,675

Flora

Hess Well ID	Old Hess Well No.	DECC Well No.	Completion Date	Function	Max Angle	Well Type	Depth (ft MDSS)
F01	F-9/P-9	31/26a-F1	August 1998	Oil producer	Horizontal	Deviated producer	12,753
F03	F-11/P-11	31/26a-F3z	July 1999	Oil producer	Horizontal	Deviated producer	12,495
F02	I4	31/26c-13	September 1998	Water injection	None (vertical)	Vertical water injector	9,627

Angus

Hess Well ID	Old Hess Well No.	DECC Well No.	Completion Date	Function	Max Angle	Well Type	Depth (ft MDSS)
A14	N/A	31/26a-16	Late 2001	Oil producer	29°	Deviated producer	11,300

7 DRILL CUTTINGS

A screening review of the cuttings piles in the FFFA fields has been undertaken to determine their environmental characteristics. This review is required in response to the implementation of OSPAR Recommendation 2006/5 on a 'Management Regime for Offshore Cuttings Piles' by DECC. The information summarised in this section is based on the Technical Review of Cuttings Data from FFFA Fields with regards to Decommissioning and OSPAR Recommendation 2006/5, ERT 2391 (Sept 2009).

7.1 Methodology and Results

OSPAR Recommendation 2006/5 requires that any accumulation of cuttings derived from drilling *more than one well,* where oil based drilling muds (OBM) have been used and discharged, must be given the Stage 1 screening assessment. If only water based muds (WBM) have been used to drill wells in a field then no assessment is required.

Following discussion with DECC, it was agreed that sidetrack wells should not be included when determining the total number of wells to be considered in the assessment. The review of historical data determined that only three fields required the full Stage 1 screening assessment; Fergus was exempt as it is a single well site.

The Stage 1 screening process collated all available environmental monitoring data for the FFFA fields to predict values for comparison with the OSPAR thresholds for oil loss and persistence. These thresholds are defined as a rate of oil loss to the water column of less than 10 tonnes per year and a total area of seabed contamination, where the concentration of oil exceeds 50 mg/kg, of less than 500 km^2years.

7.2 Conclusions

Based on the available data on drilling discharges, the Fife, Flora and Angus fields required Stage 1 assessment under Recommendation 2006/5 because OBM had been used and discharged at multiple well sites. The desktop cuttings pile review and the subsequent analysis of sediment samples taken in 2008, indicate that it is highly unlikely that the OSPAR 2006/5 oil loss or persistence thresholds would be breached at any of the FFFA fields. The data for the individual fields are presented in Table 7.1.

Table 7.1: Stage 1 Screening Process Results for the Fife, Fergus and Angus fields

Field	Estimated cuttings volume (m^3)	Estimated cuttings area (m^2)	Maximum estimated 50 mg/kg effect area (km^2)	Rate of oil leaching (Te/year)	Persistence (km^2years)
Fife	9,309	3,169	0.126	0.60	9
Flora	1,432	488	0.031	0.09	2
Angus	2,148	731	0.126	0.14	9
OSPAR Threshold value				**10**	**500**

The preferred option for management of these piles is therefore to leave them *in situ*, to degrade naturally. Further data has been gathered during the pre-decommissioning baseline survey in 2010 and the report will be made available.

8 ENVIRONMENTAL IMPACT ASSESSMENT

8.1 Introduction

This section presents a summary of the Environmental Impact Assessment (EIA) conducted by Hess and partner Premier for the proposed decommissioning of the Fife, Fergus, Flora and Angus fields. The information in this section is based on the full Environmental Statement (ES) (ADP-004) and the full Comparative Assessment (FFFA-Decomm-HSE-RP-410 Rev 0). The environmental setting and sensitivities of the FFFA area were summarised in Section 3.

8.2 The Environmental Impact Assessment Process

The objective of the EIA process is to incorporate environmental considerations into the project planning and design activities, to ensure that best environmental practice is followed and ultimately to achieve a high standard of environmental performance. The process also provides an opportunity for consultation with stakeholders at an early stage to ensure that all (potential) concerns are identified and can be addressed. The EIA was carried out in accordance with the Offshore Petroleum Production and Pipelines (Assessment of Environmental Effects) Regulations 1999, as amended by the Offshore Petroleum Production and Pipelines (Assessment of Environmental Impacts) (Amendment) Regulations 2007, and the Hess environmental management system (EMS).

To provide the necessary information to inform the EIA and assess potential impacts, specialist studies were commissioned on commercial shipping traffic and the extent of hydrocarbon contamination of the seabed in the vicinity of the FFFA fields.

A scoping exercise was conducted to identify potential environmental impacts and an environmental issues identification (ENVID) workshop was held. An informal consultation with interested parties, including both statutory and non-statutory consultees, was also conducted at this stage (ASE–158). In this way, any environmental concerns or potentially significant environmental impacts were identified at an early stage, so that they could be addressed and mitigated against throughout the duration of the project.

During the ENVID, key activities associated with each phase of the project were described with technical input from members of the project team and recorded on a scoring matrix. The environmental aspects associated with these activities were then identified and the physical, biological, and socio-economic impacts on the environment were determined with reference to the local environmental sensitivities.

All aspects that were scored as “significant” were fully assessed as part of the EIA. Any aspect that was scored “insignificant” did not require any further assessment. While it is recognised that this approach is subjective to some extent and open to a level of interpretation, it aims to provide consistency and transparency to the overall scoping process.

Table 8.1 shows the activities/events which were identified during the ENVID as having a potentially significant impact on the environment.

Table 8.1: Activities/Events with a Potential Significant Impact identified during the ENVID

Activity (Environmental Aspect)	Potentially Significant Environmental Impact on:
Physical presence of the drilling rig and other vessels (including any exclusion zones).	Sediments and seabed features Benthic (seabed) species Fish and shellfish Commercial fishing
Resource use and atmospheric emissions due to energy requirements of rig and other vessels and helicopters (engines/generators).	Air (atmosphere) Resource use (water, fuel, metals etc)
Noise and vibration from thrusters, engines and machinery, cutting tools etc, resonating through the water column.	Marine mammals
Planned use and discharge of chemicals to sea, including chemicals from blocked umbilical cores and corrosion inhibitors mixed with seawater.	Seawater/water column Sediments and seabed features Plankton Benthic (seabed) species
Leaving lines and structures on the seabed - Remobilisation of sediments due to rock dumping or trenching.	Seawater/water column Sediments and seabed features Benthic (seabed) species Fish and shellfish
Potential seabed disturbance and contaminant release (cuttings) associated with removing lines, mattress, riser base, anchors etc.	Seawater/water column Sediments and seabed features Benthic (seabed) species Fish and shellfish
Infrastructure brought to shore, such as mattresses and umbilicals, which cannot be marketed or recycled.	Land (landfill etc) Resource use (water, fuel, metals etc)
Planned use and discharge of chemicals to sea or the seabed during well decommissioning operations (eg well kill chemicals, rig chemicals, leak detection dyes, pressure test fluids).	Seawater/water column Sediments and seabed features
Planned release of hydrocarbon residue from the Xmas tree into the water column.	Seawater/water column
Generation and onshore disposal of special wastes (eg contaminated stones, gravel and concrete, contaminated produced sand, marine life, PCB/transformers).	Land (landfill etc)
Removal of trees, tubing, wellheads and guide base, with associated seabed disturbance (including potential contaminant release from cuttings piles).	Seawater/water column Sediments and seabed features Benthic (seabed) species Fish and shellfish
Large hydrocarbon spill to sea (including a well blowout or complete loss of diesel inventory), with the potential to reach the shore.	Seabirds and waterbirds Coastal environment (shorelines)

8.2.1 List of Concerns

Together with the issues raised during the informal consultation as described in Section 9.1, the ENVID identified the key concerns associated with the proposed decommissioning operations. A detailed assessment of each issue is contained in the supporting Environmental Statement, and is summarised below under the following headings:

- Physical presence (Section 8.3)
- Seabed disturbance (Section 8.4)
- Release of chemicals/contaminants to sea (Section 8.5)
- Atmospheric emissions and energy consumption (Section 8.6)
- Noise and vibration (Section 8.7)
- Waste to shore (Section 8.8)
- Potential hydrocarbon spills (Section 8.9)

8.3 Physical Presence

The proposed decommissioning operations at FFFA may affect other users of the sea, such as shipping and fishing.

During the suspension phase, a formal 500m exclusion zone has been maintained around the remaining subsea infrastructure in the FFFA fields. A guard vessel has been commissioned to patrol the FFFA fields until full decommissioning is completed. During decommissioning operations therefore, there will effectively be no change in the available area for shipping and fishing compared to that available during the operational life and suspension phase of the FFFA fields. Similarly, for subsea infrastructure and well decommissioning, the DSV, MODU and light well intervention vessel will be working within the 500m exclusion zones already established around the well sites and the former FPSO location.

At present, the well abandonment operations are planned to take place from 2012 onwards. The well abandonment campaign will be executed from a MODU, eg a semi-submersible or jack-up rig. If a semi-submersible drilling rig is used, then this exclusion area might be slightly larger for fishing activity, due to the presence of anchors and anchor chains on the seabed. All other subsea infrastructure that will be returned to shore will be removed using a support vessel, such as a Diving Support Vessel (DSV) or Construction Support Vessel (CSV).

A standby vessel will attend well abandonment operations during operational phases as required under the PFEER regulations.

None of the FFFA locations lie in an area of high shipping density. Fishing intensity around the FFFA fields can be considered low when compared to fishing intensity in the deeper waters of the northern North Sea or areas of the shallower southern North Sea. In reality, the decommissioning operations will represent no change to restrictions that have been in place during the construction, operational and suspended phases of the FFFA fields. Once the subsea infrastructure is removed from the seabed, no seabed obstructions will remain and areas from which shipping and fishing have been previously excluded will be re-opened for access. To minimise interference with shipping and the fishing industry, Hess will follow the same well-established systems for consultation, notification and permitting that have been developed for offshore exploration and production operations. Hess is consulting with the relevant authorities and fishing organisations with respect to the proposed activities, and will notify mariners and fishermen regarding these operations. The potential for interruption to shipping and fishing activities during the proposed decommissioning operations is therefore considered to be small.

8.4 Seabed Disturbance

The main sources of seabed disturbance will be the physical removal of infrastructure from the seabed, including any associated water-jetting operations and the presence of Mobile Offshore Drilling Units (MODU) during well decommissioning. Given the water depth at the FFFA fields, both jack-up and semi-submersible drilling rigs could be used for the well decommissioning operations. As the final rig has not yet been selected, generic impacts on the seabed from both types of rig have been assessed in the EIA. It should be noted that, where technically possible, a light intervention vessel may be used for the well decommissioning operations instead of a drilling rig.

It is anticipated that the combined decommissioning operations at the FFFA fields (ie the removal of surface pipelines and umbilicals, the water-jetting in of pipeline ends and structure pile foundations, and the placement of spud cans or anchors and anchor lines) will result in the disturbance or potential loss of some benthic organisms within an area of up to 0.7 km^2. This may also temporarily disturb any demersal fish present in the area at the time of operations.

Overall, no specific environmental sensitivities, such as conservation interests or qualifying features under the Habitats Directive, have been identified that would require additional mitigation with respect to decommissioning operations. In addition, whilst it seems likely that scars may be evident on the seabed for up to a few months, any impacts to the seabed are considered to be minor, given the relatively small area of seabed involved and the potentially rapid recovery rate of the benthos.

8.4.1 Disturbance of Oil-contaminated Sediments

OBM cuttings were discharged at a number of the Fife and Angus wells drilled. Pseudo OBM were used and discharged at both wells in the Flora field, and at the single well drilled in the Fergus field.

The assessment of the drill cuttings piles in the FFFA fields (Section 7) concluded that these accumulations were relatively small and extremely unlikely to exceed the OSPAR thresholds for oil loss rate and persistence (ERT report FFFA ERT 2391, Technical Review of Cuttings Data May 2008).

Any disturbance of oil-contaminated material may cause a certain amount of re-suspension of sediment into the water column. However, it is expected that any re-suspended material will re-settle in the same area, and thus no significant export of oily contaminants to clean areas of seabed will occur.

Furthermore, the results obtained from the cuttings assessment study indicated that disturbance of any such material during decommissioning is unlikely to have any adverse environmental effects, as the level of contaminated cuttings material present is very low. Due to natural physical, chemical and biological processes, hydrocarbon contamination is also likely to have declined since the sample data used to assess some of the fields was acquired. Therefore, the potential environmental impact from the disturbance of the FFFA cuttings piles during the decommissioning operations is considered to be negligible.

8.5 Release of Chemicals/Contaminants to Sea

Chemicals may be required for various applications during the well decommissioning process. There may also be some chemical discharges during the pipeline decommissioning.

The use and discharge of chemicals for offshore oil and gas activities on the UKCS is regulated under the Offshore Chemicals Regulations (OCR) 2002 (as amended). An application for a term permit for the use and discharge of chemicals during the well abandonment and the pipeline decommissioning operations will be submitted to DECC in the form of a Petroleum Operations Notice (PON). Each PON will contain a complete and fully quantified list of all chemicals to be used and discharged during the course of the proposed activity. Only chemicals which are approved for use and discharge in the UK by the Centre for the Environment, Fisheries and Aquaculture Science (CEFAS) can be used.

8.6 Atmospheric Emissions and Energy Consumption

The proposed decommissioning operations will result in both energy use and subsequent atmospheric emissions. Energy use is described as a function of energy used during the actual decommissioning activities. This includes operations to dismantle facilities or components, transport them to shore, and recycle or treat any recovered material. Additionally, there will be theoretical quantities of energy and gaseous emissions associated with recyclable material that is left *in situ* and not re-used or recycled. The total amounts presented in the following sections therefore refer to the sum of the actual energy use and theoretical energy cost. This approach to the estimation of energy use and gaseous emissions ensures that the “savings” that may be achieved by retrieving material from the sea and recycling it are fully and accurately quantified. The quantification of energy use in this assessment is based on the ‘Guidelines for the calculation of estimates of energy use and gaseous emissions in the decommissioning of offshore structures’ published by the Institute of Petroleum in 2000.

A general indicator of atmospheric emissions is the global warming potential (GWP), which is expressed in tonnes of CO_2 equivalents. GWP is a measure of the radiative effect of a given gas in relation to CO_2, integrated over a chosen time period, often over a 100 year period. It is estimated that 35,351 tonnes of CO_2 equivalent would be produced by the FFFA decommissioning operations, including vessel operations, onshore transport, recycling and new manufacture of materials left *in situ*. This figure is approximately equivalent to that of a MODU drilling 6 North Sea exploration wells, or 114 return flights between London and New York. Of this figure, the largest contributions are from the vessels (including the MODU, light intervention vessel and DSV) involved in the dismantling work offshore, and from the onshore facilities undertaking the cleaning, breaking and recycling of the decommissioned items. Notably, however, 8,071 tonnes CO_2 equivalent also arises from the fact that flowlines and umbilicals have been left buried offshore, and that the materials in these items are unavailable for recycling and, theoretically, would have to be replaced by new manufacture.

The total energy use in the proposed decommissioning programme is estimated to be 423,528 GJ; this is equivalent to 0.0043% of the total UK inland energy use in 2005 (9,833,850,934 GJ). In this context, the atmospheric emissions and energy use associated with the FFFA decommissioning operations are considered to be small.

8.7 Noise and Vibration

The main sources of underwater sound produced during the decommissioning operations at FFFA will be the machinery and engines on the MODU, light intervention vessel and DSV, and the mechanical cutting tools that will be used to cut the pipelines and piles. In addition, the light intervention vessel and the DSV will operate on their Dynamic Positioning (DP) System to remain in position, and the intermittent bursts of noise from the thrusters will add to their acoustic footprint. The broadband sound levels for vessels operating on DP typically range from 174 to 191 dB re 1µPa @ 1m, with the strongest tones being emitted at frequencies of less than 1kHz (Table 8.2). Although no specific data is available for the sound intensity of mechanical cutting tools, these are expected to be below this level.

Table 8.2: Sound Sources from various Maritime Activities

Activity	Frequency Range (kHz)	Average Source Level (dB re 1µPa @ 1m)	Estimated Received Sound Level at different Ranges (km) by Spherical Spreading (dB re 1µPa @ 1m)			
			0.1	1	10	100
Seismic airgun	<0.5	230 - 250	190 – 210	170 - 190	149 - 169	128 - 148
Production drilling	0.25	163	123	103	82	61
Anchored semi-sub rig	0.0016 - 0.2	167 - 171	127 – 131	107 - 111	86 - 90	65 - 69
Jack-up rig	0.005 - 1.2	85 - 127	45 – 87	25 - 67	4 - 46	<25
Large merchant vessel	0.005 - 0.9	160 - 190	120 – 150	100 - 130	79 - 109	58 - 88
Military vessel	-	190 - 203	150 – 163	130 - 143	109 - 122	88 – 101

The potential impact on marine mammals from the noise and vibration of the proposed operations has been assessed in the Environmental Statement. Although it is unlikely that any of the proposed decommissioning operations will cause injury to marine mammal species, they may evoke short-term behavioural responses from any cetaceans present in the immediate vicinity of the operations. Various literature sources describe behavioural changes, mainly in baleen whales, as a result of (low frequency) man-made noise at levels of 120 dB to 160 dB. As can be seen from Table 8.2 above, such reactions are expected to be limited to a radius of a few hundred metres from the operation. Cetacean densities in the FFFA area are low, and the operations will be temporary and intermittent. The impacts of underwater noise on cetaceans from any of the decommissioning operations at FFFA are therefore considered to be minor.

There are no plans to use explosives during the decommissioning activities, and Hess would exhaust all other options before applying to use explosives in connection with their operations at FFFA. Should this unlikely event occur, Hess would apply for the relevant permits and follow the existing JNCC guidelines for minimising the risk of disturbance and injury to marine mammals (https://www.og.decc.gov.uk/environment/jncc_ex_guide.pdf).

8.8 Waste to Shore

Over the course of decommissioning operations, waste materials will be generated, mostly from the removal of various types of seabed infrastructure. Disposal of waste from offshore operations is primarily controlled by The Merchant Shipping (Prevention of Pollution by Sewage and Garbage from Ships) Regulations 2008 and The Environmental Protection Act 1990 with its associated regulations such as the Environmental Protection (Duty of Care) Regulations 1991 and Hazardous Waste (England and Wales) Regulations 2005.

As required under the Duty of Care, all waste produced offshore will be segregated and recorded. Wastes generated during decommissioning will be segregated by type and periodically transported to shore in an auditable manner through licensed waste contractors.

The recovered subsea infrastructure, such as decommissioned flowlines, umbilicals and well infrastructure, will be returned to shore for processing. If possible, the materials will be reconditioned and reused, or component parts may be stripped out for recycling. Only where reclaiming or recycling is not technically possible will any material ultimately be sent to landfill for disposal. The impact of disposing of such material to landfill was assessed during the EIA as minor, in relation to the amount of material sent to landfill from other industries.

8.9 Accidental Hydrocarbon Spills

Oil spills can have a number of environmental and economic impacts, the most conspicuous of which are impacts to seabirds and coastal or intertidal communities. The severity of any impact depends on many factors, including the volume and type of hydrocarbon spilled, the sea and weather conditions at the time of the spill and the oil spill response measures that are enacted. During the proposed decommissioning operations, the main risks of a significant oil spill are associated with well abandonment operations, and the spillage of fuel oil from the MODU and associated support vessels in connection with the programme. Any large spill is therefore likely to involve either crude oil or diesel oil.

The probability of a spill as a result of a loss of well control is extremely low, as the wells are being abandoned as they no longer produce economically viable amounts of oil, and their present conditions are well known. Each wellhead will have been isolated and fitted with blind flanges with double block and bleed valves for protection. In order to prevent a spill occurring, stringent safety and operational procedures will be followed throughout decommissioning activities. In the very unlikely event that a large spill were to occur, it would be a priority for Hess to ensure that no spilled oil would impact the coastline and all oil spill response techniques would be employed to prevent this.

Diesel will be the main fuel used for power generation during the proposed decommissioning operations and will, therefore, be the most significant hydrocarbon type stored onboard the drilling rig, light intervention vessel and DSV. Once spilled into the sea, diesel oil evaporates and disperses relatively quickly. Deterministic modelling of a release of 700 tonnes of diesel at the FFFA development conducted for the *FFFA Fields (Uisge Gorm)* Oil Spill Contingency Plan (OSCP) indicated that the volume of diesel on the sea surface would become insignificant after 8 hours, and therefore there would be no threat to the nearest coast some 300 km away.

The highest risk of a diesel spillage occurs during fuel bunkering operations between the mobile drilling rig and supply vessels. Hess and the rig operator will have operational procedures in place which will minimise the risk of a spill during bunkering operations. Hess currently has an approved oil pollution emergency plan (OPEP) in place for the suspended subsea infrastructure of the FFFA development (ASE-141 Rev 2.1). This OPEP conforms to the Merchant Shipping (Oil Pollution, Preparedness, Response and Co-operation Convention) Regulations 1998 and the Offshore Installations (Emergency Pollution Control) Regulations 2002, and has been approved by DECC. The OPEP has been specifically designed to assist the decision-making process in the event of a hydrocarbon spill in the FFFA fields whilst in a suspended state. All future decommissioning operations will be covered under an approved OPEP. A contract with Oil Spill Response is in place, allowing the rapid deployment of personnel and equipment in the event of a large spill.

In conclusion, the risk of a large oil spill during the FFFA decommissioning operations is very low. If a large spill were to occur, however, Hess is well prepared to undertake immediate and appropriate action in order to minimise impacts to the environment.

8.10 Cumulative Impacts

Cumulative impacts occur as a result of a number of activities, discharges or emissions combining or overlapping, potentially creating a new impact.

The proposed decommissioning operations may impact upon the benthos through habitat disturbance related to the placement of spud cans or anchors, and by the disturbance and re-suspension of sediments (including previously deposited drill cuttings) by various activities. These impacts will be very localised and temporary in nature with strong potential for recovery. The total area affected would be a small proportion of the available benthic habitat, and no habitats of particular conservation concern are present in the area. Finally, the cessation of oil and gas operations in the FFFA fields will remove the intermittent seabed disturbance associated with the preceding field exploration, development and production activities, give seabed habitats the chance to recover, and therefore result in a beneficial impact in cumulative terms.

8.11 Transboundary Impacts

Transboundary impacts are those which could have an impact on the environment and resources beyond the boundary of UK waters. The only event associated with the FFFA field decommissioning which could have a transboundary effect is an accidental spill of hydrocarbons.

The FFFA fields are situated less than 10 km from the UK median lines with Norway and Denmark, so it is possible that any accidental spill of hydrocarbons could drift into other national waters. The most likely hydrocarbon spill during the decommissioning operations is the loss of diesel fuel, eg through collision with another vessel. The results of oil spill modelling for the loss of diesel indicate that any such spill, if left untreated, would cross the transboundary line but would evaporate and disperse before reaching the coast. Although very unlikely, crude oil spillage from a well blow-out during operations has also been modelled. This stochastic modelling indicated that there is only a 1% chance of the crude reaching the coasts of Denmark or Norway within 24 hours (without intervention).

International oil spill incidents in the North Sea are managed under the Bonn Agreement 1983, to which the UK, Norway and Denmark are signatories. Parties notify each other of any marine pollution or threat of marine pollution likely to pose a threat to the coast or related interests of another Party. They pledge to assist each other to the best of their ability, on request, and on a cost recovery basis. In addition, Norway and the UK have developed the Norbrit Agreement for joint counter pollution operations in the zone extending 50 nautical miles either side of the median line separating the UK and Norwegian continental shelves. The Norbrit Agreement sets out the command and control procedures for pollution incidents likely to affect both parties, channels of communication, and the resources available.

8.12 Conclusions

All the measures to minimise and mitigate against environmental impact, as described in this environmental impact section, will be delivered by the project through the FFFA Decommissioning Project EHS Plan. The EHS Plan implements the requirements of the Hess EMS for this specific project.

The only potentially significant impact is a large oil spill resulting from a loss of well control during the well abandonment operations. The probability of such a spill is very low, and Hess will have mitigation and management procedures in place to prevent this from happening, as well as adequate resources to deal with such a spill should it occur. All other impacts identified during the EIA are expected to have only localised impacts, with good potential for recovery over time.

Overall, it is therefore concluded that the proposed FFFA fields decommissioning operations will not result in any significant long-lasting environmental effects.

9 INTERESTED PARTY CONSULTATIONS

9.1 Early Consultations

Informal consultations have already been carried out by means of two separate initiatives.

In March 2008, organisations were invited to a presentation of the proposed Phase 1 field suspension operations at Hess offices in Aberdeen. These organisations included those named by DECC in the guidelines for decommissioning as statutory consultees, namely: the Scottish Fishermen's Federation (SFF); National Federation of Fishermen's Organisations (NFFO); Northern Ireland Fishermen's Federation (NIFF); and Global Marine Systems Ltd. Marine Scotland and the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) were also invited. SFF was the only organisation to accept this invitation and did not raise any initial concerns to the proposals as outlined in the letter to the HSE supporting the Hess application for a subsea safety zone to replace the FPSO safety zone when it left the field (refer to Appendix A).

An Early Consultation Document (ECD) outlining the proposed decommissioning strategy was prepared in August 2008 and distributed to a number of statutory and non-statutory consultees and other potentially interested parties (ASE–158). Stakeholders were invited to comment on any aspect of the ECD, including the accuracy and completeness of the environmental description. The comments received and the responses from Hess are summarised in Table 9.1.

Table 9.1: Comments Received during Informal Consultation for the Proposed Decommissioning Operations

Organisation consulted	Key comments and concerns with responses below
BERR (now DECC)	Cannot be assumed that trenched and buried flowlines and umbilicals will be left *in situ*. All feasible decommissioning options should be considered and a comparative assessment made. A comparative assessment has been carried out evaluating various pipeline decommissioning options (see Section 4)
	Oil and Gas Developments - please note that the Ardmore field has been formally decommissioned. This has been noted, as indicated in the environment description above.
JNCC	Concerned with the potential use of explosives during the removal of piled structures and other placements on the seabed. Whilst not specifically mentioned, have Hess considered contingency methods for these removals? No explosives are planned to be used during any of the decommissioning operations of the FFFA fields
	Would like to see consideration of physical seabed disturbance. Physical seabed disturbance has been fully assessed in the impact section below
	We note that the document does not mention planned monitoring activities for the decommissioned site. JNCC would appreciate consultation on this, to include justification that the design will adequately assess potential environmental issues (eg seabed sampling strategy etc), and how this will be used to inform future mitigation decisions. Environmental seabed monitoring will be undertaken in accordance with DECC and JNCC requirements following consultation (See Section 14)

Organisation consulted	Key comments and concerns with responses below
	Could the process for dealing with the blocked chemical injection lines be more fully explained? See impact section below
	The risk of oil spills has not been discussed – has the new oil spill risk been fully assessed and incorporated into existing Oil Spill Contingency Plans? A revised and approved OPEP is currently in place for the suspended FFFA fields. The risk of oil spills has been assessed below
Crown Estate	What will be the resulting impact on submarine pipelines associated with the fields?
	If rendered out of use what decommissioning operations will be undertaken on these pipelines? All buried pipelines will be left in situ, whereas all surface lines will be brought to shore (see Sections 6 and 7)
	What timeframe is expected for any pipeline decommissioning? See Section 11 for timings and scheduling
Hartlepool Borough Council	Replied with no comments.
Middlesbrough Council	Only likely impact on Middlesbrough would be if any recyclable materials were brought ashore in their area. No further comments.
Redcar and Cleveland Borough Council	Replied suggesting send to North East Sea Fisheries. The ECD was sent only to the National Federation of Fishermen's Organisation (NFFO) as they were nominated as a statutory consultee
South Holland District Council	Replied with no observations or further comments.
East Riding of Yorkshire Council	No risk to its coastline and therefore no further comment.

9.2 Consultation with Statutory Consultees and Public Notification

Following the submission of the consultation draft Decommissioning Programmes to DECC, Hess has formally consulted with the four statutory consultees listed below:

- National Federation of Fishermen's Organisations (NFFO);
- Scottish Fishermen's Federation (SFF);
- Northern Ireland Fishermen's Federation (NIFF); and
- Global Marine Systems Limited.

An example of the letter that accompanied the document to the consultees is presented in Appendix I. Acknowledgement of receipt of the document was requested from each consultee and each was contacted during the consultation period to confirm the end date of the consultation period. No formal responses or comments were received from the statutory consultees.

SECTION 9 : INTERESTED PARTY CONSULTATIONS

The Public Notice advising of the submission of the consultation draft of the combined Decommissioning Programmes was issued in the following local and national publications:

- Edinburgh Gazette;
- The (Aberdeen) Press and Journal; and
- The Daily Telegraph.

An example of the public notice (Edinburgh Gazette) is presented in Appendix H.

CD-ROM copies of the document were sent to every statutory consultee. A PDF version of the document was made available during this notice period for download from the Hess website (www.hesscorporation.com/FFFA/DecommissioningProgrammes.pdf). Copies of the Decommissioning Programmes were made available for public viewing at the Hess Aberdeen office and Aberdeen Central Library. In addition, the Public Notice contained contact details for requesting copies of the consultation draft of the Decommissioning Programmes and a contact to whom questions or comments could be submitted. A system of tracking such enquiries/comments was also put in place.

No copies of the Decommissioning Programmes were requested by the public, nor were any comments received by Hess during the notice period (4th October to 1st November, 2011). A copy of the document containing the Decommissioning Programmes was also available on the DECC website.

10 COSTS

Estimated costs for the decommissioning of the FFFA development have been prepared. The final cost of the project will depend on the actual cost of any engineering studies, eg well engineering and the equipment and vessels required to complete the work. Due to the sensitive nature of the information, detailed cost data will be provided to DECC separately during the Decommissioning Programme approval process.

The cost of meeting the FFFA Fields Decommissioning Programme is fully supported by Hess and Field partners Premier.

11 SCHEDULE

The high level schedule for the overall FFFA decommissioning programme is shown in Figure 11.1. In general, this schedule is based on performing the offshore operations during 2011 - 2016 and will be dependent upon vessel and equipment availability. Synergies with other Hess decommissioning projects which may be performed in the same time frame will be explored and so the final timing of individual activities may vary.

The final seabed clearance survey will be conducted on cessation of offshore operations, and the close-out report will be submitted to DECC within four months of this survey. The requirement for further surveys, and the nature and frequency of future monitoring of the condition of the buried pipelines and umbilicals, will be discussed and agreed with DECC.

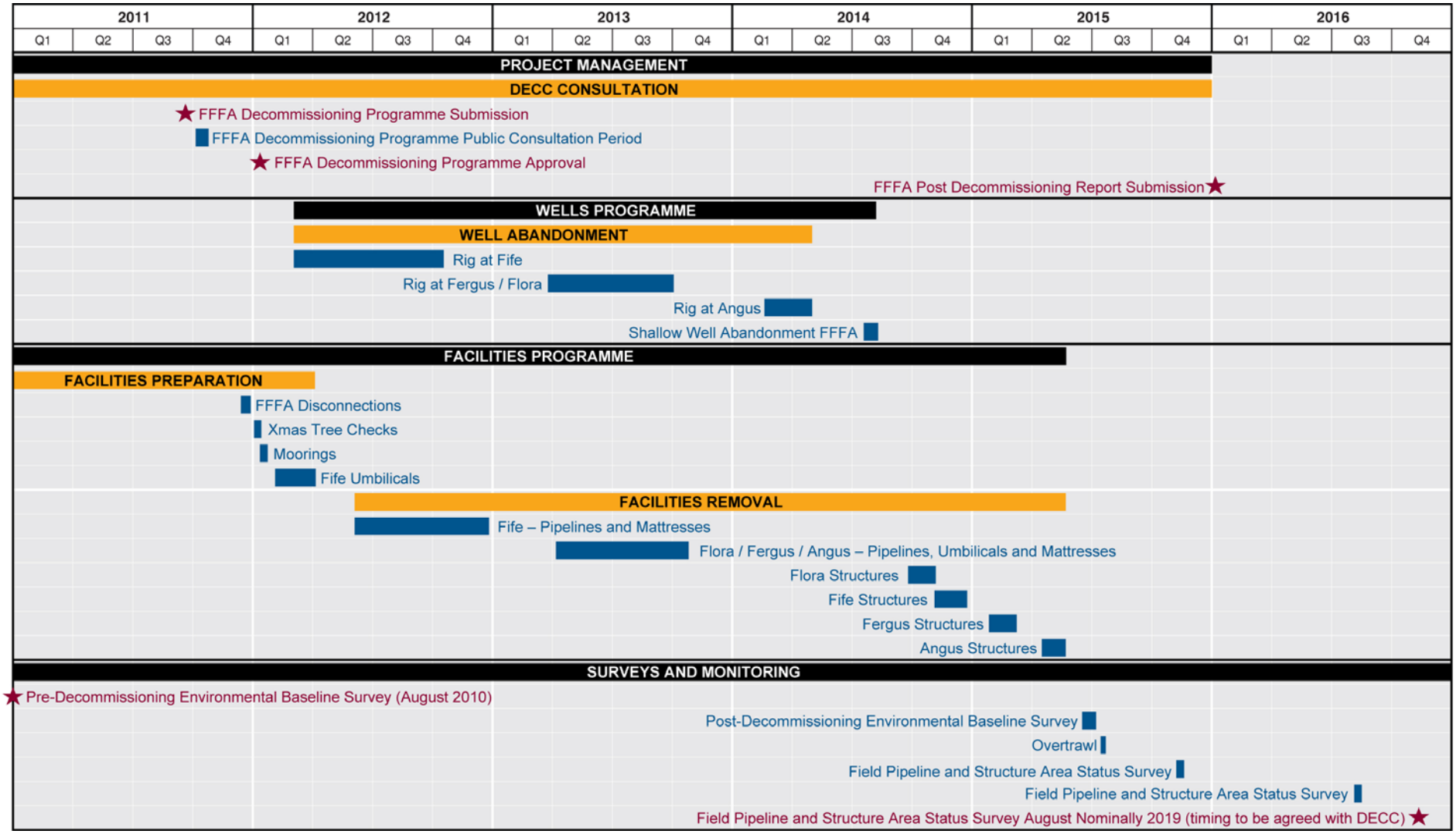


Figure 11.1: Outline Schedule for Phase 2 FFFA Decommissioning Programme

12 PROJECT MANAGEMENT AND VERIFICATION

This section provides information on the planned management process for the decommissioning of the FFFA subsea infrastructure.

12.1 Project Management

A full multi-disciplinary project team will be assembled working under the Hess project execution organisation to implement the Decommissioning Project. The team's responsibility will be to execute the decommissioning of the subsea wells and infrastructure in a safe manner, within the Hess Project Management Guidelines.

Hess has an established environmental management system (EMS), certified to the international standard ISO 14001:2004 and OSPAR Recommendation 2003/5, which has been approved by DECC. The environmental management of the decommissioning operation itself will be covered by the Project Environment, Health and Safety (EHS) Plan.

Key decisions will be made and management control achieved by the Hess Value Navigator Process. The strategy for this project will be to maximise the use of Hess in-house resources and existing contracts for the preparatory work, and to award a series of lump sum contracts to pre-qualified prime contractors for the main decommissioning activities.

The overall contract strategy for the full cycle of the decommissioning operations is still being developed but it is anticipated that the main awards will cover the following scopes:

- Engineering, preparations and removal of subsea facilities and pipelines.
- Engineering, preparations and setting of well deep barriers.
- Engineering, preparations and setting of well shallow barriers.
- Environmental support.
- Onshore recycling and disposal.

The contractors will be monitored at all stages of the work to ensure compliance with Key Performance Indicators (KPI), procedures and principles. The Hess project team will be responsible for the execution of the project, including:

- Setting EH&S standards and targets for the project.
- Determining the scope and schedule of the decommissioning work.
- Selecting and managing contractors.
- Reviewing the progress of the project and reporting to DECC.
- Ensuring compliance with appropriate regulatory requirements.
- Ensuring that the FFFA area and constituent fields are left in the condition as described in each programme and as approved by DECC.

12.2 Legal Compliance

The execution of this project will follow Hess procedures and requirements, which will include the timely management of all applicable consents, licences and permits required for the work. This will include, but not be limited to, the relevant environmental permits, waste management and disposal consents, and notifying other users of the sea of the offshore activities, as well as any associated reporting requirements.

12.3 Duty of Care for Waste Materials

All wastes generated during decommissioning operations will be handled in accordance with the Hess Waste Management Strategy and a project-specific Waste Management Plan will be developed to outline the framework for the process management. Hess will ensure that waste management and minimisation during the planned operations comply with the existing regulatory framework. Waste will be segregated and stored in suitable containers on the various vessels involved in operations, and its subsequent transportation, treatment and ultimate fate will be monitored.

Hess will ensure that all waste contractors are appropriately registered and all waste managers are appropriately authorised for the activities and types of waste being treated or disposed of. This will be achieved through following established Hess procedures and will include a requirement for the contractor to provide HS&E policy statements, ISO registration certificates, waste management licences and registered waste carriers certificates. No waste from the decommissioning project is expected to be shipped across frontiers. Hess will ensure compliance with their legal "Duty of Care" with regard to the management, treatment and disposal of all waste equipment and materials retrieved onshore during the programme (see also Section 8.8). Hess intends to recycle 95% of the recyclable material returned to shore. If it is possible to reuse or sell any recovered equipment, Hess will evaluate the opportunity on a case by case basis.

12.4 Verification

The project will be subject to internal peer reviews at key stages. This will involve Hess, Premier and other stakeholders. Key technical decisions are also subject to approval from the Hess internal 'technical authorities'.

The well abandonment programme will be examined under Regulation 18 of the Offshore Installation and Well Design and Construction Regulations (DCR, 1996) and will be verified by Hess's well examiner.

The verification of a clear seabed will be conducted by an independent vessel at the end of decommissioning operations. Hess will provide the following information to DECC, within four months of completion of the work:

- Post-decommissioning survey report.
- Debris clearance survey report.
- Seabed clearance certificate.
- Project close-out report.

12.5 Reporting Progress to DECC

Upon approval of the Decommissioning Programmes, DECC will be given regular progress reports which will continue during the offshore removal operations.

The project close-out report, including details of debris clearance and decommissioning surveys, will be submitted within four months of the completion of the work.

13 DEBRIS CLEARANCE

Very little debris has been identified within the FFFA fields during recent ROV inspection surveys. Where debris has been noted, it has been identified and logged and will be removed during the decommissioning operations. Should any large item be lost overboard during the programme of work, it will be located and retrieved.

13.1 Seabed Clearance

An ROV debris survey will be carried out at each FFFA subsea structure on completion of the proposed offshore decommissioning operations. Any debris associated with the FFFA development that is found will be removed. The debris surveys will cover at least a 200m wide corridor along the length of any pipelines and 500m radius area around the subsea structures. All debris recovered will be processed in accordance with the Hess waste management strategy.

13.2 Final Condition of the Offshore Site

At the end of the decommissioning activities all structures previously lying on the seabed will have been removed. All trenched, buried or piled items will be left *in situ* at a minimum depth of 0.6m below the seabed. Upon completion of all subsea removal operations, an independent debris trawl will be organised and a seabed clearance certificate obtained and submitted to DECC.

14 PRE- AND POST- DECOMMISSIONING MONITORING AND MAINTENANCE

In order to monitor the extent and significance of any impacts that may be caused by the offshore decommissioning operations, a programme of pre- and post-decommissioning surveys will be performed for the FFFA fields. This section outlines the scopes of the proposed surveys.

14.1 Pre-decommissioning

14.1.1 Annual ROV Surveys of Subsea Facilities

Following the suspension of the fields, and continuing until they are fully decommissioned, an annual ROV survey will be carried out to undertake general visual inspections of all Xmas trees, structures, pipelines and umbilicals to ensure there are no significant changes to their condition.

14.1.2 Environmental Baseline Survey

In order to fully characterise the physical, chemical and biological status of the FFFA fields prior to the decommissioning operations, a pre-decommissioning environmental baseline survey has been conducted in 2010. The baseline survey followed a radial sampling strategy as outlined in the OSPAR-JAMP guidelines for sediment sampling to ensure sufficient coverage. A preliminary ROV sampling study conducted within the FFFA fields in 2008 provided data which was used to inform the selection of sample locations. Where appropriate, the survey strategy was designed to revisit any previous sampling locations in order to measure the extent of change in contamination levels over time.

14.1.3 Drill Cuttings Surveillance

Although sampling was conducted via an ROV in the FFFA fields in 2008, further work was required to fully determine relevant characteristics, chiefly the area of seabed over which THC exceeds 50 mg/kg. The data from the 2008 study informed the selection of new sample locations to achieve this objective. Sampling patterns for the survey were designed to ensure that the data gathered was sufficient to characterise the extent of cuttings dispersion around each drill centre in order to address the requirements of OSPAR Recommendation 2006/5. The pre-decommissioning survey data will be used to verify the cuttings pile assessment previously conducted for the FFFA fields.

14.2 Post-decommissioning

14.2.1 ROV Surveys of Subsea Facilities

Once the fields have been decommissioned, a detailed survey will be performed to verify that all items have been cleared from the seabed surface and that no obstructions remain on the seabed. In addition, two post-decommissioning surveys will be performed, at intervals to be agreed with DECC, on the trenched areas of pipelines and umbilicals that remain buried in the seabed to confirm depth of burial, status and condition of these lines. A full report of the post-decommissioning surveys will be submitted to the DECC Offshore Decommissioning Unit and the need for further monitoring surveys will be discussed and agreed with DECC.

14.2.2 Post-decommissioning Environmental Surveys

Post-decommissioning environmental surveys will be conducted, re-sampling the stations investigated during the pre-decommissioning study in order to monitor any change in the local seabed environment, eg redistribution of cuttings material. The need for further monitoring surveys will be discussed and agreed with DECC.

15 SUPPORTING STUDIES

Document Number	Title
ASE – 158 Issue 1 / Rev 1	Decommissioning Fife, Fergus, Flora and Angus fields (Central North Sea) - Early Consultation Document
A1898-ERT-TSR-1 Rev 00	Anatec - Fife, Fergus, Flora and Angus fields shipping traffic survey
FFFA ERT 2391	Technical Review of cuttings data from FFFA fields with regard to Decommissioning and OSPAR Recommendation 2006 / 5. Updated report including 2008 ROV data
ASE-141 Rev 1.2	Oil Spill Contingency Plan - Uisge Gorm
ASE-141 Rev 2.1	Oil Spill Contingency Plan FFFA Suspended Fields
ADP-024	Fife, Fergus, Flora and Angus Oil Pollution Emergency Plan (in preparation, January 2012)
ADP-025	Fife, Fergus, Flora and Angus Oil Pollution Emergency Plan - Well Operations (in approval, January 2012)
FFFA-Decomm-HSE-RP-410 Rev 0	FFFA Comparative Assessment
ADP-004	Environmental Statement: Decommissioning of the Suspended Fife, Fergus, Flora and Angus Fields
ADP-015	Uisge Gorm Pre-decommissioning Environmental Baseline Survey FFFA Survey Areas

APPENDIX A : CORRESPONDENCE REGARDING PHASE 1 – FIELD SUSPENSION

Letter from DECC Regarding FPSO Removal and Field Suspension

BERR | Department for Business Enterprise & Regulatory Reform

BERR Ref: 01.08.07.08/15C

Mr Glenn Wilson
Facilities Engineering Manager – NW Europe
Hess Services UK Limited
1 Berry Street
Aberdeen
AB25 1HF

24 September 2008

Dear Glenn

FIFE, FLORA, FERGUS & ANGUS (FFFA) - REMOVAL OF UISGE GORM FPSO AND FIELDS SUSPENSION

Thank you for your letter dated 10 April 2008, in which you provided details of the removal of the Uisge Gorm FPSO ("FPSO") and the suspension of the FFFA fields.

We understand that the FPSO has now been removed from site and that the FFFA subsea facilities are to be left in place while possible redevelopment opportunities are explored. Hess has chosen not to participate in further study of the redevelopment of FFFA fields or their surrounds and that your field partner Premier Oil Exploration Limited ("Premier") will pursue this matter. Premier has being given a two year period, with a possible extension to four years, to enable redevelopment opportunities to be investigated. A guard vessel will be deployed over the FFFA subsea structures until such time as the field is redeveloped or an approved decommissioning programme is in place.

We are content with Hess's proposals in relation to this matter and will ensure our colleagues in other government departments are also informed. You may also wish to note we will be asking Premier to keep us informed of progress in relation to the redevelopment.

We are aware that it is your intention to submit a draft decommissioning programme for the FFFA fields to BERR in November 2008. As indicated at our meeting on 18 September 2008 this draft will be for BERR review only and will not be sent to other government departments for consideration. However, we would remind you that should a decision be reached that the FFFA fields will not be redeveloped, a full decommissioning programme will be required.

Energy Group, Atholl House, 86-88 Guild Street, Aberdeen AB11 6AR
www.berr.gov.uk

Direct Line +44 (0)1224 254034 | Fax +44 (0)1224 254019 | Minicom +44 (0)020 7215 6740
Enquiries +44 (0)20 7215 5000 | Email julie.benstead@berr.gsi.gov.uk

Continuation 2

Disused Pipeline Notifications have been completed and submitted on your behalf by Bluewater to allow us to consider the FFFA pipelines under our Interim Pipeline Regime. This is an informal regime which is intended to ensure that out of use lines are monitored and maintained and do not pose a risk to other users of the sea. Details of the FFFA pipelines have been circulated to our consultees and once we are in receipt of all responses we will write to you separately on this matter.

Acceptance of your proposals for the FFFA fields by the Offshore Decommissioning Unit should not be taken as constituting or implying any further approvals or authorisations, which may be required in connection with the suspension of the FFFA facilities and the float off of the FPSO. We are aware that you have had detailed discussions with the appropriate regulators regarding the consents required in relation to the suspension activities and a copy of your letter has been passed to our Offshore Environment Unit for their information.

Please feel free to get in touch if you wish to discuss any of the above.

Yours sincerely

Jennifer Claxton

Jennifer Claxton
Senior Manager
Offshore Decommissioning Unit

APPENDIX A : CORRESPONDENCE REGARDING PHASE 1 – FIELD SUSPENSION

Letter from Scottish Fishermen's Federation supporting the Hess Application for a Subsea Safety Zone and Part of the Field Suspension Activities

SCOTTISH FISHERMEN'S FEDERATION
24 Rubislaw Terrace · ABERDEEN · AB10 1XE

Telephone: 01224 646944 · Fax: 01224 647058
e-mail: sff@sff.co.uk
Website: www.sff.co.uk

Our ref: MJS/AMG/L054-08
SZ 3/08

25 June 2008

Terry Graham Esq
Legal & Operational Strategy
HSE
Offshore Division
Lord Cullen House
Fraser Place
ABERDEEN
AB25 3UB

Dear Terry

Application for a Subsea Safety Zone : Hess Limited : Fife (FFFA Centre) Field : Block 31/26A

Reference is made to your letter and supporting documents (your reference SZ 03/08) concerning an Application on the part of Hess Limited to seek approval for the establishment of a Safety Zone in connection with their Fife Field.

As confirmed during our recent telephone conversation, the Federation was able to meet with representatives from Hess on Thursday, 19 June, on which occasion we were able to better understand the background to the Application.

During the above mentioned meeting we discussed these matters in some detail and have agreed a strategy with Hess as to the way forward. We have since feedback to our relevant Constituent Associations and therefore as per our earlier mentioned telecon, we are hereby pleased to confirm that our Federation supports and endorses the Application.

We wish Hess well with their endeavours.

Yours sincerely

Michael J Sutherland
Director of Operations

Cc: Internal

SFF President
Constituent Associations
John Watt
File P3/4

Hess Limited

Glenn Wilson
Richard Jameson
Dave Nunn
Boyd Angus

V.A.T Reg. No. 605 096 748

Members: Anglo Scottish Fishermen's Association · Clyde Fishermen's Association · Fishsalesmen's Association (Scotland) Limited · Mallaig & North-West Fishermen's Association · Orkney Fisheries Association · Scottish Pelagic Fishermen's Association Limited · The Scottish White Fish Producers Association Limited · Shetland Fishermen's Association

APPENDIX A : CORRESPONDENCE REGARDING PHASE 1 – FIELD SUSPENSION

Section 29 Notice Holders Correspondence Regarding Field Suspension

PremierOil

Premier Oil UK Limited
53 Blenheim Place
Aberdeen AB25 2DZ
United Kingdom

Telephone +44 (0)1224 618 900
Fax +44 (0)1224 618 599
Email premier@premier-oil.com
Website www.premier-oil.com

22nd December 2010

Mr John Watson
HESS Services UK Limited
Union Plaza
1 Union Wynd
Aberdeen
AB10 1SL

Dear John,

FFFA Decommissioning Project

As you know Premier have been evaluating the options for the possible redevelopment of Flora and Angus.

We have concluded the studies.

In summary, there is no economically viable redevelopment option for the fields available at this time or in the foreseeable future.

Yesterday, 21st December 2010, Premier management approved the recommendation to abandon the fields and the associated wells.

The wells are now released for inclusion in the Hess managed abandonment plan for the fields which Premier will now fully support.

I can also advise that Premier Board has approved the 2011 budget which includes the Premier share of the Fife Area budget presented at the 7th October OCM.

Yours sincerely

Mike Travis
Fife Area Asset Manager

B.1 INTRODUCTION

The FFFA Development comprises the Fife, Fergus, Flora and Angus (FFFA) fields. The fields are located in Blocks 31/21, 31/26, 31/27a, 39/1 and 39/2 on the UK Continental Shelf (UKCS). There are twelve wells with Xmas trees in the FFFA fields, nine of which were producers and three water injectors. In addition, there are ten abandoned exploration/appraisal wells within the fields.

The FPSO *Uisge Gorm* and associated infrastructure are included in the Fife Field Section 29 Notice (RDBF/001/00068C), under Decommissioning Programme 1.

As agreed with DECC (Appendix A), production from the FFFA development ceased on 2nd May 2008 and work was carried out to safely suspend the field. This was to allow the FPSO *Uisge Gorm* to be removed and to leave the seabed infrastructure in a safe condition for possible reuse, whilst options for the development were discussed between the partners Hess and Premier. The work was carried out between May 2008 and September 2008.

Following cessation of production, the FPSO production equipment was flushed, cleaned and gas-freed. Production risers and flowlines, and the gas lift lines, were flushed and left filled with inhibited seawater. The chemical injection lines were flushed and left filled with potable water.

The Xmas trees on all the wells were shut in by closing all hydraulic valves which were subsequently tested to prove at least two barriers between the well and the external environment.

Dynamic production and WI risers were disconnected and laid on the seabed and later removed using a DSV. Flexible umbilical risers were disconnected and laid on the seabed.

Production and gas lift flowlines/jumpers were disconnected from the Xmas trees, and blind flanges fitted and pressure-tested (except Angus production side of the tree which had already been disconnected at the Flora cross over skid). Control jumper bundles were disconnected from the tree and laid on the seabed. The mid-water buoy was sunk to the seabed.

The nine FPSO mooring lines were disconnected and laid down on the seabed. The FPSO was towed from the field on 11th September 2008.

Table B.1: Section 29 Items Removed in Phase 1

Item	Removed by
FPSO	Sail away
Dynamic production and water injection risers	DSV

The remaining items listed under the Section 29 notices will be removed during Phase 2 (full field decommissioning). Details are contained within the following Appendices:

- APPENDIX C: The Fife Field
- APPENDIX D: The Fergus Field
- APPENDIX E: The Flora Field
- APPENDIX F: The Angus Field

B.1.1 FPSO *Uisge Gorm*

The FPSO *Uisge Gorm* (Figure B.1) is owned and operated by Bluewater Offshore Production Systems Ltd (Bluewater). It is a converted tanker of 92,000 tonnes deadweight, approximately 248m in length and 40m in breadth. It was moored via a turret connected to three sets of three mooring lines attached to piles in the seabed to the north, east and west-south-west of the vessel.

The FPSO *Uisge Gorm* has a crude oil storage capacity of 94,500 m^3 (594,340bbls) and oil was exported using shuttle tankers.

Figure B.1: The FPSO *Uisge Gorm*

B.1.2 Production and Water Injection Risers

Eight risers were located beneath the FPSO, comprising:

- P3 – Fife production from well P3.
- P15 – Fife production from well P15.
- P8 – Fife production from well P8.
- P10/P13 – Fife combined production from wells P10 and P13.
- F01 – Flora combined production from wells F01 and F03.
- F7 – Fergus production from well F7.
- A14 – Angus production from well A14.
- WI – Fife/Flora water injection.

Each riser ran from a connection on an individual seabed riser base up through an I-tube, and was secured in the FPSO turret. In order to allow for the dynamic movement of the FPSO, the risers were fitted with a series of buoyancy modules to form a pliant wave formation as shown in Figure B.2.

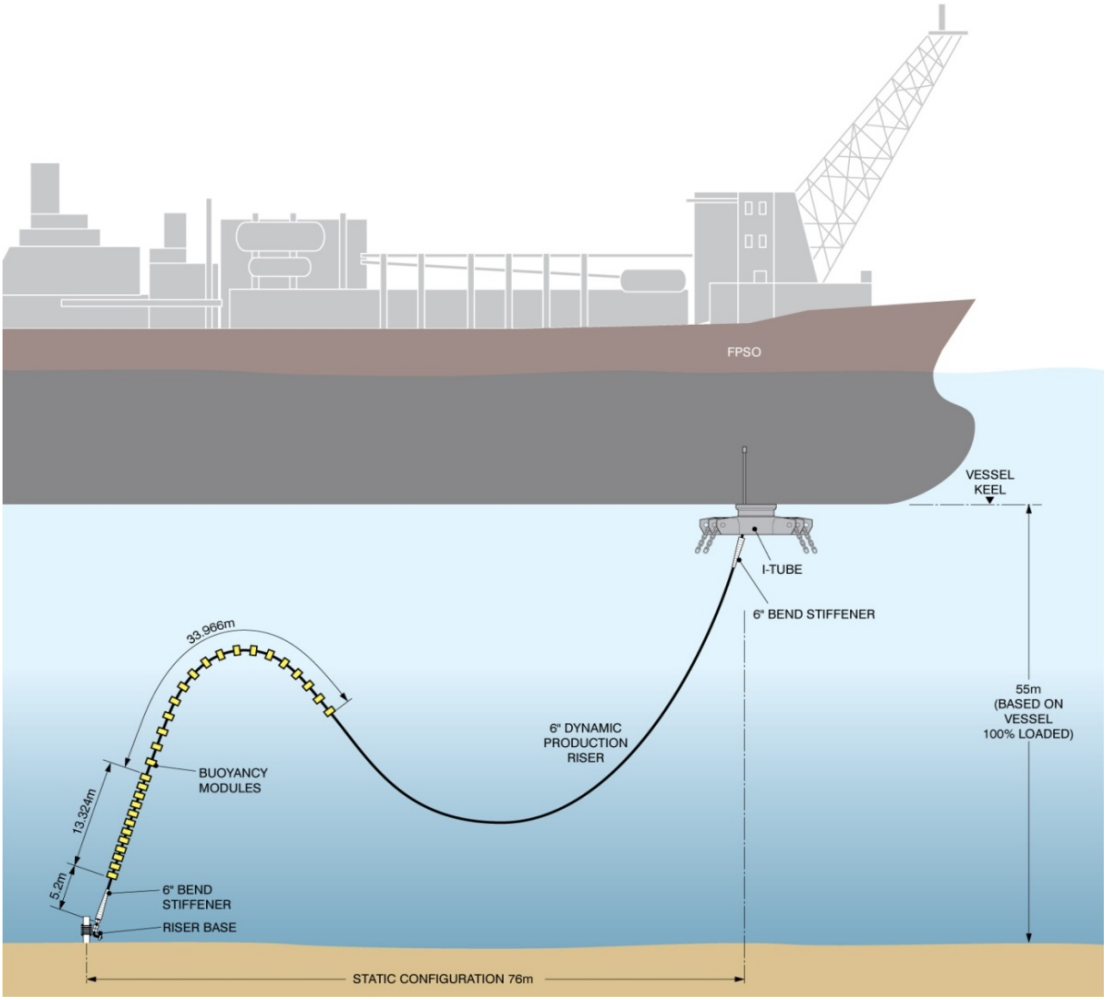


Figure B.2: Typical Riser Configuration

All FFFA oil production risers and the WI riser were decommissioned and removed from the field during the Phase 1 activities. During removal and disposal of the risers no evidence of LSA scale was detected.

B.2 REMOVAL AND DISPOSAL OPTIONS

B.2.1 FPSO

With the support of Bluewater, Premier and DECC (Appendix A and B respectively), the FPSO *Uisge Gorm* has been removed from the FFFA fields with the intention that it will be redeployed for future projects by Bluewater. No further options were considered.

B.2.2 Dynamic Flowlines and Umbilical Risers

The eight flowline and six umbilical risers had to be disconnected from the FPSO to allow it to be removed from the field. As the flowline and umbilical risers were nearing the end of their design life, they were not considered suitable for re-use, even if the fields were redeveloped.

Therefore, three options were considered for their decommissioning:

- Reverse installation direct to a vessel.
- Lower to seabed for later retrieval.
- Lower to seabed and cut up riser for removal.

B.3 SELECTED REMOVAL AND DISPOSAL OPTION

B.3.1 FPSO

As outlined in Section B.2.1 of this Appendix, the chosen option was to remove the FPSO from the field to allow the owners, Bluewater, to market the vessel for deployment on another field development.

B.3.2 Dynamic Flowlines and Umbilical Risers

It was decided that the flowline and umbilical risers would be removed and sent to a disposal contractor for recycling/disposal.

B.3.2.1 Flowline Risers

The final method adopted for riser removal was primarily dictated by vessel availability and schedule. The top of each riser was disconnected at the turret and lowered to the seabed, allowing timely release of the FPSO. This also separated the DSV schedule from the critical path for removal of the FPSO and reduced the risk associated with simultaneous operations. Removal of the eight flowline risers was carried out in two campaigns, in October 2008 and November 2009, to take advantage of vessel availability and suitable weather conditions.

As part of the FPSO removal preparations, the risers were flushed and left filled with inhibited seawater. Potential discharges during the removal operations were covered by an OPPC Term Permit and PON15C permits for each of the fields.

The material from the five risers removed in the October 2008 campaign was shipped to Aberdeen Harbour where it was received and transported by John Lawrie (Aberdeen) Ltd to their SEPA-authorised recycling facility at Greenbank Road, East Tullos Industrial Estate, Aberdeen for processing. The total consignment received consisted of the following:

Risers	62.1 tonnes
Buoys and flowline end pieces	49.74 tonnes
Total received	111.84 tonnes

This material was processed, recovered and disposed of as described below.

B.3.2.2 Flowlines

The flowlines were stripped, the outer sheathing removed, and the metal content recovered and processed onsite for full recycling. A small amount of the sheathing contained plastic which was successfully removed and transported to a specialist contractor in Newcastle for recycling into new products.

The majority of the outer sheathing consisted of nylon and steel which were bonded together and, therefore, required more specialist treatment. This material was transported to a specialist contractor in the north of Scotland where it was granulated. The metal content was recycled, and the nylon content was sent to a further processing facility where it will be made into new products (a previous similar material was used in the manufacture of new truck parts).

B.3.2.3 Buoyancy Modules and Flowline End Pieces

The outer steel bandings were removed from the buoys for recycling, along with the metal content of the flowline end pieces.

Unfortunately, the majority of the buoy material was unsuitable for recycling and was disposed of at an authorised landfill site, Stoneyhill in Aberdeenshire.

In summary, following the processes described above, the materials noted below were either recycled or disposed of:

Steel recovered for recycling	49.40 tonnes
Stainless steel recovered for recycling	2.46 tonnes
Plastic recovered for recycling	3.78 tonnes
Nylon/steel sheathing recovered for recycling	22.46 tonnes
Total waste to landfill	33.74 tonnes
Total material recovered/recycled/disposed	111.84 tonnes

All of the material noted above was handled, transported, processed, recycled and disposed of in compliance with the relevant environmental legislation. Waste transfer notes were completed as appropriate and are available for inspection, if required.

The three risers removed during the November 2009 campaign were recycled or disposed in a similar fashion. However, an outlet was found for the plastic component of buoyancy module material, thereby reducing the quantities sent to landfill. Of the 66.4 tonnes recovered, 63.3 tonnes (95.3%) was recycled and only 3.1 tonnes (4.7%) disposed of to landfill.

B.3.2.4 Umbilical Risers

Although the umbilical risers were disconnected to allow removal of the FPSO, they remain on the seabed and are part of the planned Phase 2 operations to fully decommission the Fife Field infrastructure.

B.4 SUMMARY OF PHASE 1 ACTIVITIES

The following is a brief summary of the activities performed in order to leave the fields in a safe condition for the suspension period.

- Production ceased on 2nd May 2008. The final offload of the produced crude to the shuttle tanker, along with the slops from the tank washing activities, took place in the first week of June 2008. Following the departure of the shuttle tanker, final tank washing (cold wash, hot wash, inert gas purging and gas-freeing) took place.
- Sand originating from the reservoir was removed from the process vessels, cargo and slops tanks. It was then water-washed several times by specialised contractors to reduce the oil content to an acceptable level. Before the washed sand was disposed of to sea under the OPPC permit, samples were taken and analysed onshore to ensure compliance with the permit.
- Due to some operational problems on the FPSO, only a small proportion of the sand was disposed of to sea. The bulk of the sand remained on the vessel.
- Preparations were made onboard to disconnect and lower the flowline and umbilical risers to the seabed.

- The twelve wells were shut in from the FPSO by closing all of the Xmas tree hydraulic valves.
- All production flowlines (except A14 which was flushed and isolated in January 2008) were flushed to an oil concentration of <30 mg/L. The flowlines were then filled with seawater treated with Champion Hydrosure 0-367R corrosion inhibitor at 1,000 ppm. The chemical used during the flushing operations was covered by a variation to the existing FPSO PON15D. The flowlines were disconnected from the tree and a blind flange with single valve was fitted. The release of a small amount of oil and treated seawater during the disconnection process at the riser base and Xmas trees was covered under an OPPC Term Permit and PON15Cs for each of the fields. A continuity strap was attached between the flowline flange and tree.
- All gas lift flowlines were flushed and then filled with seawater treated with Champion Hydrosure 0-367R corrosion inhibitor at 1,000 ppm. The chemical used during the flushing operations was covered by a variation to the existing FPSO PON15D. The flowlines were disconnected from the tree and a blind flange with single valve was fitted. The release of a small amount of treated seawater during the disconnection process at the riser base and Xmas trees was covered under a PON15C for each of the fields. A continuity strap was attached between the flowline flange and tree.
- The majority of chemical injection (CI) hoses within the umbilicals were flushed and left filled with potable water although this was not possible on a few as they were found to be blocked. The release of small amounts of chemicals from the blocked lines during the disconnection process at the riser base and Xmas trees was covered under a PON15C for each of the fields.
- The hydraulic lines were not flushed and remained filled with the hydraulic fluid Oceanic HW540. The release of a small amount of HW540 during the disconnection process at the riser base and Xmas trees was covered under a PON15C for each of the fields.
- The chemical injection and control hoses were disconnected from the tree and were sealed by parking on a Tree Parking Plate (TPP) fitted to the tree by a diver-operated clamp (on trees with more than 10 supply hoses, two TPPs were used for ease of diver operation). For future diver safety, each of these parking connections was tubed back to a test point on the parking plate, in order to ensure any trapped pressure is released prior to disconnecting the hoses. A continuity strap was attached between the TPP and Xmas tree.
- At the Xmas trees, the production, WI and gas lift tie-in flanges were fitted with a blind flange with DBB valves. The flanges were leak tested to 128bar for all Xmas trees.
- At the Xmas trees, for the disconnection of the CI lines, Tree Isolation Valve Panels (TIVPs) were fitted to the Xmas tree structure by means of a diver-operated clamp. When the CI hoses were disconnected, each of the exposed CI ports was connected by hoses to this TIVP. The TIVP has an isolation needle valve for each CI line and, in addition, has a common block and bleed valve. A continuity strap was attached between the TIVP and tree. When the control jumper bundles were disconnected at the trees, protective caps (with a small intervention valve included) were fitted at the tree interface panel. The electrical cable bundles remain connected at the trees in order to protect the connectors on the SUT.
- All risers, umbilicals and mooring lines were disconnected from the FPSO and laid on the seabed.

- All flexible production and water injection risers were removed by disconnecting at the riser base flange which has been fitted with a blind flange with a single valve. Once the risers were retrieved onboard the DSV, they were checked for the presence of NORM but no evidence of NORM was found. The risers were shipped ashore for recycling/disposal.
- The flexible umbilical risers were disconnected at the riser base SUTs and cut either side of the clamps on the mid-water buoy. The sections of umbilical riser remain on the seabed in the vicinity of the umbilical riser base structure. The electrical cables at the riser base were cut leaving the connectors protecting the connector interface. Each of the CI and hydraulic lines on the riser base were fitted with a cap with a test intervention valve.
- The mid-water buoy was sunk to the seabed and the umbilicals were cut free on either side.
- Disused Pipeline Notices were submitted to DECC outlining the suspended status of all pipelines.
- PON 5 applications were submitted to DECC for the Temporary Abandonment of the FFFA wells.
- A subsea 500m safety zone has been granted by the Health and Safety Executive (HSE) at the FFFA centre to replace the FPSO 500m safety zone, due to the seabed obstructions in the area.
- A guard vessel was mobilised to patrol the area and warn approaching vessels of the locations of the subsea obstructions. This vessel remains on station.

A schematic of the field showing the layout of the subsea assets following suspension activities is shown in Figure B.3.

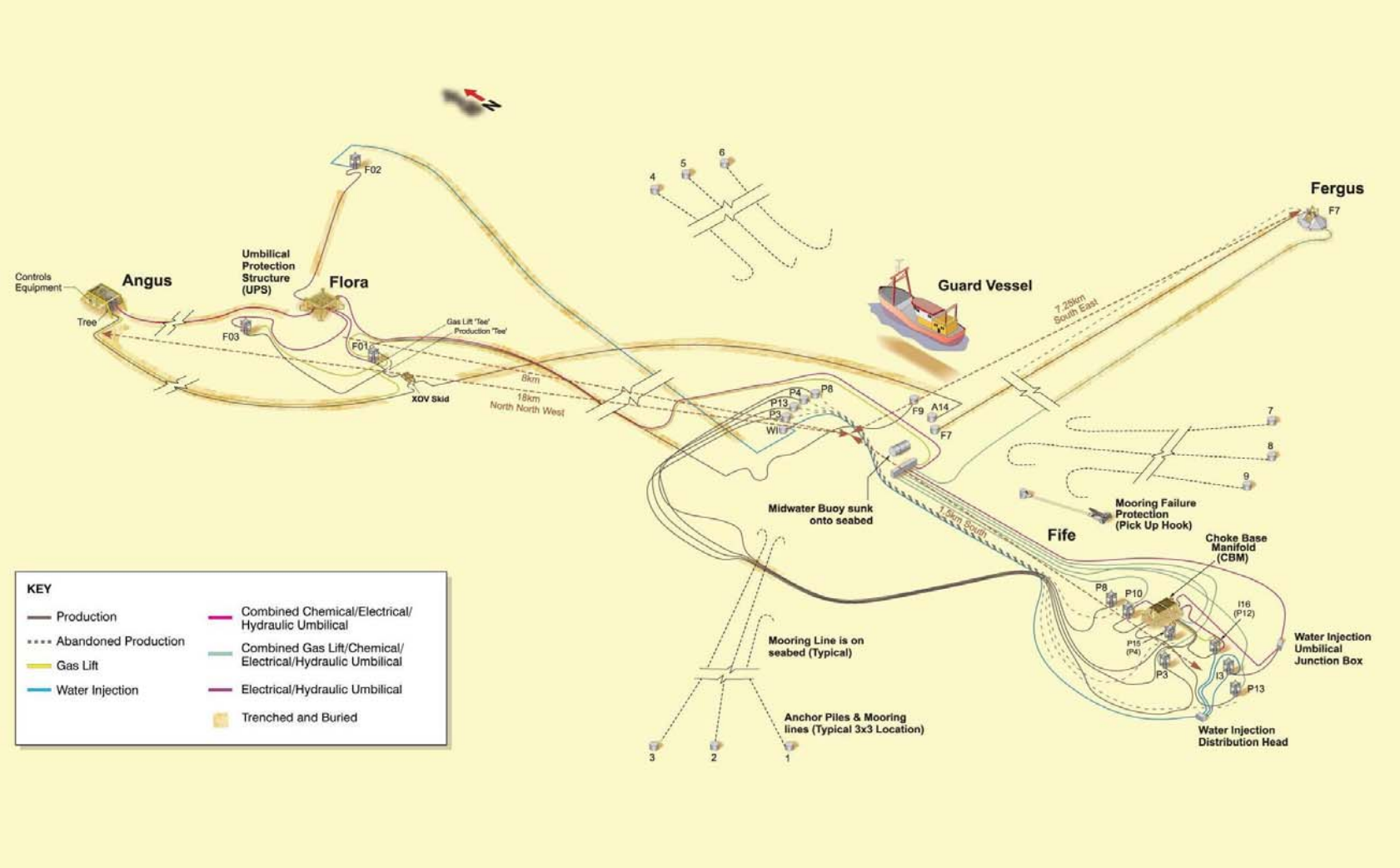
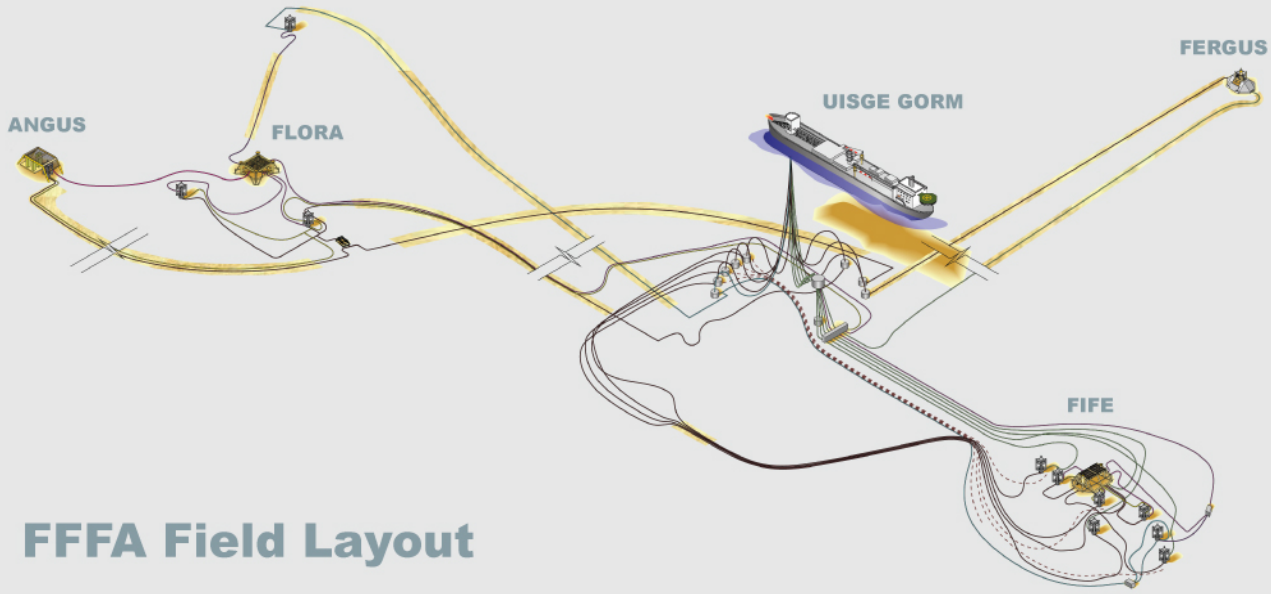
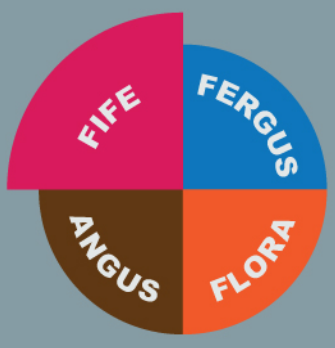


Figure B.3: Arrangement of Facilities in the FFFA after Completion of the Phase 1 Decommissioning Activities

Fife



FFFA Field Layout



C.1 THE FIFE FIELD

The Fife Field reserves were produced through five production wells; three wells flowed via individual subsea flowlines and risers to the FPSO, the final two wells were tied back to the Fife CBM (Section C.3.1.1 (e)) which then tied back to the FPSO through a single flowline and riser. Following suspension activities, the subsea infrastructure is hydrocarbon-free and the wellheads isolated from the production flowlines.

Further details of the layout and facilities of the Fife Field are given in Sections C.3 and C.4 of this Appendix.

C.2 ITEMS REMOVED IN PHASE 1

As outlined in Section 1.2, Hess and Premier agreed with DECC to suspend production from the fields and remove the FPSO from the site (Appendix A). The following items which were common to all of the FFFA fields were removed.

- FPSO Uisge Gorm.
- Eight flexible production/water injection risers.

These items were included on the Section 29 Notice referred to in this document as Decommissioning Programme 1 (DP1). Information regarding the Phase 1 field suspension activities is contained in Appendix B.

C.3 DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

Figure C.1 shows the layout of the infrastructure at the Fife well centre prior to any decommissioning activities. As part of the Phase 2 activities, the following items will be decommissioned:

Fife Decommissioning Programme, DP1:

- Subsea structures.
- Mattresses and grout bags.
- FPSO mooring system.
- Wells.

Fife Decommissioning Programme, DP2

- Production and gas lift flowlines.
- Water injection flowlines.
- Umbilicals.

These items are described in Sections C.3.1 (DP1) and C.3.2 (DP2).

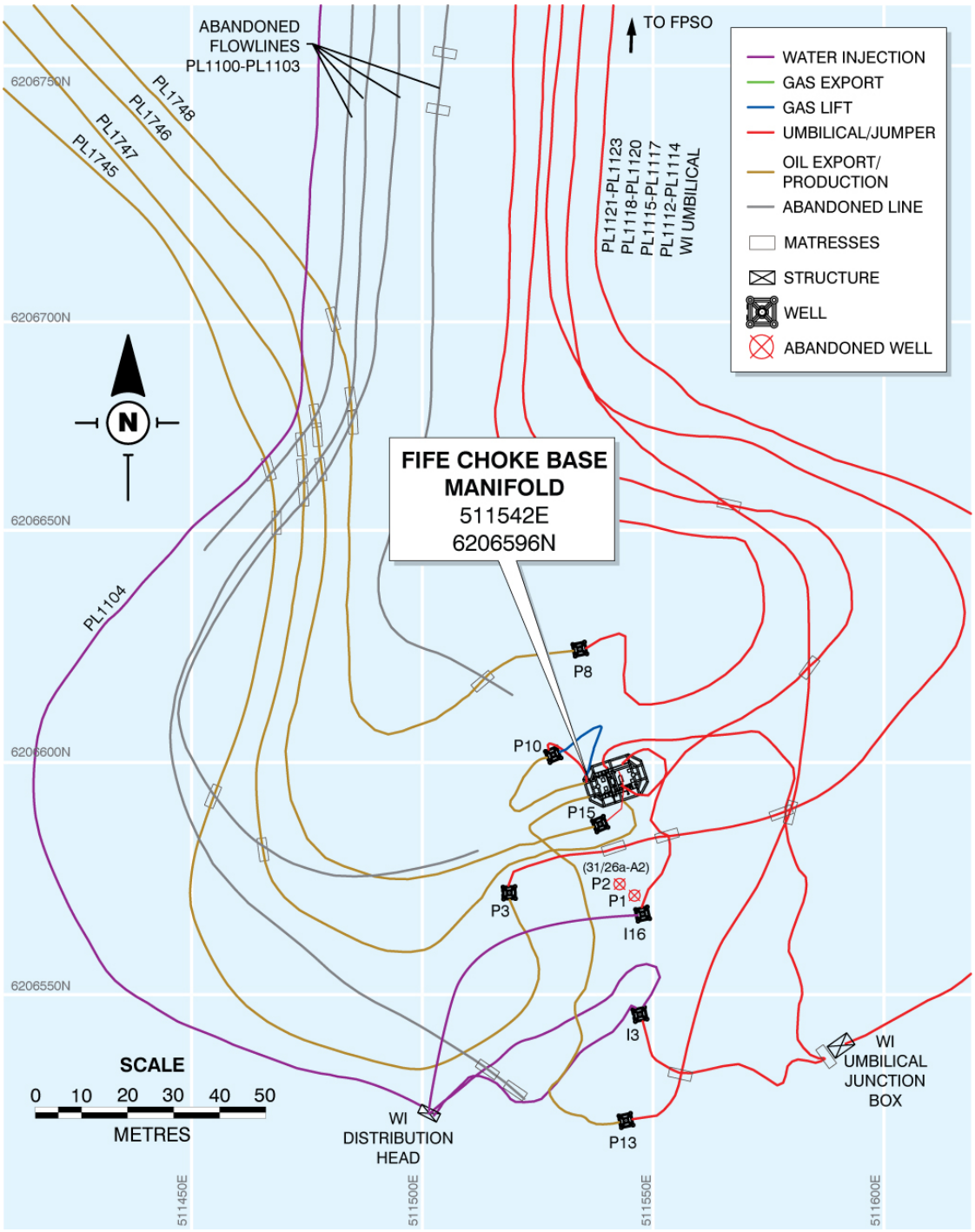


Figure C.1: The Infrastructure around the Fife Well Centre

C.3.1 Fife Decommissioning Programme, DP1

C.3.1.1 Subsea Structures

Whilst in operation, there were a number of subsea structures within the FFFA fields. Of these, the structures covered under Fife DP1 are:

- Flexible umbilical risers (a).
- Mid-water buoy (b).
- Fife production and water injection riser bases (c).
- Umbilical riser base (d).
- Fife choke base manifold (e).
- Fife water injection distribution head (f).
- Fife water injection umbilical junction box (g).

(a) Flexible umbilical risers

Each of the six flexible umbilical risers ran from connections on the common seabed umbilical riser base, up through I-tubes and was secured in the FPSO turret. In order to allow for the dynamic movement of the FPSO, the umbilical risers were supported by a mid-water buoy at approximately 35m above the seabed, as shown in Figure C.2. As part of the removal process for the FPSO, the six umbilical risers were disconnected at the FPSO turret and lowered to the seabed. Divers cut the six umbilical risers at either side of the mid-water buoy and disconnected them from the umbilical riser base. These sections of riser remain on the seabed in the vicinity of the umbilical riser base (See (d) overleaf).

(b) Mid-water buoy

The six umbilical risers were supported over a single mid-water buoy (MWB), a 3.8m diameter x 11.2m long steel cylinder. The MWB was tethered to the umbilical riser base with steel wire ropes at a height of approximately 35.5m above the seabed (ie approximately 35m below sea level). As part of suspension activities, the MWB was sunk on location and remains on the seabed.

(c) Production and water injection flowline riser bases

Individual flowline riser bases were required beneath the FPSO to provide seabed anchors for the risers. The riser bases were used within the Fife, Flora, Fergus and Angus Field development for the production and water injection flowline risers.

The four Fife well riser bases and the single WI riser base are piled bases with a pipe spool mounted at the top.

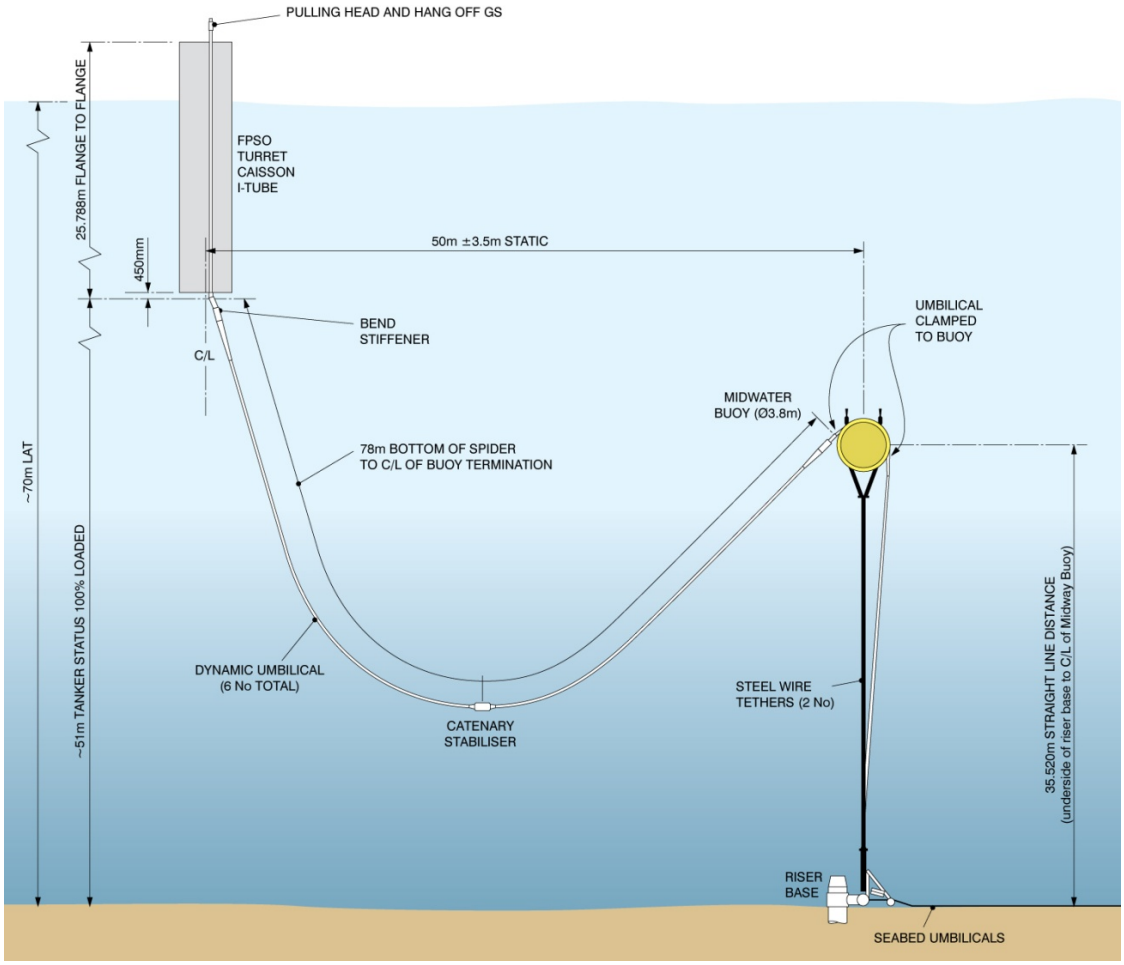


Figure C.2: Typical Umbilical Riser Configuration

(d) Umbilical riser base

The single umbilical riser base at the former site of the FPSO is a piled structure holding all riser umbilicals and seabed umbilicals connected by pigtails.

(e) Fife choke base manifold (CBM)

The Fife CBM was used for combining and controlling production from production wells P10 and P13, and for supplying control and chemicals to production wells P15, P10 and water injection well I16. Gas lift was supplied via the CBM to wells P10 and P15.

The CBM consists of a protection structure, production and gas lift hydraulic chokes, manual isolation valves, pipe spools and pressure sensors. Control equipment is housed within the structure and consists of two control modules, two accumulator units and two distribution units. In total, the CBM weighs 57 tonnes.

The structure provides protection for the valves, chokes, pipe spools and control equipment. The base of the structure provides support for the choke base manifold assembly. Anodes are fitted on the manifold to provide cathodic protection.

Figure C.3: Fife CBM (during load out)

(f) Fife water injection distribution head (WIDH)

The treated injection water that was supplied from the FPSO prior to suspension was fed to the water injection distribution head for supply to the injection well via flexible jumpers. At the time of suspension, only two injection wells (I3 and I16) were used within the Fife Field. Provision was made, however, for a total of five such water injection wells. Anodes are fitted on the 8.3 tonne structure to provide cathodic protection.

(g) Fife water injection umbilical junction box

As part of the water injection umbilical infrastructure, the water injection umbilical ran from the umbilical riser base under the FPSO to the water injection umbilical junction box. From the junction box, two jumpers went on to control well P10 and I16 through the CBM and well I3. These jumpers are a combination of hydraulic, electrical and chemical injection cores.

Anodes are fitted on the junction box to provide cathodic protection. In total, the umbilical junction box weighs 8.25 tonnes

C.3.1.2 Mattresses and Grout Bags

The mattresses consist of concrete elements linked together with high strength non-degradable polypropylene rope or wire rope, with typical dimensions of 6m long x 3m or 2m wide x 0.15m thick. There are large numbers of mattresses in the area of the FFFA centre, to provide dropped object protection to the pipelines of the different fields directly below the former location of the FPSO.

In addition, grout/sand bags have been used close to structures in various locations, typically to provide support where pipelines and umbilicals are connected to structures.

In total 266 mattresses are present in the Fife Field: 202 are located within the FFFA centre, and 64 protect the Fife specific infrastructure (Table C.1).

Table C.1: Locations of Mattresses specific to Fife Infrastructure

Number of mattresses	Location
30	Crossing points of out of use poduction flowlines (PL1100-PL1103) and replacement flowlines (PL1745-PL1748)
24	PL1104 (WI flowline) near the riser base
4	Crossing point of production flowlines PL1745-PL1748 and PL1104
2	PL1106 (WI flowline) (also has intermittent seabed cover)
2	PL1107 (WI flowline) (also has intermittent seabed cover)
2	PL1747C (WI flowline) (also has intermittent seabed cover)

C.3.1.3 FPSO Mooring System

The FPSO *Uisge Gorm* was held on station by a 9 anchor mooring system using 3 sets of 3 moorings running approximately north, east and west-south-west and included a failure protection system (Table C.4). The tops of the mooring piles are 1m below the seabed.

During removal of the FPSO, the nine mooring lines were disconnected from the turret and lowered to the seabed. Anchor chains 2 and 3 were laid down over the out-of-use flowlines (PL1100-PL1103), but anchor chain 1 was laid back clear of the lines.

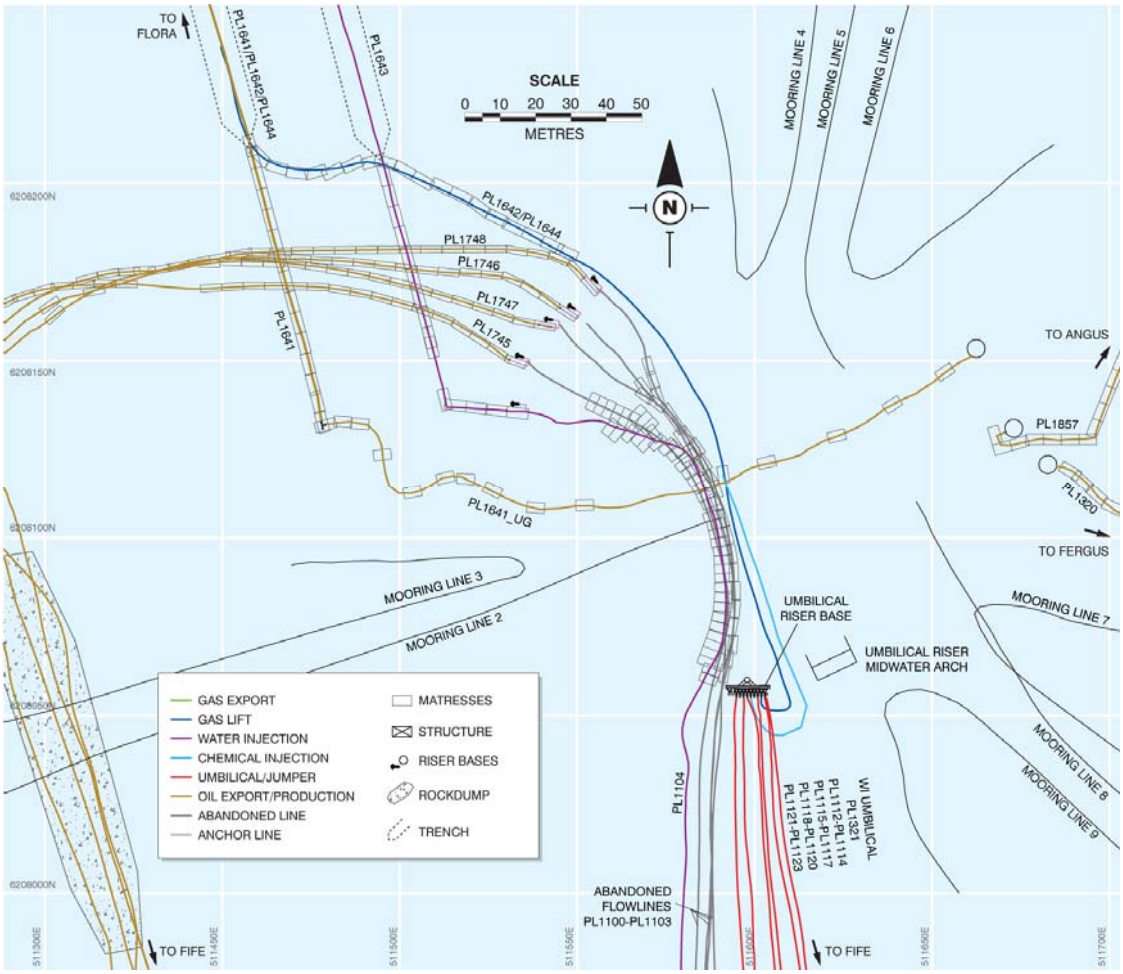


Figure C.4: Location of Mattresses at the FFFA Centre Location

C.3.1.4 Wells

The reserves from the Fife Field were recovered via five subsea production wells. Three of the wells (P3, P15 and P8) flowed via subsea flowlines and risers to the FPSO. The remaining two production wells (P10 and P13) flowed to the CBM which was tied back to the FPSO through a single subsea flowline and riser.

The recovery of Fife reserves was enhanced by two water injection wells I3 and I16 (I16 was converted from producer P12 in 2002) supplied via the Water Injection Distribution Head (WIDH), and by gas lift to the production wells (P3, P8 and P13). Gas lift to production wells P10 and P15 was via the CBM; all other gas lift was supplied as part of the chemical injection and control system through the main central core within the umbilicals.

There are also two abandoned exploration/appraisal wells.

C.3.2 Fife Decommissioning Programme, DP2

Table C.2 details the pipelines associated with the Fife Field as described in the Section 29 Notice for Submarine Pipelines (reference 01.08.07.05/81C).

Corrosion protection of the flowlines is provided by a cathodic protection system and an anti-corrosion coating. The cathodic protection system comprises sacrificial anodes on the steel components of the Xmas trees, flexible flowlines, riser bases and the risers. All flexible components of the flowlines are protected by a 6mm thick high density polypropylene anti-corrosion coating.

Concrete mattresses are laid on the first section of the flowline connected to the riser base, primarily to prevent mechanical damage by dragged objects on the seabed but also to prevent damage from dropped objects.

Table C.2: Fife Section 29 Pipelines and Description

Pipeline Number	Type	Description	Surface/ Buried
PL1100	Production flowline	Out of use line from near P3 riser base to well P3	Surface
PL1101	Production flowline	Out of use line from near P15 rise base to well P15	Surface
PL1102	Production flowline	Out of use line from near P8 riser base to well P8	Surface
PL1103	Production flowline	Out of use line from near P6 riser base to P6	Surface
PL1104	Water injection flowline	From WI riser base to Fife WIDH	Surface
PL1104.1	Chemical injection line	From CBM to well P10	Surface
PL1104.2	Chemical injection line	From CBM to well P10	Surface
PL1104.3	Control line	From CBM to well I16	Surface
PL1104.4	Control line	From CBM to well I16	Surface
PL1106	Production flowline	WIDH to well I3	Surface
PL1107	Production flowline	WIDH to well I3	Surface
PL1108	Gas lift	Umbilical riser base to well P3	Surface
PL1109	Gas lift	Umbilical riser base to well P13	Surface
PL1110	Gas lift	Umbilical riser base to CBM	Surface
PL1110A	Gas lift	CBM to well P10	Surface
PL1110C	Gas lift	CBM to well P15	Surface
PL1111	Gas lift	Umbilical riser base to P8	Surface
PL1112	Spare line	Umbilical riser base to well P3	Surface
PL1113	Chemical injection line	Umbilical riser base to well P3	Surface
PL1114	Chemical injection line	Umbilical riser base to well P3	Surface
PL1115	Spare line	Umbilical riser base to well P13	Surface
PL1116	Chemical injection line	Umbilical riser base to well P13	Surface
PL1117	Chemical injection line	Umbilical riser base to well P13	Surface
PL1118	Chemical injection line	From umbilical riser base to CBM and well P15	Surface
PL1119	Spare line	From umbilical riser base to CBM and well P15	Surface
PL1120	Chemical injection line	From umbilical riser base to CBM and well P15	Surface
PL1121	Spare line	Umbilical riser base to P8	Surface
PL1122	Chemical injection line	Umbilical riser base to P8	Surface
PL1123	Chemical injection line	Umbilical riser base to P8	Surface
PL1745	Production flowline	P3 to production riser base	Surface[1]
PL1746	Production flowline	CBM to production riser base	Surface[1]
PL1747	Production flowline	CBM to production riser base	Surface[1]
PL1747A	Production flowline	CBM to P13	Surface[1]
PL1747B	Production flowline	CBM to P10	Surface[1]
PL1747C	Production flowline	WIDH to well I6	Surface[1]
PL1748	Production flowline	P8 to production riser base	Surface[1]

[1] The surface flowlines PL1745-1748 are covered by rock dump where they cross the mooring chains lying on the seabed

C.3.2.1 Production and Gas Lift Flowlines

Three Fife production wells (P3, P15 and P8) were tied back directly to the FPSO through individual 6" subsea flexible flowlines and risers. The remaining production wells (P10 and P13) were directed to the CBM where the produced fluids were commingled and transported back to the FPSO through a single 6" flexible subsea flowline and riser.

The four 6" flexible production flowlines (PL1745, PL1746, PL1747 and PL1748) were laid on the seabed in a corridor between the FPSO and the subsea wells. These flowlines cross over the Flora production (PL1641) and WI (PL1643) lines below the FPSO location. The four flexible flowlines were connected to four riser bases beneath the FPSO.

All four of the production flowlines from the Fife Field to the FPSO were replaced in 2000 because of the failure of the P3 flexible flowline in October 1998. The four original flowlines (PL1100, PL1101, PL1102 and PL1103) lie disconnected and out of use on the seabed between the Fife wells and riser base locations.

Gas lift to the Fife wells was provided through the umbilical central cores (refer to Section C.3.2.3).

C.3.2.2 Water Injection Flowlines

Treated injection water was supplied from the FPSO through a 7" flexible water injection flowline and riser. The 7" flexible flowline (PL1104) was run from the water injection riser base beneath the FPSO to a water injection distribution header (WIDH) and remains connected at both ends. The Fife water injection wells were then supplied with the treated water from the WIDH; to I3 through two 4" flexible water injection lines (PL1106 and PL1107), and to I16 through a 6" flexible water injection line (PL1747C).

The jumpers to I3 are brought together at a short tee section to supply the injection side of the tree. PL1106, PL1107 and PI1747C remain connected to the WIDH. Both PL1106 and PI1107 have been disconnected from the I3 Xmas tree and blind flanges fitted to the tree and pipeline ends. PL1747C has been disconnected from the I16 Xmas tree and blind flanges fitted to the tree and pipeline ends.

C.3.2.3 Umbilicals

Five separate umbilicals were installed between the FPSO and the Fife Field to control and monitor subsea facilities and supply chemicals. All five of the Fife umbilicals were laid on the seabed in a corridor between the umbilical riser base and the subsea wells, with various crossings in the vicinity of the Fife wells.

Two different types of umbilicals were utilised within the FFFA development, namely production control and water injection control.

(a) FFFA Production Control Umbilicals

The production umbilicals were designed to carry hydraulic and electrical signals from the control system on the FPSO to and from the respective field production wells. These umbilicals also carried chemicals for injection purposes, and lift gas if required.

Each production umbilical is split into two parts. The first part is the riser section that ran from the FPSO to the umbilical riser base. The second section is the seabed umbilical that runs from the umbilical riser base to either a production well or a subsea umbilical termination within the Fife Choke Base Manifold (CBM) or the Flora Umbilical Protection Structure (UPS). Fife production wells P3, P8 and P13 have their own dedicated umbilicals. The P15 umbilical feeds the P15 well via the CBM. The central core of these four umbilicals is a 2” line which was used to feed lift gas to the wells.

The following chemicals were supplied via the umbilicals:

- Corrosion inhibitor.
- Scale inhibitor.
- Methanol.

(b) FFFA Water Injection Control Umbilicals

The water injection umbilicals were designed to carry hydraulic and electrical signals from the control system onboard the FPSO to and from the water injection wells on Fife and Flora.

The single main water injection riser umbilical ran between the FPSO turret and the umbilical riser base on the seabed and on to the water injection umbilical junction box. Two jumpers run from the junction box to the wells. The first umbilical jumper, for control only, was connected to the water injection tree (well I3). The second jumper fed production well P10 and water injection well I16 via the CBM.

C.4 INVENTORY OF ITEMS AND MATERIALS

This section contains information about the items that have yet to be decommissioned in Phase 2.

C.4.1 Fife Decommissioning Programme, DP1

C.4.1.1 Subsea Structures

Table C.3: Seabed Structures included in Fife DP1 (including the umbilical mid-water buoy for all fields)

Field	Item	Size (m)	Weight (te)	Notes
All	Flexible umbilical risers	148 long x 6" dia.	5.9 each (35.4 total)	The risers run from the FPSO turret to the Subsea Umbilical Termination (SUT) unit on the umbilical riser base. These risers were disconnected and are currently lying on the seabed.
All	Umbilical Mid-Water Buoy	11.238 long x 3.8" dia.	40	Has been sunk to the seabed.
Fife/ Flora	WI riser base	3 x 3 x 1	5	Ø762 x 25wt pile with clamped spool attachment
All	Umbilical riser base	12 x 5 x 3.6	23.4 (structure)	Piled with single pile
		Ø762 x 25wt	7 (pile)	-
Fife	Choke base manifold	13 x 9 x 4	52	Piled with two piles
Fife	Choke base manifold roof panels	3.5 x 3.66	2.3 each	2 panels
Fife	Water injection distribution head	4.426 x 1.99 x 1.39	8.3	Gravity base
Fife	Water injection umbilical junction box	5 x 1.8 x 1.5	8.25	Gravity base
Fife	Riser base P-3	3 x 3 x 1	5	Ø762 x 25wt pile with clamped spool attachment
Fife	Riser base P-8	3 x 3 x 1	5	Ø762 x 25wt pile with clamped spool attachment
Fife	Riser base P-13	3 x 3 x 1	5	Ø762 x 25wt pile with clamped spool attachment
Fife	Riser base P-15	3 x 3 x 1	5	Ø762 x 25wt pile with clamped spool attachment

C.4.1.2 FPSO Mooring System

Table C.4: Description of FPSO Mooring System and Failure Protection System at Fife

System	Item	Quantity	Size	Length (m)
FPSO Mooring System	Slip wire	3	Ø22 mm wire	110
	Forerunner	3	2 ¼" chain	100
	Upper chain	9	5 ¼" chain	400
	Wire	9	4" wire rope	1,100
	Chain	9	5 1/4" chain	100
	Pile (top of pile 1m below seabed)	9	Ø60" x 37m long	-
Mooring Failure Protection System at Fife	Pick-up hook	1	7 x 7 x 4.5m high	-
	Chains (between pile and pick-up hook)	3	87mm chain	100
	Connection plate	1	1.5 x 1.5 x 0.13m thick	-
	Pile (top of pile 1m below seabed)	1	Ø60" x 37m long	-

C.4.1.3 Mattresses

Table C.5: Protection and Stabilisation Items at Fife, including the FFFA Centre

Field	Item	Number	Size (m)	Weight (te)
FFFA Centre	Mattresses	202	6 x 2 x 0.15	554
	Uraduct	2	150 (length)	10
Fife	Mattresses	64	6 x 2 x 0.15	176

C.4.1.4 Wells

(a) Production Wells

All five production wells at Fife require decommissioning (Table C.6). They are fitted with Vetco dual-bore Xmas trees measuring 4m x 4m x 5m. The Fife production wells were suspended during suspension activities in Phase 1 (Appendix A).

Table C.6: Fife Production Wells

Hess Well ID	Old Hess Well No.	DECC Well No.	Completion Date	Function	Max Angle	Well Type	Depth (ft MDSS)
P-3	N/A	31/26a-A8	Jul 1996	Oil producer	58°	Deviated producer	9,687
P-8	N/A	31/26a-A9z	Dec 1997	Oil producer	65°	Deviated producer	11,565
P-10	N/A	31/26a-A10	Jan 1999	Oil producer	46°	Deviated producer	9,629
P-13	P-6	31/26a-A11z	Nov 2000	Oil producer	Horizontal	Deviated producer	11,511
P-15	P-4	31/26a-A13x	Feb 2002	Oil producer	Horizontal	Deviated producer	13,157

(b) Injection Wells

Two injection wells require decommissioning (Table C.7); both are fitted with Vetco dual-bore Xmas trees measuring 4m x 4m x 5m. The wells are currently suspended, following Phase 1 operations (Appendix A).

Table C.7 Fife Injection Wells

Hess Well ID	Old Hess Well No	DECC Well No	Completion Date	Function	Max Angle	Well Type	Depth (ft MDSS)
I3	N/A	31/26a-A1	May 1995	S-shape	65°	Water injector	12,062
I16	P-12	31/26a-A12z	Jan 2001	S-shape	52°	Deviated producer. Converted to injector Apr 2003	9,843

(c) Abandoned Wells

Four Fife exploration and appraisal wells have been abandoned.

Table C.8: Fife Abandoned Wells

DECC Well Number	WONS Ref Number	Hess Well Identity	Well Type	Current Status
31/26a-9a	N/A	N/A	Exploration	Abandoned
31/26a-10	N/A	AB	Appraisal	Side-tracked to A5 (P2) – Abandoned 1993
39/1-2	N/A	N/A	Appraisal	Abandoned 1993
31/26a-11	N/A	N/A	Appraisal	Side-tracked to A1 (I3) - Abandoned

C.4.2 Fife Decommissioning Programme, DP2

C.4.2.1 Production Flowlines and Jumpers

Several types of flowlines and jumpers were used in the FFFA development and within the Fife Field itself (Table C.9).

C.4.2.2 Water Injection Flowlines, Jumpers and Spools

Three types of water injection flowlines, jumpers and spools were used in the Fife Field (Table C.10).

Table C.9: Description of Flowlines and Jumpers at Fife Field

Pipeline Number	Description	Size (in)	Coating	Overall diameter (mm)	Wall thickness (mm)	Length (m)	Nominal weight in air (kg/m)	From	To	Trenched or lying on the seabed surface
PL1745	Flexible API 17J	6	None	218.5	33.1	1,944	74.5	Production riser base	Well P-3	Surface
PL1746	Flexible API 17J	6	None	218.5	33.1	1,871	74.5	Production riser base	Well P-15	Surface
PL1747	Flexible API 17J and Multilayer Flexible API 17J	6 + 6	None	218.5 + 242	33.1 + 45	1,895 + 20	74.5 + 118	P-10/P13 riser base	CBM	Surface
PL1748	Flexible API 17J	6	None	218.5	33.1	1,842	74.5	P-8 riser base	Well P-8	Surface
PL1100[1]	Flexible API 17J	6	None	225.3	36.4	1,658	75	Near to P-3 riser base	Well P-3	Surface
PL1101[1]	Flexible API 17J	6	None	225.3	36.4	1,697	75	Near to P-15 riser base	Well P-15	Surface
PL1102[1]	Flexible API 17J	6	None	225.3	36.4	1,725	75	Near to P-8 riser base	Well P-8	Surface
PL1103[1]	Flexible API 17J	6	None	225.3	36.4	1,550	75	Near to P-6 riser base	Well P-6	Surface
PL1747-A	Multilayer Flexible API 17J	6	None	242	45	30	118	CBM	Well P-13	Surface
PL1747-B	Multilayer Flexible API 17J	6	None	242	45	70	118	CBM	Well P-10	Surface

[1] These lines were disconnected, abandoned and filled with inhibited seawater in 2000 and their function was replaced by PL1745 to PL1748

Table C.10: Description of Water Injection Flowlines, Jumpers and Spools

Pipeline Number	Description	Size (in)	Coating	Overall diameter (mm)	Wall thickness (mm)	Length (m)	Nominal weight in air (kg/m)	From	To	Trenched or lying on the seabed surface
PL1104	Wellstream Flexible API 17J	7	None	243.6	34.1	1,688	68.1	WI riser base	Fife WIDH	Surface
PL1106	Wellstream Flexible API 17J	4	None	154.9	29.0	53	34.4	WIDH	Well I-3	Surface
PL1107	Wellstream Flexible API 17J	4	None	154.9	29.0	71	34.4	WIDH	Well I-3	Surface
PL1747C	Wellstream Flexible API 17J	6	None	229.4	38.5	75	102.3	WIDH	Well I-16	Surface

C.4.2.3 Control, Chemical Injection and Gas Lift Umbilicals

Table C.11 outlines the composition of the seabed umbilicals. Each umbilical to the Fife production wells includes a central gas lift line and all were laid, and remain, on the seabed (Figure C.5).

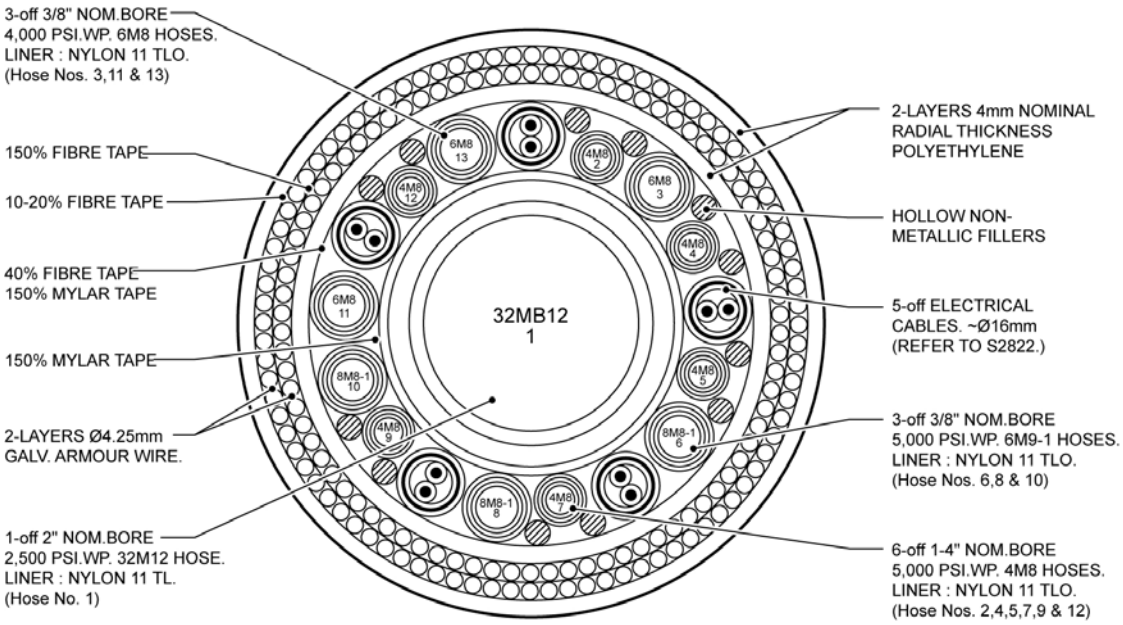


Figure C.5: Cross-section of Typical Seabed Umbilical at Fife

Table C.11: Description of Control, Chemical Injection and Gas Lift Umbilicals at Fife

Well	Pipeline ID	Size (in)	Type	Overall diameter (mm)	Length (m)	Nominal Weight (kg/m)	From / To
Fife P3	PL1108	2	Gas Lift	137	1,606	29	Umbilical riser base / Well P3
	PL1112	3/8	spare				
	PL1113	3/8	CI				
	PL1114	3/8	CI				
	–	1/4 + 3/8	Controls				
	–	16mm	5 cables				
Fife P13	PL1109	2	Gas Lift	137	1,580	29	Umbilical riser base / Well P13
	PL1115	3/8	spare				
	PL1116	3/8	CI				
	PL1117	3/8	CI				
	–	1/4 + 3/8	Controls				
	–	16mm	5 cables				
Fife P15	PL1110	2	Gas Lift	137	1,553	29	Umbilical riser base / CBM + Well P15
	PL1118	3/8	CI				
	PL1119	3/8	spare				
	PL1120	3/8	CI				
	–	1/4 + 3/8	Controls				
	PL1120	16mm	-				
Fife P8	PL1111	2	Gas Lift	137	1,519	29	Umbilical riser base / Well P-8
	PL1121	3/8	spare				
	PL1122	3/8	CI				
	PL1123	3/8	CI				
	–	1/4 + 3/8	Controls				
	–	16mm	5 cables				
Fife WI	–	3/8	Controls	142	1,608	31	Umbilical riser base / WI Umbilical Junction Box
	–	1/4	Controls				
	–	2	Cable				
Fife WI	–	3/8 + 1/4	Controls	81	50	11	WI UJB / Well I3
Fife WI		3/8 + 1/4	Controls	81	78	11	WI UJB / CBM
Fife WI	PL1104.3 & .4	3/8 + 1/4	Controls	81	61	11	CBM / Well I16
Fife	PL1104.1	3/8	CI	20	25	0.7	CBM / Well P10
	PL1104.2	3/8	CI	20	25	0.7	

C.4.3 Summary of Subsea Infrastructure Material Weights

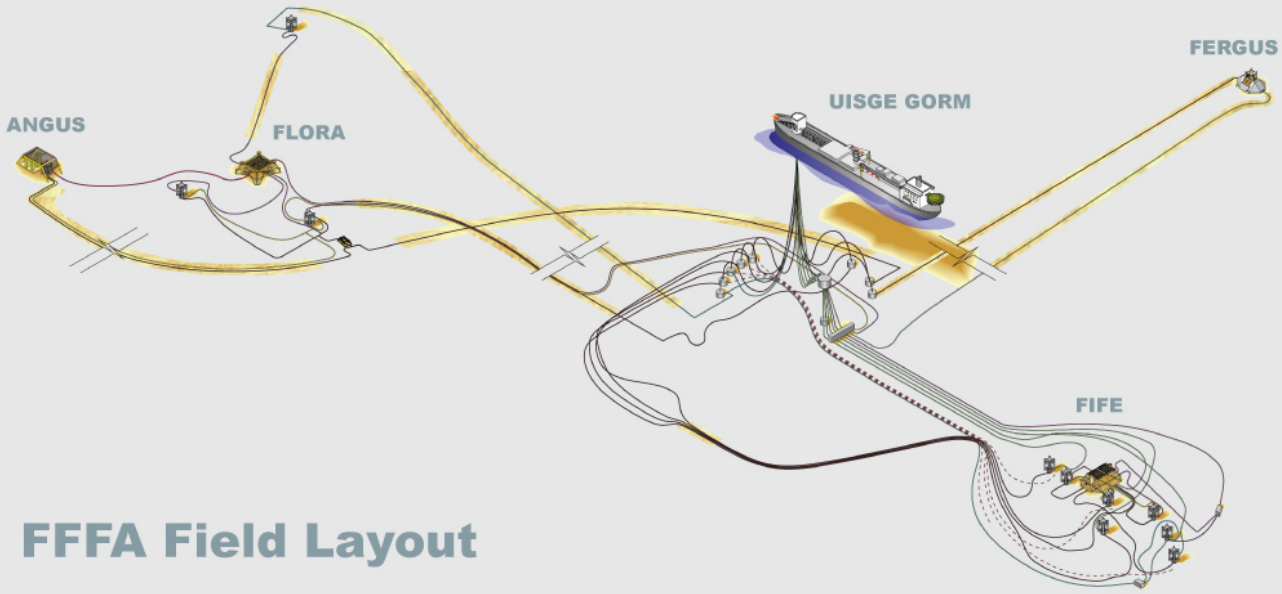
Table C.12: Type of Material and Approximate Totals in the Subsea Infrastructure of the Fife Field (including FPSO related items)

Item	Type of material	Total Weight (tonnes)	Weight to be recovered (tonnes)
Flexible umbilical risers (6 no)	Steel Composites	23.5 11.9	23.5 11.9
Flexible flowlines / jumpers	Steel Composites	983 216	983 216
Rigid spools	Steel	6	6
Umbilicals	Steel Composites	152.5 81	152.5 81
Structures (MWB, production, WI and umbilical riser bases, CBM, WIDH, WI Junction Box)	Steel Zn anodes	162 10	162 10
Mooring system	Steel	2253	2253
Mattresses	Concrete	730	730
Xmas trees	Steel Zn Anodes	161 6	161 6
Flowbases / Wellheads	Steel	49	49

Table C.13: Overall Weight and Intended Fate of Material Currently in the Fife Field (including the FFFA Centre), by Type

Type of material	Total weight (tonnes)	Predicted Fate (tonnes)			
		Recycle	Reuse	Disposal	Left in situ
Steel	3,790	3,790	0	0	0
Composites	308.9	0	0	308.9	0
Concrete	730	730	0	0	0
Zn	16	16	0	0	0

Fergus



FFFA Field Layout

D.1 THE FERGUS FIELD

A single production well (F7) was used to recover the Fergus reserves. Production flowed via a single subsea flowline and riser to the FPSO *Uisge Gorm*. No gas lift or water injection enhancement was needed to produce from the Fergus reservoir. Following suspension activities, the subsea infrastructure is hydrocarbon-free and the wellhead isolated from the production flowline.

Further details of the layout and facilities of the Fergus Field are given in Sections D.2 and D.3 of this Appendix.

D.2 DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

Figure D.1 shows the current layout of infrastructure at the Fergus well centre.

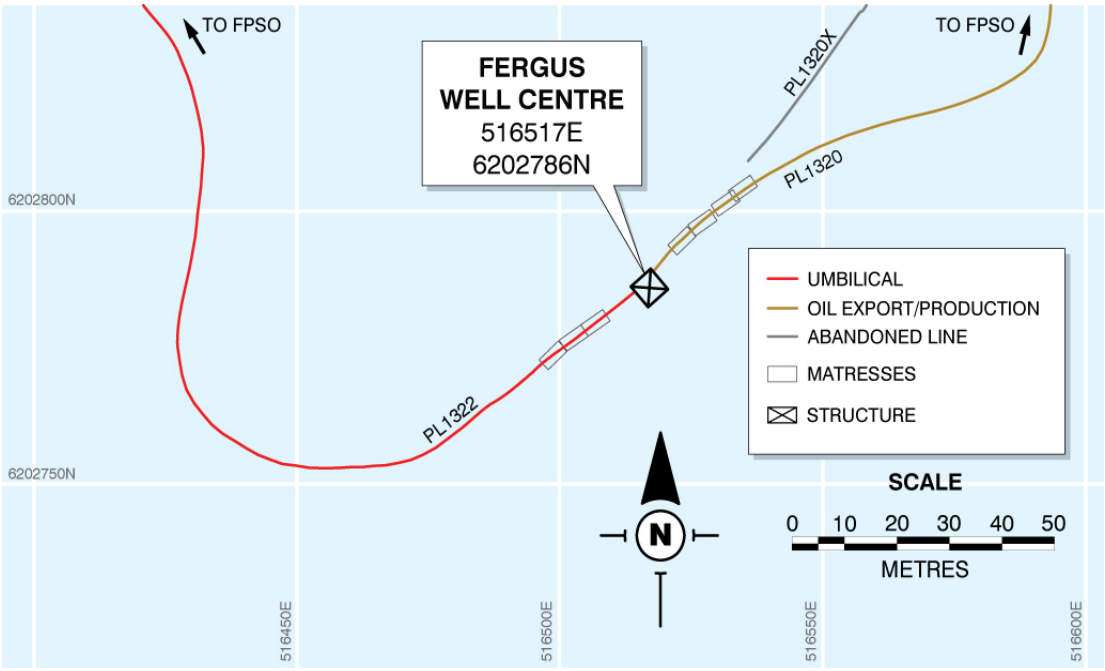


Figure D.1: Fergus Well Centre and Infrastructure

As part of the Phase 2 – Full Field Decommissioning Activities, the following items will be decommissioned:

Fergus Decommissioning Programme, DP3

- Subsea structures.
- Mattresses and grout bags.
- Wells.

Fergus Decommissioning Programme, DP4

- Production flowline.
- Umbilical.

These items are described in Section D.2.1 (DP3) and Section D.2.2 (DP4).

D.2.1 Fergus Decommissioning Programme, DP3

D.2.1.1 Subsea Structures

Whilst in operation, there were a number of subsea structures within the FFFA development, and the majority have been described and accounted for in the Fife Decommissioning Programmes. The structures covered under Fergus DP3 are described below.

(a) Production Flowline Riser Base

Individual flowline riser bases were required beneath the FPSO to provide seabed anchors for the risers. The riser bases were used within the FFFA Field development for the production and water injection flowline risers.

The Fergus flowline riser base is secured to the seabed with a suction anchor and has a pipe spool mounted on top.

(b) Fergus Wellhead Protection Structure

The Fergus Xmas tree is protected by a four part, 3.2m high concrete protection structure.

D.2.1.2 Mattresses and Grout Bags

There are 24 mattresses in the Fergus Field; 14 cover the flexible production flowline and umbilical, and 10 protect the Fergus infrastructure within the FFFA centre.

The mattresses consist of concrete elements linked together with high strength non-degradable polypropylene rope or wire rope, with typical dimensions of 6m long x 3m or 2m wide x 0.15m thick.

In addition, grout/sand bags have been used close to structures in various locations, typically to provide support where pipelines and umbilicals are connected to structures.

D.2.1.3 Wells

The Fergus Field reserves were recovered by means of a single production well (F7) that flowed via a subsea flowline and riser to the FPSO. No water injection or gas lift was required to produce from the Fergus reservoir. There is also one abandoned exploration well in the Fergus Field.

D.2.2 Fergus Decommissioning Programme, DP4

Table D.1 itemises the pipelines associated with the Fergus Field as detailed in the Section 29 Notice for Submarine Pipelines (reference 01.08.07.05/80C).

Table D.1: Fergus Section 29 Pipelines and Description

Pipeline Number	Type	Description	Surface/ Buried	% of lines buried
PL1320	Production flowline (flexible)	Production flowline from Fergus production tree to production riser base.	Buried	99
PL1320X	Production flowline (flexible)	Out of use production flowline.	Buried	99
PL1322.1	Chemical injection and control umbilical	Fergus production tree to umbilical riser base	Buried	98
PL1322.2	Chemical injection and control umbilical	Fergus production tree to umbilical riser base	Buried	98
PL1322.3	Chemical injection and control umbilical	Fergus production tree to umbilical riser base	Buried	98

D.2.2.1 Production Flowline

The Fergus production well F7 was tied back directly to the FPSO through a 7" flexible flowline (PL1320) at the well end, connected to a flexible 6" 1.8 km flowline, then up from the riser base through a flexible riser into the FPSO turret.

The flowline remains connected to the riser base beneath the former location of the FPSO and does not cross any other pipeline along its route. The flowline has been disconnected from the Xmas tree and blind flanges have been fitted to the tree and flowline end. No gas lift flowline was laid to Fergus.

The flowline has been regularly surveyed and the burial depth was checked during the ROV survey performed in December 2008. Figure D.2 shows the depth of the pipeline below the seabed indicating good coverage over the entire length between the trench transitions.

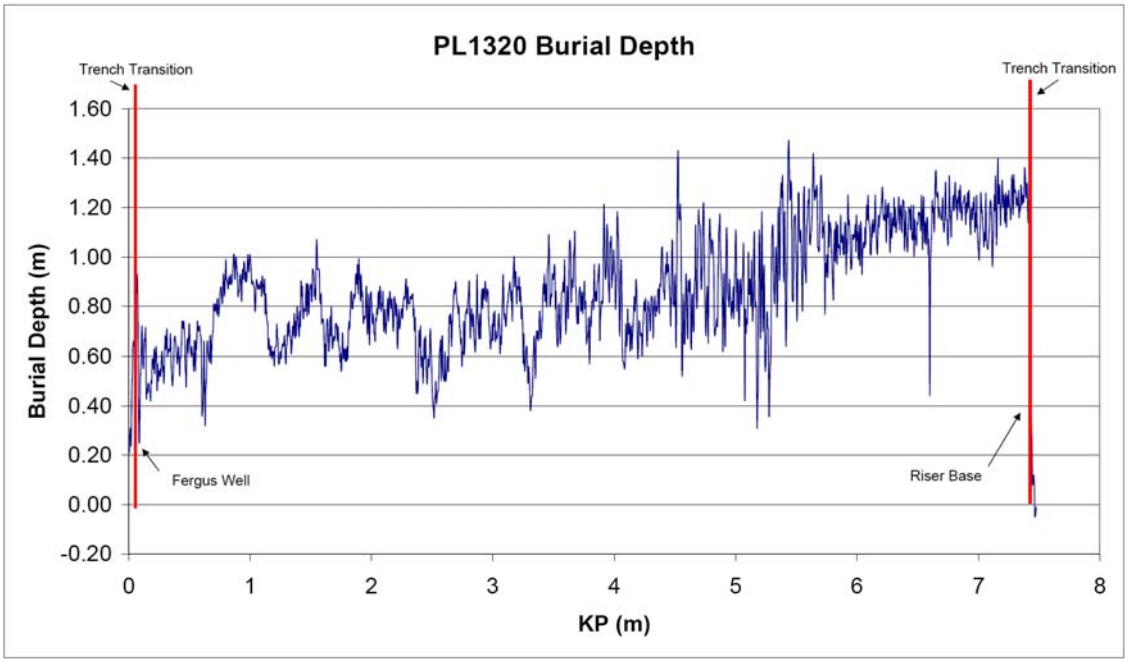


Figure D.2: PL1320 Burial Depth

In 2000, a 2 km section of the original 7" flexible flowline was replaced following failure of the flowline. The removed section was recovered from the seabed, leaving 3.5 km of the original flowline (PL1320X), trenched and buried *in situ*. Figure D.3 shows the depth of burial of this section of original pipeline.

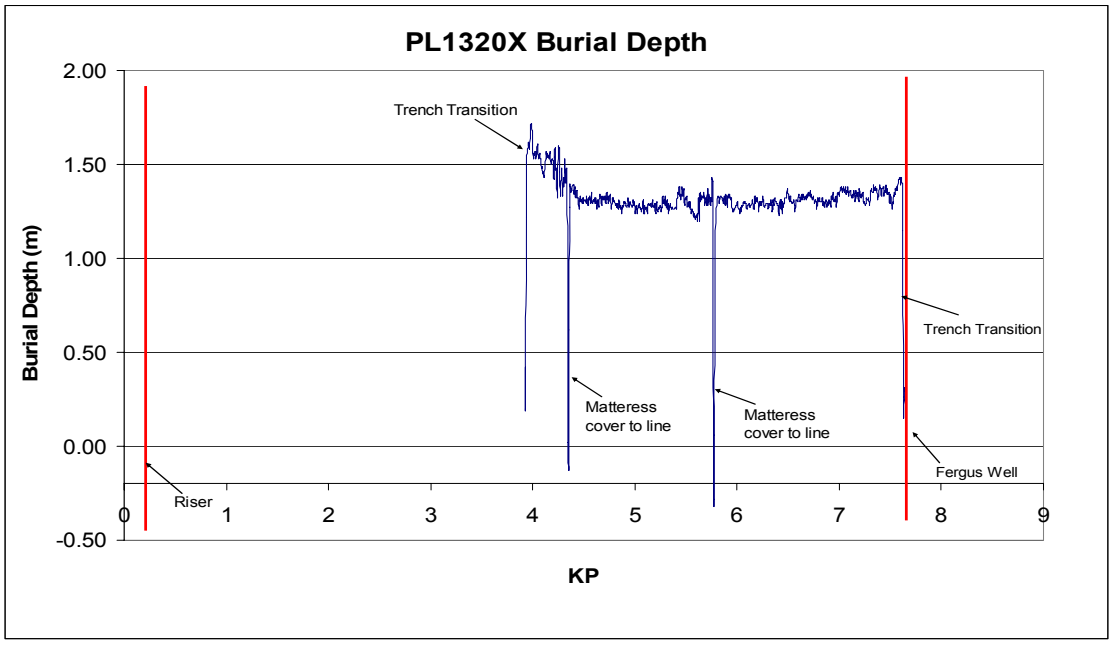


Figure D.3: PL1320X Burial Depth

Corrosion protection of the flowlines is provided by a cathodic protection system and an anti-corrosion coating. The cathodic protection system comprises sacrificial anodes on the steel components of the Xmas trees, flexible flowlines, riser bases and the risers. All flexible components of the flowlines are protected by a 6mm high density polypropylene anti-corrosion coating.

Concrete mattresses (Section D.2.1.2) are laid on the first section of the flowline connected to the riser base and around the wellhead, primarily to prevent mechanical damage by dragged objects on the seabed but also to prevent damage from dropped objects.

D.2.2.2 Umbilicals

A single production control and chemical injection umbilical was tied back from the Fergus Field production tree to the FPSO. Control of the Fergus tree and subsea valves was achieved through a direct hydraulic control system located on the FPSO. Chemical injection was provided through cores in the umbilical. The flexible umbilical riser which ran from the FPSO turret to the SUT on the umbilical riser base was disconnected and laid on the seabed to allow the FPSO to sail away. During suspension activities in 2008, the umbilical was disconnected at the tree and caps installed at the tree and umbilical end.

Two different types of umbilical were utilised within the FFFA development, namely production control and water injection control. The single Fergus umbilical (PL1322) is a production control umbilical.

(a) Fergus Production Control Umbilical

The production umbilicals were designed to carry hydraulic and electrical signals from the control system on the FPSO to and from the respective field production wells. These umbilicals also carried chemicals for injection purposes, and lift gas if required.

Each production umbilical is split into two parts. The first part is the riser section that runs from the FPSO to the umbilical riser base. The second section is the seabed umbilical that ran from the umbilical riser base to the production well.

The following chemicals were supplied via the umbilicals:

- Corrosion inhibitor.
- Scale inhibitor.
- Methanol.

The Fergus production well F7 had its own dedicated umbilical. The flowline has been regularly surveyed and the burial depth was checked during the ROV survey performed in December 2008 which showed a good level of cover (Figure D.4).

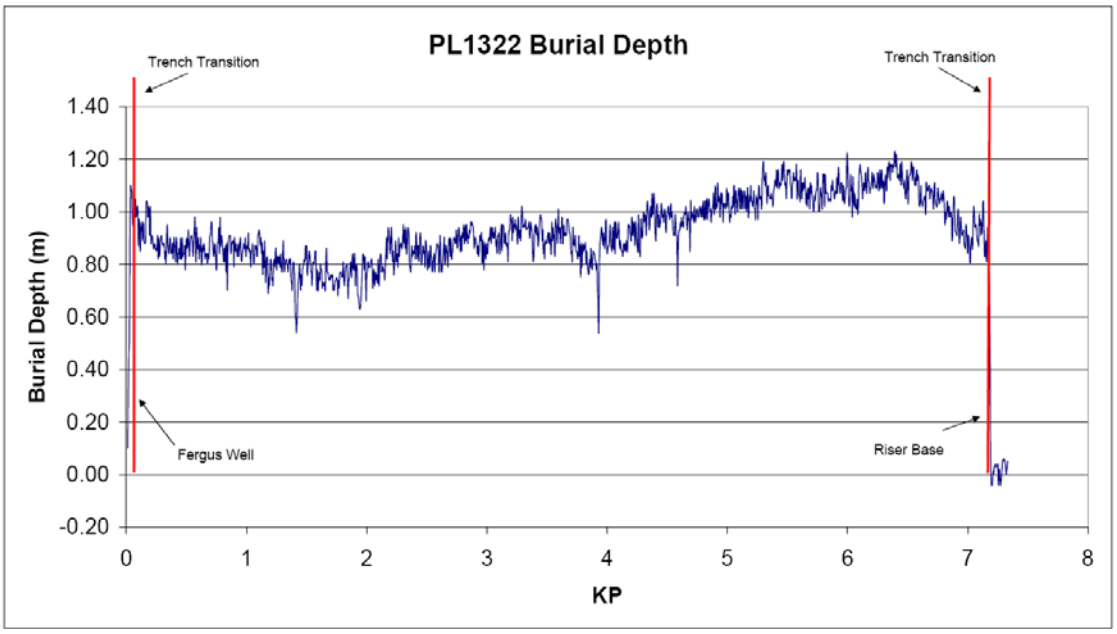


Figure D.4: PL1322 Burial Depth

D.3 INVENTORY OF ITEMS AND MATERIALS

D.3.1 Fergus Decommissioning Programme, DP3

D.3.1.1 Subsea Structures

Table D.2: Seabed Structures at Fergus

Item	Size (m)	Weight (te)	Notes
Production flowline riser base	5 dia. X 4.5 high	54	Suction pile with concrete ballast and clamped spool attachment.
Wellhead protection structure beneath the well	4 x 3.7 x 3.2 4.8 x 3 0.25	2 x 25 2 x 7	Blocks of concrete contained by a chain around the outside.

D.3.1.2 Mattresses and Grout Bags

Table D.3: Protection and Stabilisation Items at Fergus

Item	Number	Size (m)	Weight (te)
Mattresses	24	6 x 2 x 0.15	86

D.3.1.3 Wells

(a) Production Wells

The single production well at Fergus was fitted with a Vetco dual-bore Xmas tree measuring 4m x 4m x 5m and was tied back by a flowline to the FPSO.

Table D.4: Fergus Production Well

Hess Well ID	Old Hess Well No.	DECC Well No.	Completion Date	Function	Max Angle	Well Type	Depth (ft MDSS)
F7	N/A	39/02-2z	July 1996	Oil producer	31°	Deviated producer	9,675

(b) Suspended and Abandoned Wells

The Fergus Field has a single abandoned exploration well (Table D.5).

Table D.5: Fergus Abandoned Well

DECC Well Number	WONS Reference Number	Hess Well Identity	Well Type	Current Status
39/2-2	N/A	N/A	Exploration	Side-tracked for operational reasons to 2z (F7).

D.3.2 Fergus Decommissioning Programme, DP4

D.3.2.1 Production Flowlines and Jumpers

Several types of flowlines and jumpers were used in the FFFA development and within the Fergus Field itself (Table D.6).

Table D.6: Description of Flowlines at Fergus Field

Pipeline Number	Description	Size (in)	Coating	Overall Diameter (mm)	Wall Thickness (mm)	Length (m)	Nominal Weight in Air (kg/m)	From	To	Trenched or Lying on the Seabed Surface
PL1320	Flexible API 17J	6	None	204.7	26.2	1,827	55.4	F7 riser base	Midline connection	Trenched
PL1320	Flexible API 17J	7	None	248.7	35.4	5,610	88.4	Midline connection	Well F7	Trenched
PL132X[1]	Flexible API 17J	7	None	248.7	35.4	3,500	88.4	Midline connection	Well F7	Trenched

[1] The upstream end of the Fergus Field production flowline (PL1320) was replaced in 2000 with a 7" flexible flowline as a result of the original flexible flowline failure. Approximately 2 km of the original 7" section of flowline was removed but the remaining 3.5 km length to the well location was left *in situ*, trenched and buried.

D.3.2.2 Control, Chemical Injection and Gas Lift Umbilicals

Table D.7: Description of Control and Chemical Injection Umbilicals at Fergus

Well	Pipeline ID	Size (in)	Type	Overall Diameter (mm)	Length (m)	Nominal Weight (kg/m)	From / To
Fergus F7	PL1322.1	3/8	Chemical injection	108	7,315	16	Umbilical riser base to well F7
	PL1322.2	3/8	Chemical injection				
	PL1322.2	3/8	Spare				
	-	3/8 + ¼	Controls				
	-	-	4 cables				

D.3.3 Summary of Subsea Infrastructure Material Weights

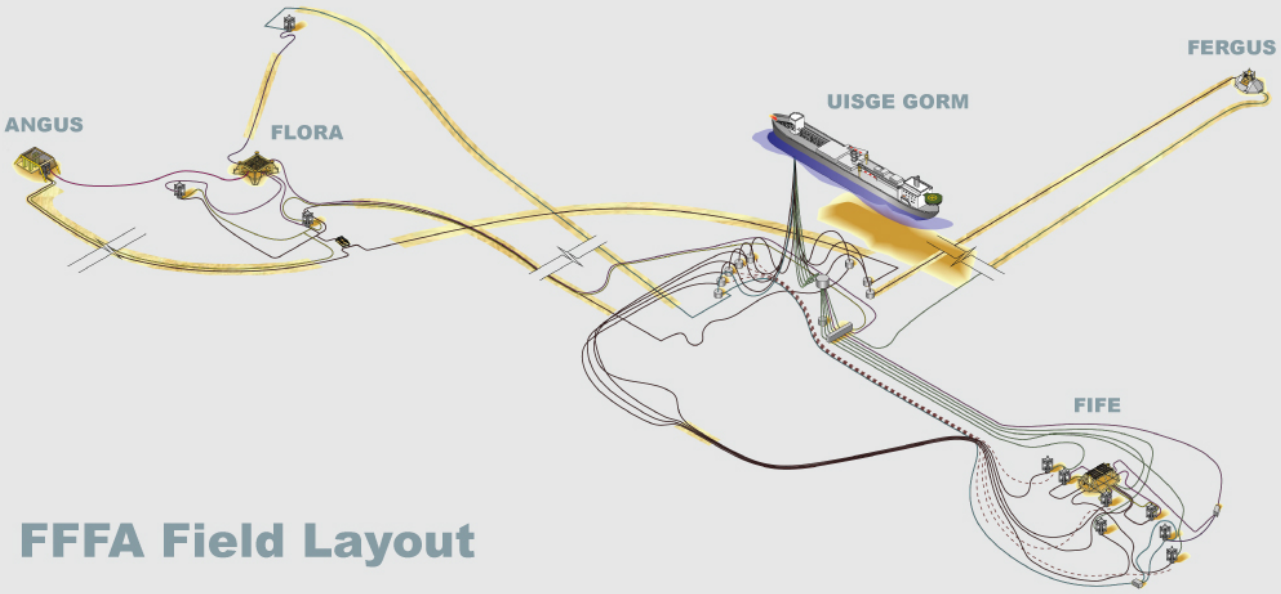
Table D.8: Type of Material and Totals of the Subsea Infrastructure Currently in the Fergus Field

Item	Type of Material	Total Weight (tonnes)	Weight to be Recovered (tonnes)
Flexible flowlines / jumpers	Steel Composites	789 197	8.5 2.1
Umbilicals	Steel Composites	76 41	1.8 0.9
Structures	Steel Zinc Concrete	27 1 91	27 1 91
Mattresses	Concrete	86	86
Xmas trees	Steel Zn Anodes	23 1	23 1
Flowbases / Wellheads	Steel	18	18

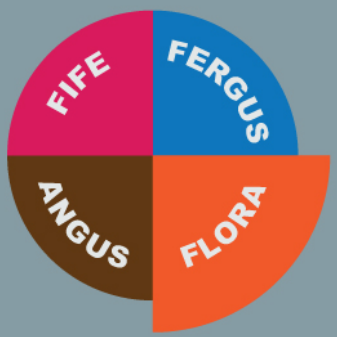
Table D.9: Overall Weight and intended Fate of Material in the Fergus Field, by Type

Type of Material	Total Weight (tonnes)	Weight to be Recovered (tonnes)	Predicted Fate (tonnes)			
			Recycle	Reuse	Disposal	Left in situ
Steel	933	78.3	78.3	0	0	854.7
Composites	238	3	0	0	3	235
Concrete	177	177	177	0	0	0
Zn	2	2	2	0	0	0

Flora



FFFA Field Layout



E.1 THE FLORA FIELD

Two production wells (F01 and F03) were used to recover the Flora reserves. Produced fluids from each well were commingled at a tee section close to production well F01 and tied back to the FPSO *Uisge Gorm* via the production flowline PL1641. Gas lift facilities were provided at the production trees by a flowline from the FPSO which comprised both rigid and flexible pipes. The rigid section of pipe is piggy-backed onto the production flowline. Enhanced recovery was achieved by a water injection well (F02) served by a water injection flowline that lies in a separate trench. A single umbilical controlled and monitored the Flora subsea facilities. All flowlines and umbilicals were installed in 1998 and are trenched and buried, except at their ends, where they are covered by mattresses. Following suspension activities, the subsea infrastructure is hydrocarbon-free and the wellheads are isolated from the production flowlines.

Further details of the layout and facilities of the Flora Field are given in Sections E.2 and E3 of this Appendix.

E.2 DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

Figure E.1 and Figure E.2 show the current layout of infrastructure at the Flora well centre.

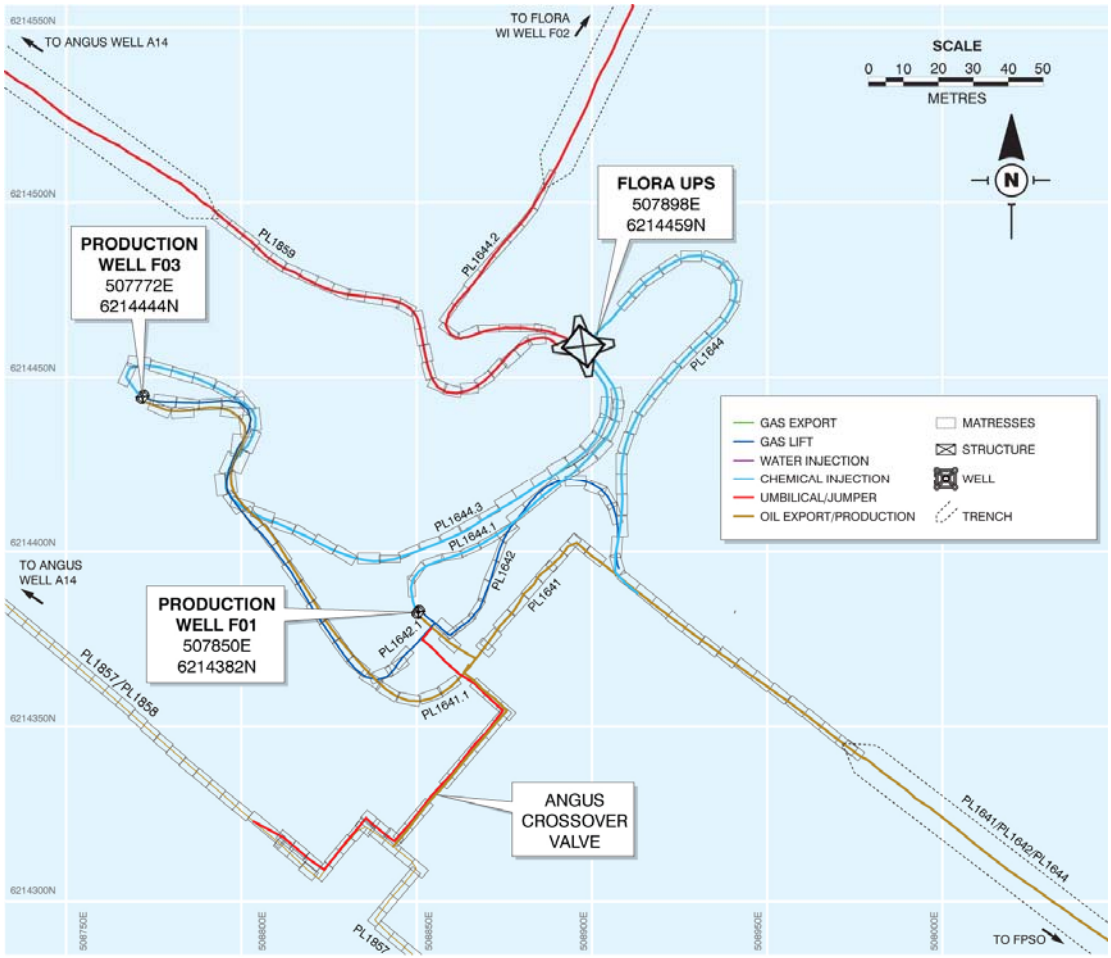


Figure E.1: Flora Well Centre and Infrastructure

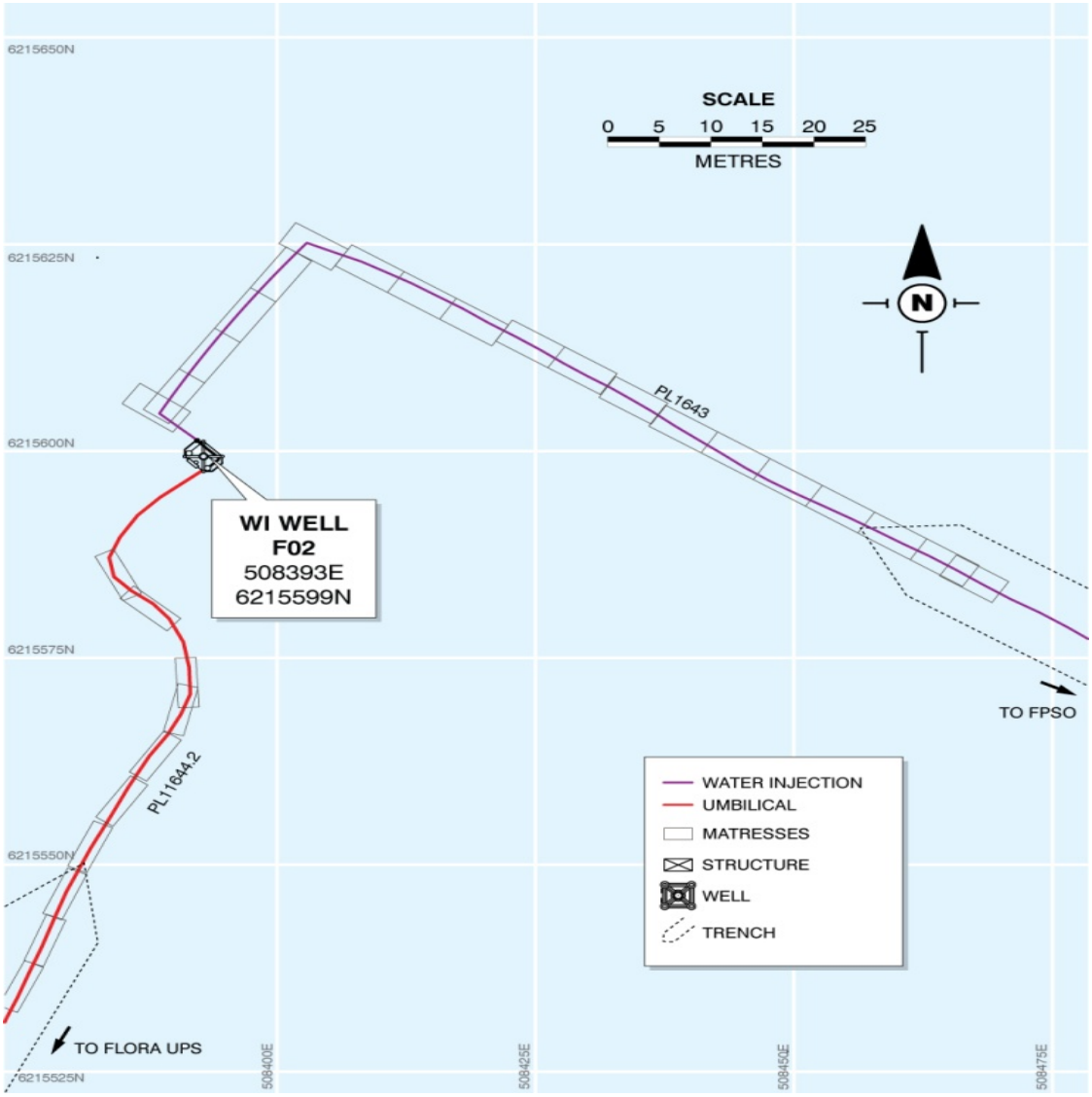


Figure E.2: Flora Water Injection Well Centre

As part of the Phase 2 – Full Field Decommissioning Activities, the following items will be decommissioned:

Flora Decommissioning Programme, DP5

- Subsea structures.
- Mattresses and grout bags.
- Wells.

Flora Decommissioning Programme, DP6

- Production flowlines.
- Umbilical.

These items are described in Sections E.2.1 (DP5) and E.2.2 (DP6).

E.2.1 Flora Decommissioning Programme, DP5

E.2.1.1 Subsea Structures

Whilst in operation, there were a number of subsea structures within the FFFA development, and the majority have been described and accounted for in the Fife Decommissioning Programmes. The structures covered under Flora DP5 are described overleaf.

(a) Production Flowline Riser Base

Individual flowline riser bases were required beneath the FPSO to provide seabed anchors for the risers. The riser bases were used within the FFFA Field development for the production and water injection flowline risers.

(b) Umbilical Termination Protection Structure

The single Flora control and chemical injection umbilical from the FPSO terminated at the UPS. At the UPS, four umbilical jumpers supplied the two production wells (F01 and F03), Angus well (A14) and the water injection well (F02).

The UPS protection frame is a tubular structure, rectangular in plan, supported by four 24" diameter steel piles on a 9m by 8m grid. The frame design includes over-trawlable elements, ie inclined corner raking members angled at 55° to the horizontal. The UPS also has hinged roof panels to allow access to the control equipment.

The support skid is a 7.2m x 6m grillage structure designed for offshore installation into the protection frame. The skid is supported within the protection frame at four corner locations using support pads and lock-down cotter pins.

The UPS control equipment comprises a main SUT, four wellhead SUTs (three production and one water injection), three associated wellhead Subsea Control Modules (SCMs), two Subsea Distribution Units (SDUs), two subsea accumulator modules (SAMs) and chemical interface/distribution in a modularised control skid and separate protection frame.

Anodes are fitted on the protection structure to provide cathodic protection.

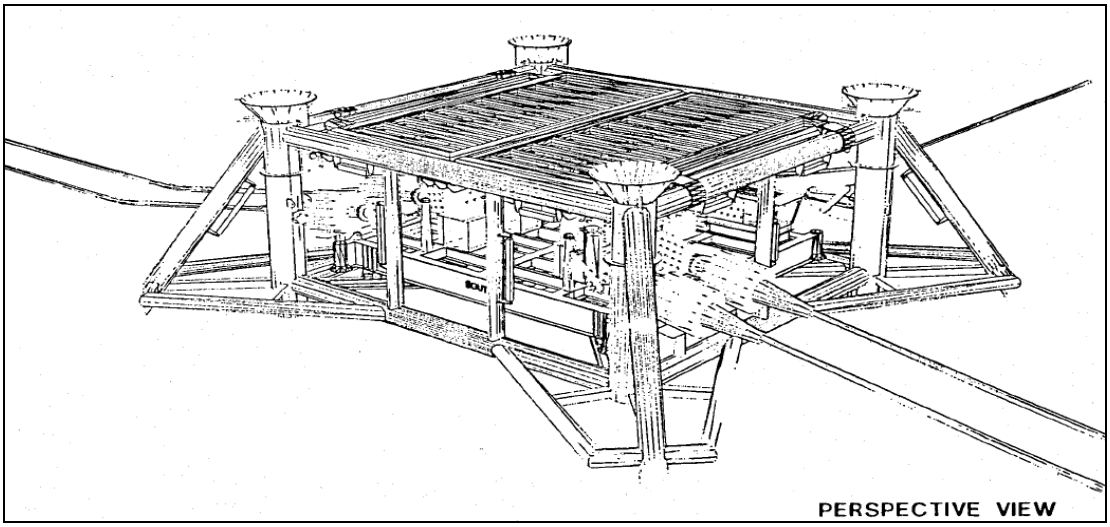


Figure E.3: Flora UPS Perspective View

E.2.1.2 Mattresses and Grout Bags

The mattresses consist of concrete elements linked together with high strength non-degradable polypropylene rope, with typical dimensions of 6m long x 3m or 2m wide x 0.15m thick. In addition, grout/sand bags have been used close to structures in various locations, typically to provide support where pipelines and umbilicals are connected to structures.

282 mattresses are used in the Flora Field; 216 cover the production flowline and infrastructure and 66 protect the Flora infrastructure from dropped objects in the FFFA centre. A small number of grout bags are also present in the field.

E.2.1.3 Wells

There are two production wells (F01 and F03), one water injection well (F02) and one abandoned exploration well (31/26a-12) in the Flora Field.

E.2.2 Flora Decommissioning Programme, DP6

Table E.1 itemises the pipelines associated with the Flora Field as detailed in the Section 29 Notice.

Table E.1: Flora Section 29 Pipelines and Description

Pipeline Number	Type	Description	Surface / Buried	% of line buried
PL1641	Production flowline (flexible)	From riser base to rigid pipeline	Surface	N/A
PL1641	Production flowline (rigid)	From flexible pipeline at riser base to production well F01	Buried	94
PL1641.1	Production flowline (flexible)	From rigid spool tie-in to production well F03	Surface	N/A
PL1642	Gas lift flowline (flexible and rigid sections)	Umbilical riser base to production well F01 and gas lift tee tie-in	Buried	94
PL1642.1	Gas lift flowline (flexible)	Gas lift tee tie-in to production well F03	Surface	N/A
PL1643	Water injection flowline (rigid)	Riser base to water injection well F02	Buried	98
PL1644 (Sections 1644.4-16)	Umbilical	Umbilical riser base to Flora UPS	Buried	93
PL1644.1	Umbilical (chemical injection)	UPS to production well F01	Surface	N/A
PL1644.2	Umbilical	UPS to water injection well F02	Buried	88
PL1644.3	Umbilical (chemical injection)	UPS to production well F03	Surface	N/A

E.2.2.1 Production Flowline

The Flora production well F01 was tied back to the FPSO through an 8" rigid subsea flowline (PL1641) and 6" flexible riser. An 8" flexible production jumper flowline (PL1641.1) from Flora production well F03 was connected to the rigid 8" subsea production flowline at a production tee close to production well F01. The commingled production fluids were then routed back to the FPSO through the rigid flowline.

PL1641 is crossed by the four Fife production flowlines (PL1745 – PL1748) beneath the FPSO location and by the Angus production flowline (PL1857) approximately half way between the FPSO location and the Flora field.

The 8" rigid production flowline PL1641 is trenched and buried, and has been regularly surveyed. The burial depth was checked during the ROV survey in December 2008 and this showed a good level of cover (Figure E.4). The 3" gas lift line PL1642 (which is piggy-backed onto PL1641), and the umbilical PL1644, are buried in the same trench. In order to prevent upheaval buckling, the flowline is covered by rock dump along the majority of its length.

The rigid flowline remains connected to a riser base beneath the FPSO location but is disconnected from the F01 Xmas tree; blind flanges have been fitted to the tree and flowline ends. There are 33 mattresses covering the pipeline at the riser base end and 24 at the well end.

Corrosion protection of the flowline is provided by a cathodic protection system and an anti-corrosion coating. The cathodic protection system uses sacrificial anodes on the steel components on the Xmas trees, flowlines, riser base and the riser. In addition, the rigid flowline is protected by 39mm of polypropylene, and the flexible production jumper from well F03 to the rigid production tee is protected by a high density 3-layered polypropylene outer sheath.

In 2007, due to integrity issues with the Flora riser, production from the Flora wells was routed via the existing cross-over structure to the Angus riser. The flowline was flushed and left filled with corrosion inhibitor. A spool piece at the well F01 end of the pipeline was disconnected (but remains on the seabed locally) and the flowline ends were fitted with blind flanges.

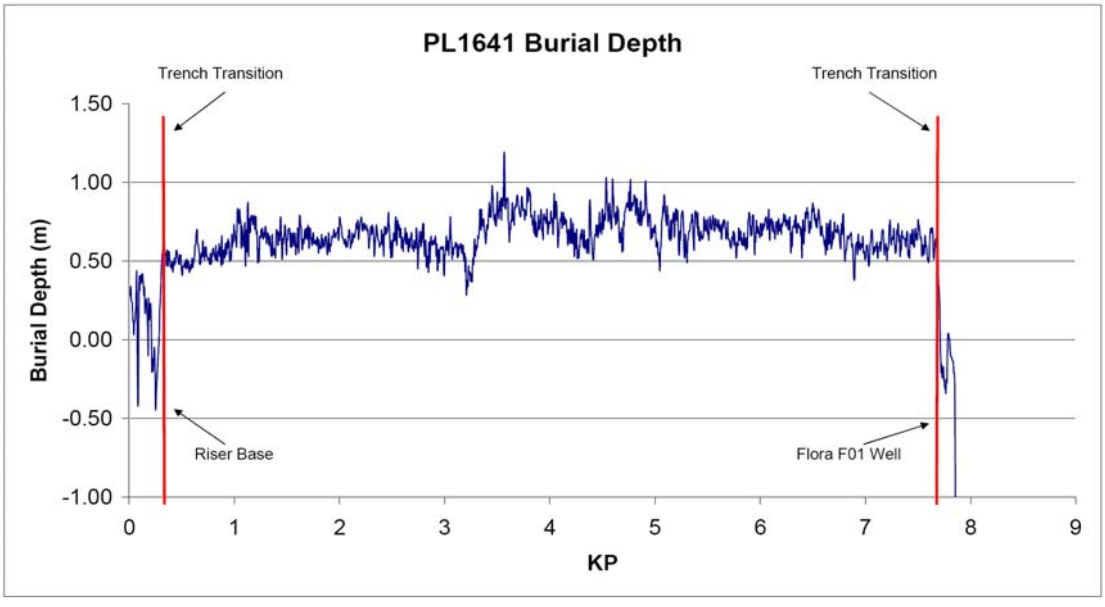


Figure E.4: PL1641 Burial Depth

E.2.2.2 Gas Lift Flowline

Lift gas was supplied to the two production wells by a 3" flexible gas lift flowline (PL1642) from the FPSO. The gas lift flowline primarily consists of flexible pipe with a short section (470m) of rigid pipe, which is piggy-backed to the Flora production flowline. In the period leading up to suspension, however, neither of the production wells was supplied with lift gas.

The flowline is laid in the same trench as the Flora production flowline (PL1641) and is therefore trenched and buried to the same depth.

The gas lift flowline is insulated by a 3-layered polypropylene anti-corrosion coating.

As with the production flowline, there is a rigid gas lift tee section close to production well F01. Gas lift was supplied to production well F01 via a 3" tie-in spool from the gas lift tee section. A 3" flexible tie in spool (PL1642.1) from the tee section supplied gas lift to production well F03. The gas lift flowline has been disconnected from wells F01 and F03 and blind flanges have been fitted to the trees and flowline ends.

E.2.2.3 Water Injection Flowline

The Flora Field was supplied with treated injection water through an 8" rigid water injection flowline (PL1643) from the FPSO. The water injection flowline was run from the same water injection riser base as the Fife water injection system and supplied the Flora water injection well (F02).

PL1643 is trenched and backfilled, and has been regularly surveyed. The burial depth was checked during the ROV survey in December 2008 and this showed a good level of cover (Figure E.5). The flowline remains connected to the riser base but is disconnected from the F02 Xmas tree; blind flanges have been fitted to the tree and flowline ends.

PL1643 is crossed by the four Fife production flowlines and the Flora gas lift line and umbilical close to the riser base location. The Angus production flowline also crosses PL1643 approximately halfway between the riser base and Flora field.

PL1643 has 19 mattresses at the riser base end and 20 mattresses where the flowline approaches the Xmas tree.

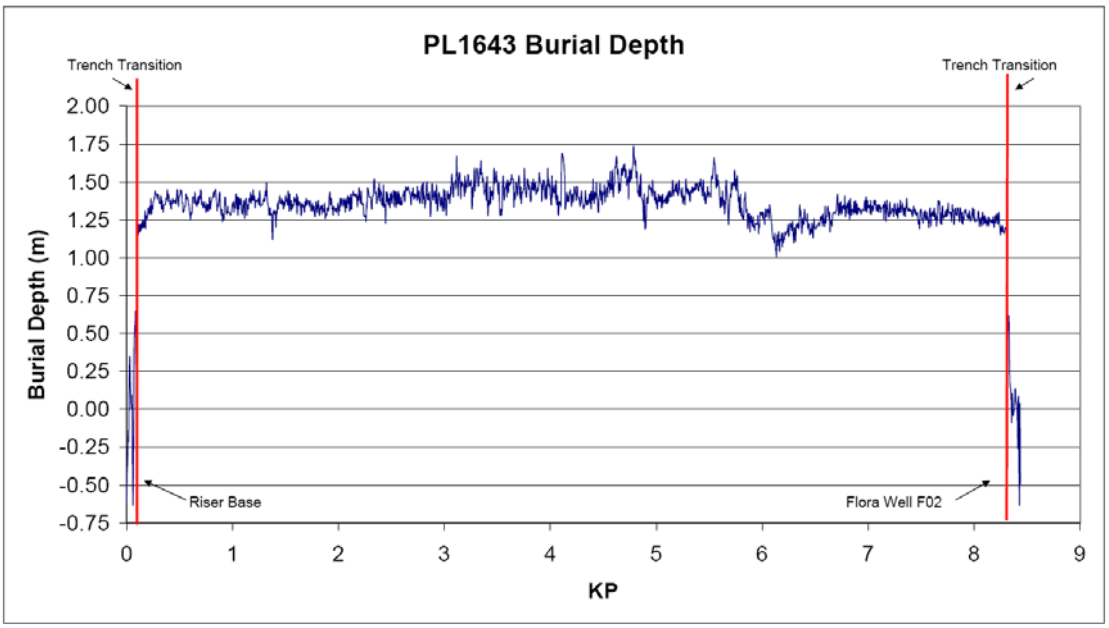


Figure E.5: PL1643 Burial Depth

E.2.2.4 Umbilicals

Two different types of umbilical were used in the FFFA development - production control and water injection control.

(a) Flora Production Control Umbilical

The production umbilicals were designed to carry hydraulic and electrical signals from the control system on the FPSO to and from the respective field production wells. They also carried chemicals for injection purposes, and lift gas if required. The flexible umbilical riser which ran from the FPSO turret to the SUT on the umbilical riser base was disconnected and laid on the seabed to allow the FPSO to sail away. During suspension activities in 2008, the umbilical was disconnected at the tree and caps installed at the tree and umbilical end.

Each production umbilical is split into two parts. The first part is the riser section that runs from the FPSO to the umbilical riser base. The second section is the seabed umbilical that ran from the umbilical riser base to a subsea umbilical termination within the Flora UPS. Umbilical jumpers from the UPS feed the two production wells F01 and F03. The main umbilical is trenched in the same trench as the Flora production flowline PL1641 (Figure E.4); the two jumpers are predominantly covered by mattresses.

The following chemicals were supplied via the umbilicals:

- Corrosion inhibitor.
- Scale inhibitor.
- Methanol.

(b) Flora Water Injection Control Umbilical

The water injection umbillicals were designed to carry hydraulic and electrical signals from the control system on the FPSO to and from water injection wells. For Flora, the main water injection umbilical fed into the UPS and a trenched jumper (PL1644.2) ran from the UPS to the water injection well F02, for control purposes only. The burial depth of PL1644.2 is shown in Figure E.6.

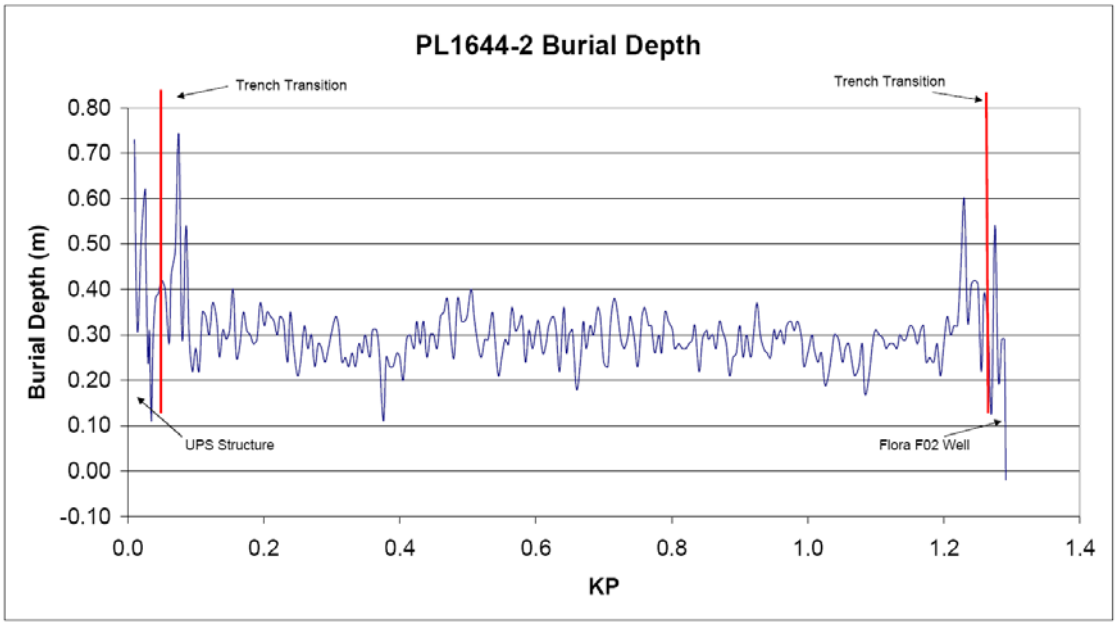


Figure E.6: PL1644.2 Burial Depth

E.3 INVENTORY OF ITEMS AND MATERIALS

This section contains information about the items that have yet to be decommissioned in Phase 2.

E.3.1 Flora Decommissioning Programme, DP5

E.3.1.1 Subsea Structures

Table E.2: Seabed Structures at Flora[1]

Item	Size (m)	Weight (te)	Notes
Production flowline riser base	5 dia. x 4.5 high	54	Suction pile with concrete ballast and clamped spool attachment
Umbilical Protection Structure (UPS)	9 x 8 x 4 (CL) 14.5 x 13.6 x 4.9 (OA)	63	Piled (4 x 24" piles)
Support skid	7.2 x 6	23	Steel frame. Diver lock-down cotter pins in four corner locations.
XOV skid	5.5 x 4.2 x 1.3	20	Steel frame.

[1] Note that the flexible umbilical riser presently lying on the seabed has been included in the Fife Decommissioning Programmes (Appendix C).

E.3.1.2 Mattresses

Table E.3: Protection and Stabilisation Items at Flora

Item	Number	Size (m)	Weight (te)
Mattresses	282	6 x 3 x 0.15	1,130

E.3.1.3 Wells

(a) Production Wells

The two production wells at Flora were fitted with Vetco dual-bore Xmas trees measuring 4m x 4m x 5m and were tied back by a flowline to the FPSO. The trees weigh approximately 36 tonnes each.

Table E.4: Flora Production Wells

Hess Well ID	Old Hess Well No.	DECC Well No.	Completion Date	Function	Max Angle	Well Type	Depth (ft MDSS)
F01	F-9/P-9	31/26a-F1	August 1998	Oil producer	Horizontal	Deviated producer	12,753
F03	F-11/P-11	31/26a-F3z	July 1999	Oil producer	Horizontal	Deviated producer	12,495

(b) Water Injection Well

The injection well is fitted with a Vetco dual-bore Xmas tree measuring 4m x 4m x 5m, and was tied back by a flowline to the FPSO.

Table E.5: Flora Injection Well

Hess Well ID	Old Hess Well No.	DECC Well No.	Completion Date	Function	Max Angle	Well type	Depth (ft MDSS)
F02	I4	31/26c-13	September 1998	Water injection	None (vertical)	Vertical water injector	9,627

(c) Abandoned Wells

The Flora exploration well has been abandoned (Table E.6). The appraisal well was converted to the water injector well F02. During Phase 1 operations, the Flora wells were suspended (Appendix A)

Table E.6: Flora Abandoned Wells

DECC well number	WONS Reference Number	Hess well identity	Well type	Current status
31/26a-12	NA	NA	Exploration	Abandoned 1997
31/26a-13	NA	NA	Appraisal (converted to injector)	Well re-designated as F02 (Table E.5)

E.3.2 Flora Decommissioning Programme, DP6

E.3.2.1 Production Flowlines and Jumpers

Several types of flowlines and jumpers were used in the FFFA development and within the Flora Field itself. Table E.9 summarises these components and gives estimates of the materials within them.

Table E.7: Description of Flowlines at Flora Field

Pipeline Number	Description	Size (in)	Coating	Overall diameter (mm)	Wall thickness (mm)	Length (m)	Nominal weight in air (kg/m)	From	To	Trenched or lying on the seabed surface
PL1641 (Production)	Flexible API 17J	8	None	239.4	43.5	210	114	Riser base	Rigid pipeline	Surface
PL1641 (Production)	Rigid API 5L X65	8	39-40mm 4 layer PP insulation	219.1	15.9	7860	79.7	F01 well	Flexible flowline connected to riser base	Trenched
PL1641.1 (Production)	Flexible API 17J	8.6	None	308.5	45.5	150	157.5	F03 well	Rigid spool	Surface
PL1642 Flexibles 1, 2 and 3 (Gas lift)	Flexible API 17J	3	None	123.2	23.5	687, 3,992, 2,680	14.6	Umbilical riser base	Gas lift tie-in	Trenched
PL1642 Rigid section (Gas lift)	Rigid API 5L X65	3	39mm 4-layer PP	88.9	7.1	470	14.3	Flexible 1	Flexible 2	Trenched
PL1642.1 (Gas lift)	Flexible API 17J	4	None	149	23.7	145	31.6	Gas lift tee tie-in	F03	Surface
PL1643 (Water injection)	Rigid API 5L X65	8	3mm PP	219.1	18.3	8,448	90.62	Riser base	F02	Trenched

E.3.2.2 Control, Chemical Injection and Gas Lift Umbilicals

Table E.8: Description of Control and Chemical Injection Umbilicals at Flora

Well	Pipeline ID	Size (in)	Type	Overall diameter (mm)	Length (m)	Nominal Weight (kg/m)	From / To
-	PL1644.1 - PL1644.16	1/2	Chemical injection	130	7900	24	Umbilical riser base to Flora UPS
		1/2	Controls				
		3/8	Controls				
		39mm	Cable				
F01	PL1644.1 – PL1644.16	1/2	CI (M)	141	106	29	UPS to F01
		1/2	CI (W)				
		3/8	CI (C)				
		3/8	CI (S)				
		3/8	Controls				
		49mm	Cable				
F02	PL1644.2	3/8	Controls	126	1300	23	UPS to F02
		49mm	Cable				
F03	PL1644.1- PL1644.16	1/2	CI (M)	141	236.5	29	UPS to F03
		1/2	CI (W)				
		3/8	CI (C)				
		3/8	CI (S)				
		3/8	Controls				
		49mm	Cable				

E.4 SUMMARY OF SUBSEA INFRASTRUCTURE MATERIAL WEIGHTS

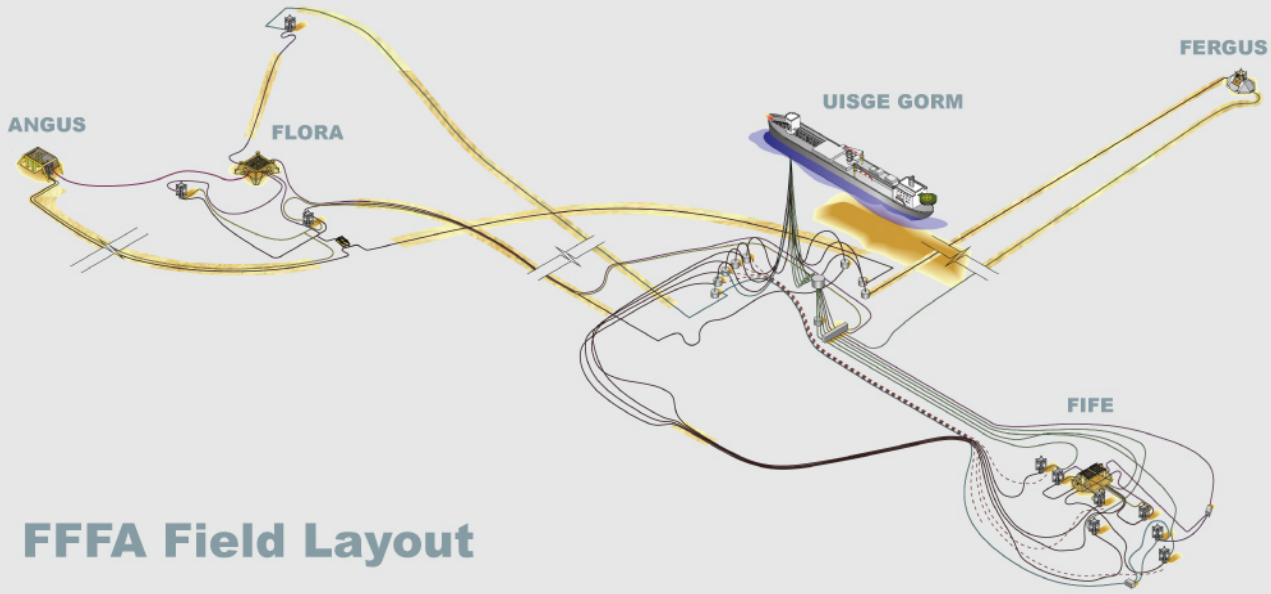
Table E.9: Type of Material and Totals of the Subsea Infrastructure of the Flora Field

Item	Type of Material	Total Weight (tonnes)	Weight to be Recovered (tonnes)
Flexible flowlines / jumpers	Steel	172	50
	Composites	40	12
Rigid flowlines/spools	Steel	1,427	40
	Composites	12	0.2
	Zn anodes	6.8	0.2
Umbilicals	Steel	151	18
	Composites	79	9
Structures	Steel	128	128
	Zn anodes	5	5
	Concrete	27	27
Mattresses	Concrete	1,130	1,130
Xmas trees	Steel	70	70
	Zn anodes	3	3
Flowbases / Wellheads	Steel	60	60

Table E.10: Overall Weight and Intended Fate of Material Currently in the Flora Field, by Type

Type of Material	Total Weight (tonnes)	Weight to be Recovered (tonnes)	Predicted Fate (tonnes)			
			Recycle	Reuse	Disposal	Left in situ
Steel	2,008	366	366	0	0	1,642
Composites	131	21.2	0	0	21.2	109.8
Concrete	1,157	1,157	1,157	0	0	0
Zn	14.8	8.2	8.2	0	0	6.6

Angus



FFFA Field Layout

F.1 THE ANGUS FIELD

A single gas lifted well (A14) was used to recover the Angus reserves and was tied back to the FPSO using a flexible riser via a dedicated riser base. The production flowline is routed via the Flora Field, though the Angus flowline is situated within its own corridor. The production flowline incorporates an in-line tee located near the Flora Field, providing the facility for Flora reserves to be tied into the Angus flowline (Figure F.1). The flowline was therefore designed to satisfy both Angus and Flora production requirements. In addition, the design and layout of the Angus facilities is capable of accommodating at least one more Angus production well.

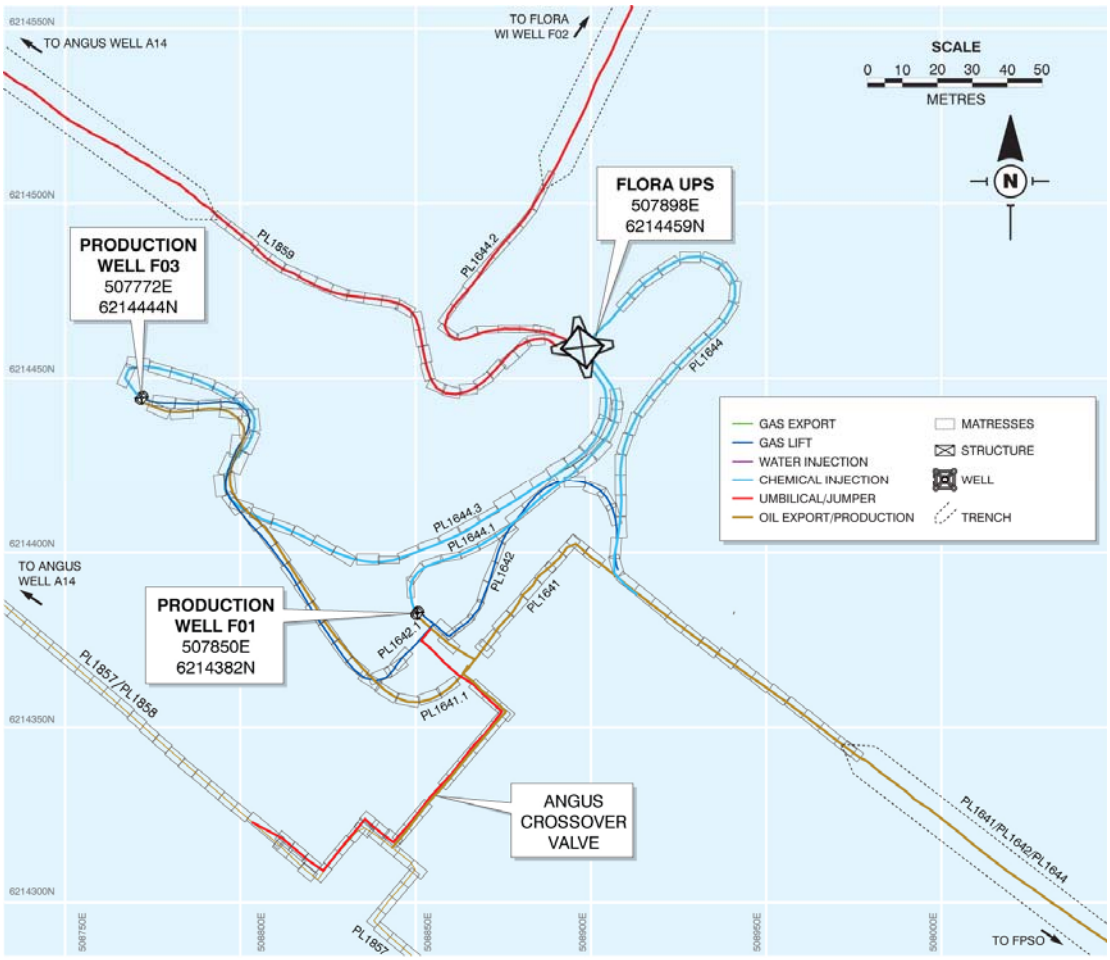


Figure F.1: Arrangement of Angus and Flora Subsea Facilities near the Flora Location

A gas lift flowline provided lift gas to the Angus well. This flowline was tied back to the Flora gas lift system via a tee facility located at the Flora site. The gas lift system at Flora was supplied via a 3" flowline from the FPSO. The gas lift flowline from Flora to Angus is piggy-backed onto the Angus production flowline. The Angus production well was supplied with an electro-hydraulic control and chemical injection umbilical which tied in with the Flora controls system at the Flora UPS. The umbilical is buried within its own corridor to Flora. All of the flowlines and umbilicals were installed in 2001 and are trenched, except at their ends where they are covered by mattresses.

Production from the Angus Field ceased in 2006 when a 'kick-over' tool became stuck during a campaign to change out gas lift valves. The well was shut in and a bridge plug installed. There are also three abandoned Angus wells (Section F.2.1.3).

Further details of the layout and facilities of the Angus Field are given in Sections F.2 and F.3 of this Appendix.

F.2 DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

Figure F.2 shows the present layout of infrastructure at the Angus well centre.

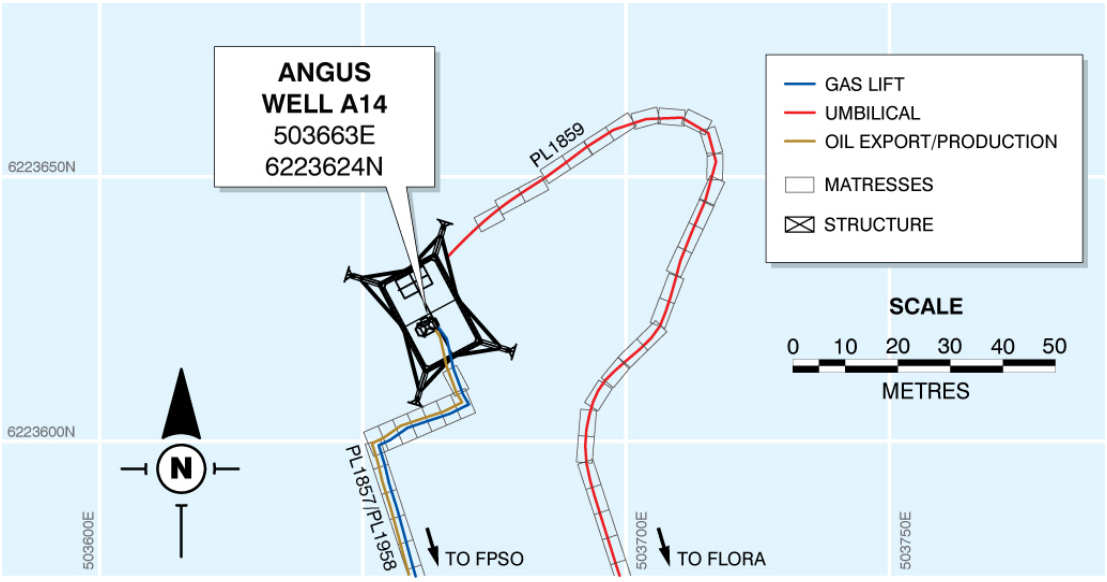


Figure F.2: Angus Well Centre and Infrastructure

As part of the Phase 2 – Full Field Decommissioning Activities, the following items will be decommissioned:

Angus Decommissioning Programme, DP7

- Subsea structures.
- Mattresses and grout bags.
- Wells.

Angus Decommissioning Programme, DP8

- Production flowlines.
- Umbilical.

These items are described in Sections F.2.1 (DP7) and F.2.2 (DP8).

F.2.1 Angus Decommissioning Programme, DP7

F.2.1.1 Subsea Structures

Whilst in operation, there were a number of subsea structures within the FFFA development. The majority of these structures have been described and accounted for in the Fife Decommissioning Programmes, eg the umbilical riser base. The structures covered under the Angus DP7 are described overleaf.

(a) Production Flowline Riser Base

Individual flowline riser bases were required beneath the FPSO to provide seabed anchors for the risers. The riser bases were used within the FFFA Field development for the production and water injection flowline risers.

(b) Angus Wellhead Protection Structure

The Angus subsea tree and associated control equipment (two accumulator units, two distribution units and one control module) are protected by an Anchortech protection structure. The protection structure was designed to provide interfaces for accepting the controls system equipment, main umbilical and tree umbilical jumper. It is a tubular steel structure, rectangular in plan and supported by four steel piles. The structure is 26m long, 19.3m wide and 7.7m high. Anodes fitted to the structure provide cathodic corrosion protection. Figure F.3 shows the protection structure during fabrication.

Figure F.3: Angus Wellhead Protection Structure

(c) Angus Crossover Skid at Flora Production Tie-in

The Angus crossover skid is located at the tee section between the Flora and Angus production flowlines and is designed to house the production crossover isolation valve. Anodes are fitted to the skid to provide cathodic protection.

F.2.1.2 Mattresses and Grout Bags

The mattresses consist of concrete elements linked together with high strength non-degradable polypropylene rope or wire rope, with typical dimensions of 5m long x 3m wide x 0.15m thick. In addition, grout/sand bags have been used close to structures in various locations, typically to provide support where pipelines and umbilicals are connected to structures.

218 mattresses are used in the Angus Field; 35 protect the Angus infrastructure within the FFFA centre, 30 protect the umbilical and 34 protect the flowline at the well end. The remaining mattresses protect the flowline and umbilical at various locations.

F.2.1.3 Wells

The Angus Field reserves were recovered by a single production well, A14, which was supported by gas lift supplied by the Flora gas lift system.

There are also three abandoned Angus wells; one exploration, one appraisal and one producer.

F.2.2 Angus Decommissioning Programme, DP8

Table F.1 gives details of the pipelines associated with the Angus Field as listed in the Section 29 Notice. All of the flowlines and umbilicals are trenched and buried, except the ends, which are covered by mattresses.

Table F.1: Angus Section 29 Pipelines and Description

Pipeline Number	Type	Description	Surface/ Buried	% of line buried
PL1857	Production flowline (rigid)	From riser base to Angus well A14	Buried	96
PL1858	Gas lift flowline (flexible)	Angus tie-in spool to Flora tie-in tee section	Buried	96
PLU1859	Umbilical	Flora UPS to Angus control skid within the Angus wellhead protection structure	Buried	97

F.2.2.1 Production Flowline

Production from the Angus production well was tied back directly to the FPSO through a trenched and backfilled 8” rigid subsea flowline (PL1857) and a 6” flexible riser. The rigid flowline incorporates the in-line tee located near the cross-over skid which allowed the Flora reserves to be tied into the Angus flowline. A further tee-section was provided in the production tie-in spool-piece at the riser base to facilitate further crossover of production. The production flowline is insulated by a 4-layered polypropylene anti-corrosion coating system. The flowline has been regularly surveyed, and the burial depth was measured during the ROV survey performed in December 2008 which confirmed a good level of cover (Figure F.4). The gas lift flowline for well A14 is piggy-backed onto the production flowline (Section F.2.2.2).

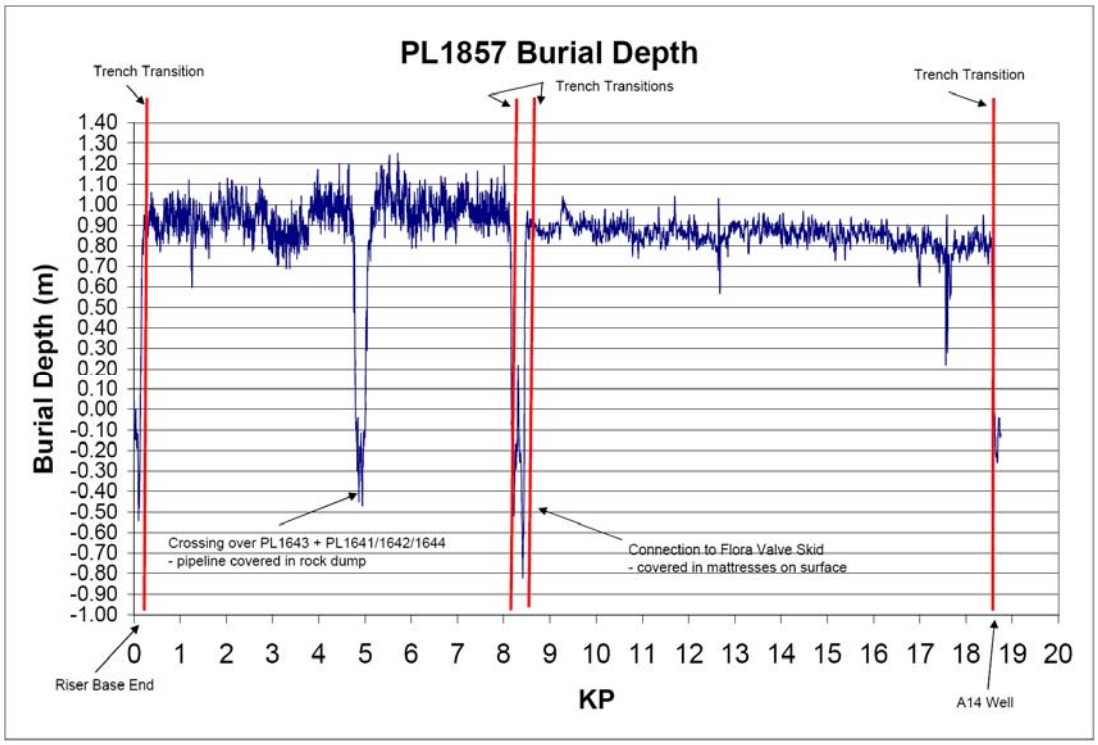


Figure F.4: PL1857 Burial Depth

As part of the Flora production re-configuration in 2007, and since the Angus well had been previously shut-in, a short spool-piece in PL1857 north of the Angus cross-over skid was disconnected and the ends fitted with blind flanges. The spool-piece remains on the seabed near to the skid.

PL1857 crosses the Flora water injection line (PL1643), the Flora production (PL1641) and gas lift lines (PL1642), and umbilical (PL1644), approximately half way between the FFFA Centre and the Flora Field. PL1857 also crosses an out-of-service Newbiggin to Arundel cable, although the exact location of the cable is not known.

The production and gas flowline is protected by 35 mattresses at the riser base end, 87 mattresses at the cross-over skid and 43 mattresses at the well end.

F.2.2.2 Gas Lift Flowline

The Angus production well A14 was provided with gas lift from the Flora gas lift system via a tee facility located at the Flora site and a 3" rigid gas lift flowline (PL1858). The Flora system itself was supplied via a 3" flowline from the FPSO. The flowline is piggy-backed onto the production flowline PL1857, and is buried in the same trench to the same depth (Figure F.4).

The gas lift flowline is covered with a 3mm corrosion coating.

F.2.2.3 Umbilicals

Two different types of umbilical - production control and water injection control - were installed in the FFFA development. The Angus umbilical is a production control umbilical.

(a) Angus Production Control Umbilical

The production umbilicals were designed to carry hydraulic and electrical signals from the control system on the FPSO to and from the respective field production wells, and, if required, chemicals for injection purposes. The following chemicals were supplied via the umbilicals:

- Corrosion inhibitor.
- Scale inhibitor.
- Methanol.

Each production umbilical comprises a riser section that ran from the FPSO to the umbilical riser base, and a seabed umbilical that runs from the umbilical riser base to the production well.

The Angus control/chemical injection umbilical runs from the Flora UPS to the Angus production wellhead protection structure. As the umbilical termination unit and the Angus well are located within a common protection structure, the umbilical jumpers and hoses are fully protected by the structure.

PLU1859 lies in a separate trench, parallel to the Angus production/gas lift flowlines, with a nominal separation of approximately 30m. The umbilical has been regularly surveyed, and the burial depth was checked during the December 2008 ROV survey which found a good level of cover (Figure F.5). At each end, where the umbilical emerges from the trench, it is covered by concrete mattresses; there are 23 at the Flora UPS and 30 at the well end. During the suspension activities, it was found that the chemical core of the umbilical was blocked and could not be cleaned; the umbilical therefore still contains its chemical contents, some of which will inevitably be discharged during disconnection. DECC's Environmental Unit will be consulted during the disconnection process and relevant Petroleum Operations Notice application(s) will be completed.

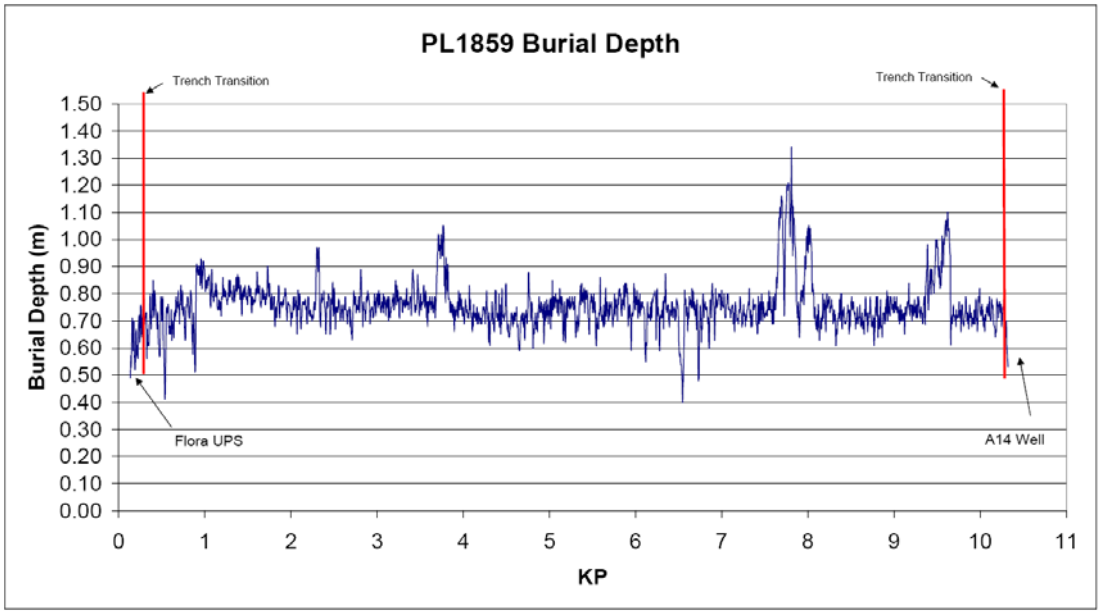


Figure F.5: PL1859 Burial Depth

F.3 INVENTORY OF ITEMS AND MATERIALS

F.3.1 Angus Decommissioning Programme, DP7

F.3.1.1 Subsea Structures

Table F.2: Seabed Structures at Angus

Item	Size (m)	Weight (te)	Notes
Production flowline riser base	5 dia. x 4.5 high	54	Suction pile with concrete ballast and clamped spool attachment
Wellhead protection structure	26 x 19.3 x 7.7	80	Steel-piled Anchortech with epoxy coating. Piles are 'T' shaped plate items
Roof panels	11 x 13 11 x 4	22.3 9.0	Steel-framed with epoxy coating
Protection structure control skid	8 x 4 x 2.6	10	Steel-framed skid with epoxy coating
Protection structure control skid roof panel	10.97 x 4.9	9	Steel-framed with epoxy coating

F.3.1.2 Mattresses and Grout Bags

Table F.3: Protection and Stabilisation Items at Angus

Item	Number	Size (m)	Weight (te)
Mattresses	218	5 x 3 x 0.15	790

F.3.1.3 Wells

(a) Production Well

The single Angus production well was fitted with a Vetco dual-bore Xmas tree measuring 4m x 4m x 5m and was tied back by a flowline to the FPSO, which was routed via Flora. As described in Appendix A, this well was suspended during Phase 1 operations.

Table F.4: Angus Production Well

Hess Well ID	Old Hess Well No.	DECC Well No.	Completion Date	Function	Maximum Angle	Well Type	Depth (ft MDSS)
A14	NA	31/26a-16	Late 2001	Oil producer	29°	Deviated producer	11,300

(b) Abandoned Wells

The Angus exploration, appraisal and previous production wells have all been abandoned (Table F.5).

Table F.5: Angus Abandoned Wells

DECC Well Number	WONS Reference Number	Hess Well Identity	Well Type	Current Status
31/26-3	NA	NA	Exploration	Abandoned 1984
31/26a-6, 6z	NA	NA	Producer	Abandoned 1993
31/26a-7	NA	NA	Appraisal	Abandoned 1993

F.3.2 Angus Decommissioning Programme, DP8

F.3.2.1 Production Flowlines and Jumpers

Several types of flowlines and jumpers were used in the FFFA development and within the Angus Field itself (Table F.6).

Table F.6: Description of Flowlines at Angus Field

Pipeline Number	Description	Size (in)	Coating	Overall Diameter (mm)	Wall Thickness (mm)	Length (m)	Nominal Weight in Air (kg/m)	From	To	Trenched or Lying on the Seabed Surface
PL1857 (Production)	Rigid API 5L X60	8	39-40mm 4-layer PP insulation	219.1	15.9	18,811	79.7	Riser base	Well A14	Trenched
PL1858	Rigid API 5L X65	3	3mm PP insulation	88.9	7.1	10,385	14.3	Angus tie-in spool	Flora tie-in tee section	Trenched

F.3.2.2 Control, Chemical Injection and Gas Lift Umbilicals

Table F.7: Description of Control and Chemical Injection Umbilicals at Angus

Well	Pipeline ID	Size (in)	Type	Overall Diameter (mm)	Length (m)	Nominal Weight (kg/m)	From / To
A14	PLU1859	1/2	CI (M)	108	10,500	17	Flora UPS/ Angus control skid
		1/2	CI (M)				
		1/2	CI (W)				
		1/2	CI (C)				
		1/2	CI (S)				
	-	1/2 + 3/8	Controls				
	-	49mm	Cable				

F.4 SUMMARY OF SUBSEA INFRASTRUCTURE MATERIAL WEIGHTS

Table F.8: Type of Material and Totals of the Subsea Infrastructure of the Angus Field

Item	Type of material	Total Weight (tonnes)	Weight to be recovered (tonnes)
Rigid flowlines/spools	Steel Composites Zinc	1,681 30 8.5	62 1 0.42
Umbilicals	Steel Composites	116 62	3.5 2
Structures	Steel Zinc Concrete	158.3 1 27	158.3 1 27
Mattresses	Concrete	790	790
Xmas trees	Steel Zn anodes	24 1	24 1
Flowbases / Wellheads	Steel	16	16

Table F.9: Overall Weight and Intended Fate of Material Currently in the Angus Field, by Type

Type of Material	Total Weight (tonnes)	Weight to be Recovered (tonnes)	Predicted Fate (tonnes)			
			Recycle	Reuse	Disposal	Left in situ
Steel	1,995.3	263.8	263.8	0	0	1,731.5
Composites	92	3	0	0	3	89
Concrete	817	817	817	0	0	0
Zn	10.5	2.4	2.4	0	0	8.1

APPENDIX G: SUMMARY OF FFFA DEVELOPMENT MATERIALS AND FATES

G.1 TOTAL MATERIALS WITHIN THE FFFA DEVELOPMENT

Material	Fife (tonnes)	Fergus (tonnes)	Flora (tonnes)	Angus (tonnes)	Total in FFFA (tonnes)	Tonnage to be Recovered
Steel	3,790	933	2,008	1,995.3	8,726.3	4,498.1
Composites	308.9	238	131	92	769.9	336.1
Concrete	730	177	1,157	817	2,881	2,881
Zn	16	2	14.8	10.5	43.3	28.6

G.2 FATE OF MATERIAL FROM FFFA DEVELOPMENT

Material	Tonnage to be Recycled	Tonnage to be Reused	Tonnage to be Disposed of	Tonnage Left *in situ*
Steel	4,498.1	0	0	4,228.2
Composites	0	0	336.1	433.8
Concrete	2,881	0	0	0
Zn	28.6	0	0	14.7

South Ayrshire Council

TOWN & COUNTRY PLANNING (SCOTLAND) ACT 1997, AS AMENDED BY THE PLANNING ETC. (SCOTLAND) ACT 2006, PLANNING (LISTED BUILDINGS AND CONSERVATION AREAS) (SCOTLAND) ACT 1997

TOWN AND COUNTRY PLANNING (LISTED BUILDINGS AND BUILDINGS IN CONSERVATION AREAS) (SCOTLAND) REGULATIONS 1987

PLANNING APPLICATIONS

DETAILS AND REPRESENTATION INFORMATION: 4TH OCTOBER 2011

Applications for planning permission and listed building consent detailed below together with the plans and other documents submitted with them may be examined at the offices of South Ayrshire Council, Planning Service, Burns House, Burns Statue Square, Ayr, KA7 1UT between the hours of 0845 and 1645 (Monday to Thursday); and 0845 and 1600 on a Friday (excluding public holidays); or by viewing from the Council's website at www.south-ayrshire.gov.uk. Comments may be made to the Head of Planning and Enterprise, in writing to the above address, or by e-mailing planning.development@south-ayrshire.gov.uk or by submitting comments online via the Council's website www.south-ayrshire.gov.uk/planning within 21 days of the date of publication of this advertisement.

Executive Director of Development and Environment
Where plans can be inspected: Planning Services, 5th Floor, Burns House, Burns Statue Square, Ayr KA7 1UT

Proposal/Reference:	11/01199/LBC LISTED BUILDING
Address of Proposal:	40 Culzean Road, Maybole KA19 8AL
Description of Proposal:	Alterations to listed building
Proposal/Reference:	11/01150/LBC LISTED BUILDING IN CONSERVATION AREA
Address of Proposal:	16 Cathcart Street, Ayr KA7 1BJ
Description of Proposal:	Alterations to listed building

(7)

Pipe-Lines

THE PETROLEUM ACT 1998

THE FIFE, FERGUS, FLORA AND ANGUS FIELDS DECOMMISSIONING PROGRAMMES

Hess Limited has submitted, for the consideration of the Secretary of State for Energy and Climate Change, a draft Decommissioning Programme for the Fife, Fergus, Flora and Angus (FFFA) Fields, in accordance with the provisions of the Petroleum Act 1998. It is a requirement of the Act that interested parties be consulted on such decommissioning proposals.

The FFFA Fields are located in the central North Sea, in Blocks 31/21, 31/26, 31/27a, 39/1 and 39/2, of the UK Continental Shelf (UKCS), approximately 330km east-south-east of Aberdeen, in a water depth of approximately 71m. The FFFA Fields collectively comprise of a number of wells, surface-laid and buried flowlines, protection structures, such as mattresses and a number of seabed structures.

Hess Limited hereby gives notice that The Fife, Fergus, Flora and Angus Fields Decommissioning Programmes can be viewed at the internet address:

http://www.hesscorporation.com/FFFA/DecommissioningProgrammes.pdf

Alternatively hard copies of the Programmes can be inspected at the Hess Aberdeen office, during office hours by appointment only, and Aberdeen Central Library, Rosemount Viaduct, Aberdeen AB25 1GW.

Representations regarding The Fife, Fergus, Flora and Angus Fields Decommissioning Programmes should be submitted in writing or by email to the Hess nominated contact, Jennifer Sweeney, where they should be received by 1 November 2011 and should state the grounds upon which any representations are being made.

A CD copy of the Programmes may be made available upon request.

Jennifer Sweeney
Hess Limited, Union Plaza, 1 Union Wynd, Aberdeen AB10 1SL
Email: decommissioning@hess.com

4 October 2011. (8)

Environment

Environmental Protection

James Mellor

WATER ENVIRONMENT AND WATER SERVICES (SCOTLAND) ACT 2003

WATER ENVIRONMENT (CONTROLLED ACTIVITIES) (SCOTLAND) REGULATIONS 2011

APPLICATION FOR AUTHORISATION

BARRANDROMAN HYDRO SCHEME

Notice is hereby given, in accordance with regulation 13 of the above Regulations, that an application has been made to the Scottish Environment Protection Agency (SEPA) by Mr James Mellor for authorisation to carry on controlled activities at, near or in connection with Barrandroman Hydro Scheme, namely:

Description of controlled activity	Waters affected	National grid reference
Construction and/or operation of impounding works <1m	Allt Barrandromain	NM 8477 2286
Abstraction of 3800 m3 per day of water	Allt Barrandromain	NM 8477 2286
Return of abstracted water approximately 0.5 km away from abstraction point	Allt Barrandromain	NM 8491 2321

SEPA consider that the above controlled activities have or are likely to have an impact on the water environment and on the interests of other users of the water environment. Any person affected or likely to be affected by, or having an interest in, the application may make representations to SEPA in writing within 28 days beginning with the date of this advertisement, at the following address, quoting reference number CAR/L/1094065:

Registry Department, SEPA, Graesser House, Fodderty Way, Dingwall Business Park, Dingwall IV15 9XB.

A copy of the application and any accompanying information may be inspected free of charge, at the above address, between 9.30 am and 4.30 pm Monday to Friday (except local and national holidays) and by prior arrangement at SEPA Lochgilphead, 2 Smithy Lane, Lochgilphead, Argyll PA31 8TA. Alternatively, the application may be viewed on SEPA's website at:
www.sepa.org.uk/about_us/consultations.aspx

A statement of the reasons for SEPA's assessment that the above controlled activity or activities is likely to have an impact on the water environment will be made available by SEPA on request by contacting the above office.

Written representations receive by SEPA within 28 days of this advertisement will be taken into consideration in determining whether or not to grant the application. Any such representations will be placed in a public register unless the person making them requests that they should not be. Where such a request is made SEPA will include a statement in the register indicating that representations have been made which have been the subject of such a request.

When ready to determine the application, SEPA will serve notice on any person who has made a representation within 28 days of this advertisement, informing them of SEPA's proposed determination and giving them the opportunity to notify the Scottish Ministers in writing that they object to SEPA's proposed determination within 21 days of the notice being served.

Before determining the application, SEPA will:

- assess the risk to the water environment posed by the carrying on of the activity or activities;
- assess the indirect effects of that impact on any other aspects of the environment likely to be significantly affected;
- consider any likely adverse social and economic effects of that impact and of any indirect environmental effects that have been identified;
- consider the likely environmental, social and economic benefits of the activity;
- assess the impact of the controlled activity or activities on the interests of other users of the water environment;

APPENDIX I: EXAMPLE LETTER ACCOMPANYING DOCUMENT TO CONSULTEES

HESS LIMITED
Union Plaza, 1 Union Wynd
Aberdeen AB10 1SL
Tel: 01224 269000
Fax: 01224 269001

DDI:

28 September, 2011

Our Ref: LT/js

Mr M. Sutherland
Scottish Fishermen's Federation
24 Rubislaw Terrace
Aberdeen
AB10 1XE

Dear Mr Sutherland,

PETROLEUM ACT 1998:
The Fife, Fergus, Flora and Angus Fields Decommissioning Programmes

Hess Limited, on behalf of their partners in the Fife, Fergus, Flora and Angus (FFFA) development, has submitted a draft of the FFFA Decommissioning Programmes for the consideration of the Secretary of State for Energy and Climate Change, in accordance with the provisions of the Petroleum Act 1998.

Please find enclosed a CD copy of the draft programmes for your review.

Comments on the decommissioning programmes should be made, in writing, to our nominated contact, by close of business 01 November 2011.

Jennifer Sweeney
Union Plaza
1 Union Wynd
Aberdeen
AB10 1SL
decommissioning@hess.com

In the event you have no comments on the enclosed, it would be greatly appreciated if you would confirm this in writing to the above address. Should you have any questions, or require any further information, please contact Jennifer Sweeney using the details above.

Thank you for your attention in this matter,

Yours sincerely

Lorne Taylor
Project Coordinator

Registered office: Level 9, The Adelphi Building, 1-11 John Adam Street, London WC2N 6AG. Number 807346

APPENDIX J : SECTION 29 NOTICE HOLDERS CORRESPONDENCE REGARDING SUBMISSION OF THE DECOMMISSIONING PROGRAMMES

HESS LIMITED
Level 9
The Adelphi Building
1-11 John Adam Street
London WC2N 6AG

February 13, 2012

Mr, Kevin Munro
Senior Manager
Offshore Decommissioning Unit
3rd Floor, Atholl House
86-88 Guild Street
Aberdeen
AB11 6AR

Dear Sir,

RE: FIFE, FERGUS, FLORA AND ANGUS FIELDS DECOMMISSIONING PROGRAMMES PETROLEUM ACT 1998

We acknowledge receipt of your letter, reference 12.04.06.08/16C, dated 9th February 2012.

We, Hess Ltd, hereby submit an abandonment programme dated 16th February 2012 relating to the Fife, Fergus, Flora and Angus facilities as directed by the Secretary of State on 9th February 2012.

The Fife, Fergus, Flora and Angus Fields Decommissioning Programme is submitted on behalf of Section 29 Notice holders, Hess Ltd., Premier Oil UK Ltd and Bluewater Services (UK) Ltd as a requirement under section 29 of the Petroleum Act 1998.

Yours faithfully

for Martin Edwards
VP Production - Europe & North Africa
For and on behalf of **Hess Limited**

Tel: +44 (0)20 7331 3000 Fax: +44 (0)20 7331 3333
Registered office at the above address Incorporated in England Number 807346

APPENDIX J : SECTION 29 NOTICE HOLDERS CORRESPONDENCE REGARDING SUBMISSION OF THE DECOMMISSIONING PROGRAMMES

PremierOil

Premier Oil UK Limited
53 Blenheim Place
Aberdeen AB25 2DZ
United Kingdom

Telephone +44 (0)1224 618 900
Fax +44 (0)1224 618 590
Email premier@premier-oil.com
Website www.premier-oil.com

Offshore Decommissioning Unit
3rd Floor
Atholl House
86-88 Guild Street
Aberdeen
AB11 6AR

Date: 13th February 2012

Attn: Kevin Munro
Senior Manager, Offshore Decommissioning Unit

Dear Sir,

FIFE, FERGUS, FLORA, ANGUS DECOMMISSIONING PROGRAMME
PETROLEUM ACT 1998

We acknowledge receipt of your letter dated 9th February 2012.

We, Premier Oil UK Ltd, confirm that we authorise Hess Ltd to submit on our behalf an abandonment programme relating to the Fife, Fergus, Flora and Angus facilities as directed by the Secretary of State on 9th February 2012.

We confirm that we support the proposals detailed in the final Fife, Fergus, Flora and Angus Decommissioning Programme dated 16th February 2012, which is to be submitted by Hess Ltd in so far as they relate to those facilities in respect of which we are required to submit an abandonment programme under section 29 of the Petroleum Act 1998.

Yours faithfully

JON BOOT
BUSINESS SERVICES MANAGER
For and on behalf of **Premier Oil UK Ltd**

APPENDIX J : SECTION 29 NOTICE HOLDERS CORRESPONDENCE REGARDING SUBMISSION OF THE DECOMMISSIONING PROGRAMMES

bluewater
Bluewater Services (UK) Limited

Date: 13th February 2012

Our Ref: G-4110A-GCHO-UG-G026

Offshore Decommissioning Unit
3rd Floor
Atholl House
86-88 Guild Street
Aberdeen
AB11 6AR

Attn.: Kevin Munro
Senior Manager, Offshore Decommissioning Unit

Dear Sir

Subject: FIFE, FERGUS, FLORA AND ANGUS FIELDS DECOMMISSIONING PROGRAMMES PETROLEUM ACT 1998

We acknowledge receipt of your letter dated 9th February 2012.

We, Bluewater Services (UK) Ltd, on behalf of Bluewater Operations (UK) Ltd (installation s29 notice holder) and Bluewater Offshore Production Systems Ltd (pipeline s29 notice holder), confirm that we authorise Hess Ltd to submit on our behalf an abandonment programme relating to the Fife, Fergus, Flora and Angus facilities as directed by the Secretary of State on 9th February 2012.

We confirm that we support the proposals detailed in the Fife, Fergus, Flora and Angus Decommissioning Programme dated 16th February 2012 which is to be submitted by Hess Ltd in so far as they relate to those facilities in respect of which we are required to submit an abandonment programme under section 29 of the Petroleum Act 1998.

Yours faithfully

D. A. Chown
Asset Manager
For and on behalf of **Bluewater Services (UK) Ltd**

Office address:
Bluewater House, Badentoy Crescent
Portlethen, Aberdeen AB12 4YD, United Kingdom
Tel. (+44) 1224 403 300
Fax (+44) 1224 403 340

Registered address:
15 Appold Street
London EC2A 2HB, United Kingdom
VAT No.: 683 0174 39
Comp. Reg No.: 325 3206

www.bluewater.com

Power by People

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