VENTURE PRODUCTION plc

Kittiwake Loading Buoy
Decommissioning Programme

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AMENDMENT RECORD

All amendments to this document shall be recorded on the Amendment Record sheet below. No changes to this document are to be made without approval from the Project Manager.

Date	By	Rev	Section	Description
13/10/06	S Ford	A2	All	Text added
25/10/06	S Ford	A3	2 &	Sections 2 & 10 added
01/06/07	S Ford	A4	All	General revision incorporating BERR and Partner comments
03/09/07	S Ford	A5	All	Amended to reflect re-tender
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REVISION SYSTEM

The following revision system shall apply to this Decommissioning Programme.

Rev	Purpose
A1, A2, etc	Index Issued for Review (& any subsequent reissues) Pre-Draft Issued for Review (& any subsequent reissues)
B1, B2, etc	First Draft Issued for Consultation (& any subsequent reissues)
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ABBREVIATIONS

BERR	Department for Business Enterprise and Regulatory Reform
COP	Cessation of Production
Dana	Dana Petroleum (E&P) Limited
DP	Dynamic Positioning
ELSBM	Exposed Location Single Buoy Mooring
Esso	Esso Exploration and Production UK
FRS	Fisheries Research Service
GKA	Greater Kittiwake Area
HSE	Health and Safety Executive
IPR	Interim Pipeline Regime
JNCC	Joint Nature Conservation Committee
KLB	Kittiwake Loading Buoy
NUI	Normally Unmanned Installation
PLEM	Pipeline End Manifold
ROV	Remotely Operated Vehicle
SAL	Submerged Anchor Loading System
SEPA	Scottish Environment Protection Agency
SFF	Scottish Fishermen's Federation
Shell	Shell U.K. Limited
TOC	Total Organic Content
Venture	Venture North Sea Oil Limited
WROV	Work Class Remotely Operated Vehicle

INDEX TO THE DECOMMISSIONING PROGRAMME

1. INTRODUCTION

This decommissioning programme relates to the removal and disposal of the Kittiwake Loading Buoy (KLB) and is submitted in accordance with the requirements of the Petroleum Act 1998.

Kittiwake is located in Block 21/18 of the UKCS (Central North Sea). KLB is located approximately 2km East of Kittiwake Platform at 6370132N, 532721E.

Venture North Sea Oil Limited (Venture) is the licensed operator of Kittiwake field and joint owner with Dana Petroleum (E & P) Limited (Dana). As part of the transfer agreement, Shell U.K. Limited (Shell) retained liability for their share of the cost of decommissioning the transferred facilities and are therefore a party to the decommissioning of KLB. Venture, Dana and Shell are jointly responsible for the preparation and delivery of this Decommissioning Programme and ensuring that the work is performed accordingly. The removal and disposal of KLB will be project managed by Venture and will comprise the following activities:

- disconnection,
- tow,
- transfer to shore,
- deconstruction,
- recycling / reuse of suitable materials,
- disposal of any residual waste in accordance with relevant legislation.

Figure 1.1 Kittiwake Loading Buoy

2. EXECUTIVE SUMMARY

This Decommissioning Programme relates to the removal and disposal of the Kittiwake Loading Buoy (KLB), which is now out of service and redundant.

KLB was used to offload export crude to shuttle tankers. It was not a storage facility and cannot be used as such, the only crude oil inventory being contained in its risers, pipework and loading hose. The export system was thoroughly flushed from the topsides through to the shuttle tanker when KLB was taken out of service. The tie-in spool at Kittiwake was removed and the export pipeline (PL672) sealed with a blind flange. The pipeline, risers, pipework and loading hose are currently filled with inhibited water. The only hydrocarbons remaining on KLB are small quantities of lubrication, fuel and hydraulic oils associated with the topsides equipment.

The schedule of operations is dependent on the availability of vessels and will be determined once contracts are let. However the schedule will be based on the following targets:

- Offshore scope will be carried out during the 2008 marine construction season.
- Offshore scope completed by Q3/4 2008.
- Deconstruction, recycling and disposal completed by Q2/3 2009.

The KLB Pipeline End Manifold (PLEM) will be decommissioned as part of the scope of this Decommissioning Programme. The KLB export pipeline is now out of use and is being maintained under the Interim Pipelines Regime (IPR) for possible future reuse. This is being reviewed as part of the consideration of the KLB decommissioning programme. There remains a possibility that this line could be reused at some time in the future and therefore it is Venture's recommendation that it continues to be part of the IPR. The mooring tethers and riser system will be removed.

KLB will be dismantled at a yard specialising in the deconstruction, recycling and disposal of offshore facilities and with an adjacent mooring suitable for the draft of KLB. If this facility is outside the UK, KLB will be the subject of a Trans-frontier Waste Shipment application. KLB consists mainly of structural steel therefore the bulk of her fabric can be recycled. Reuse of suitable items will be considered but an offshore survey by decommissioning experts confirmed that the opportunities for this are limited. It has not been possible to confirm the nature of all materials on board KLB whilst it remains on station because of access restrictions, therefore a conservative approach has been taken in defining waste materials. Nevertheless, major issues over hazardous wastes are not anticipated.

It is anticipated that most of the disconnection work will be done remotely using a WROV equipped with cutting tools.. Diver intervention will be avoided for the disconnection process as far as possible but is not precluded. The chains and riser components will be recovered and taken to the disposal site. KLB will be towed to

the disposal site and moored there at a temporary berth. The main components (rotating head, pedestal, fender and buoy) will be transferred ashore for dismantling. Materials will be sorted for recycling, reuse or disposal as appropriate.

Once the removal scope is complete, a debris survey will be carried out using side scan sonar. Debris discovered by this survey will be recovered to the surface and delivered to a disposal yard for processing.

Seabed samples will be taken and tested for the presence of hydrocarbons and other pollutants. If necessary, these will be used as the basis for ongoing monitoring of the condition of the seabed. Given the function of KLB, seabed contamination is not expected.

3. HISTORY AND BACKGROUND

3.1 HISTORY

3.1.1 Kittiwake Development

Kittiwake has been in operation since 1990. Gas is exported to St Fergus via the Fulmar to St Fergus 20" Gas Pipeline. Until 2005, crude oil was exported by shuttle tanker via KLB. By the end of 2005, this function was performed by a SAL system. A new export pipeline was put into service in November 2007 and crude oil is now exported from the Greater Kittiwake Area (GKA) through this pipeline to BP's Unity Platform.

VENTURE and Dana acquired Kittiwake from the original owners, Shell U.K. Ltd (Shell) and Esso Exploration and Production UK Limited (Esso) on 26th November 2003.

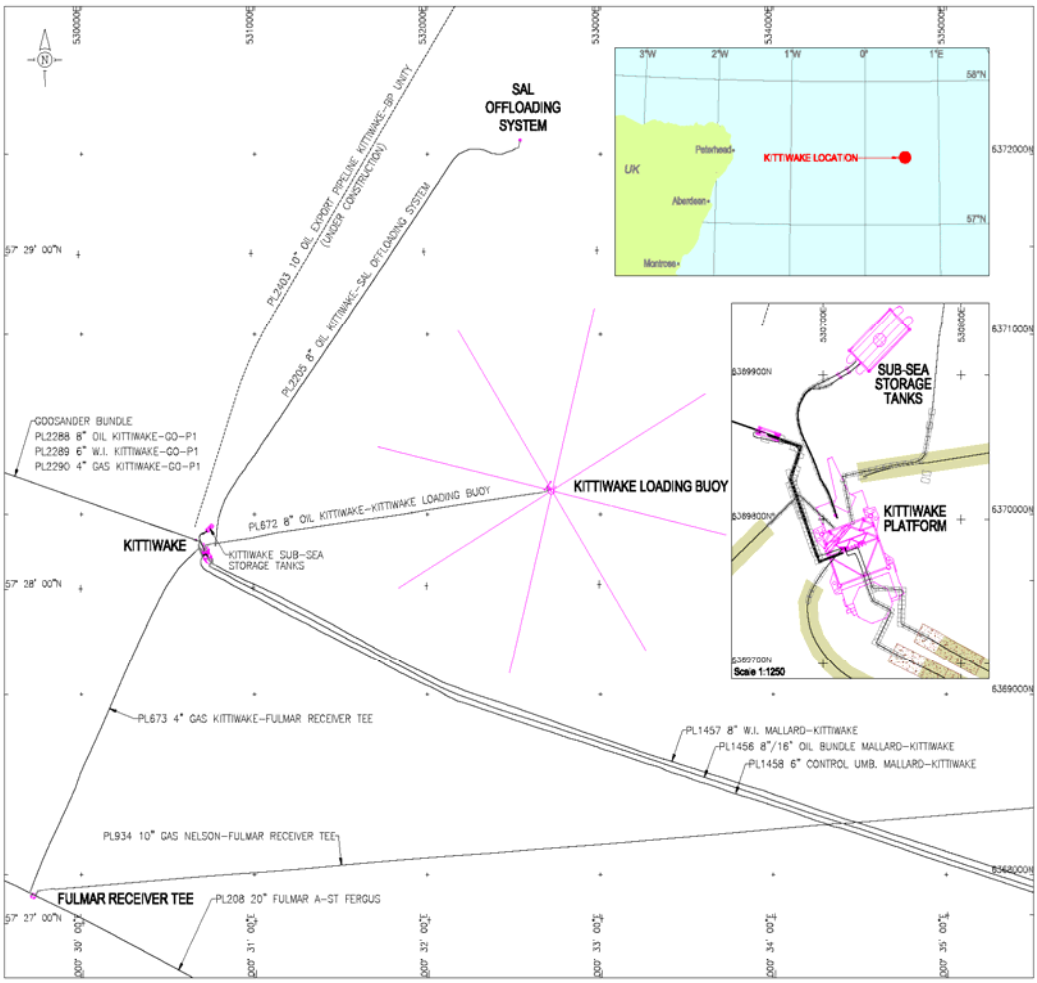


Figure 3.1 Kittiwake Facilities

Kittiwake remains the hub for the fields in the Greater Kittiwake Area (GKA) and will continue in production until at least 2018.

Figure 3.1 shows the layout of the Kittiwake facilities. Figure 3.3 provides a schematic of the GKA facilities.

3.1.2 Background Information

Kittiwake is located in Block 21/18 of the UKCS (Central North Sea) and is approximately 135km East of Peterhead. Figure 3.2 shows the position of Kittiwake and KLB relative to the nearest neighbouring fixed installations and indicates the approximate distances from these installations to Kittiwake.

KLB is located approximately 2km East of Kittiwake Platform at 6370132N, 532721E. The water depth at KLB is 85m.

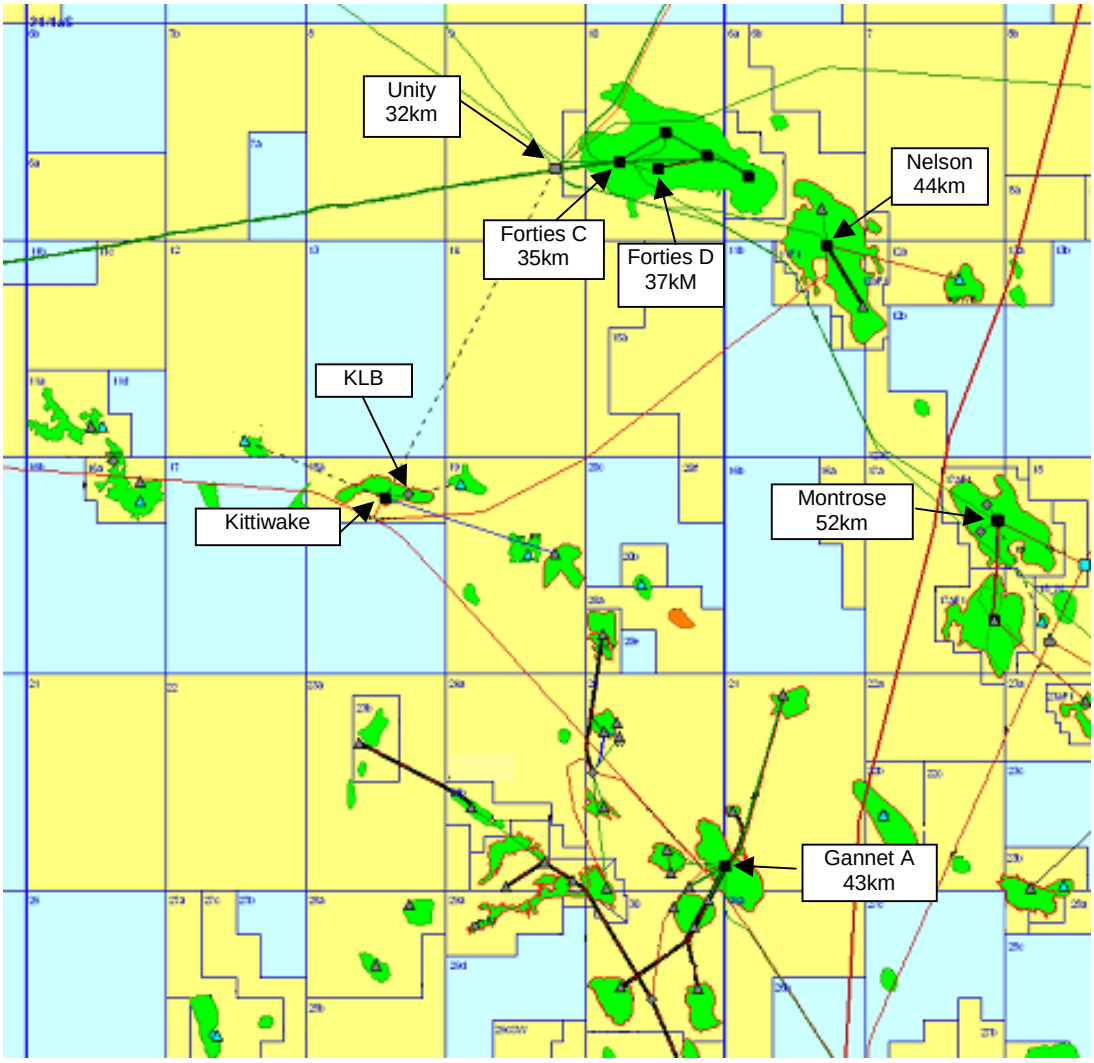


Figure 3.2 Kittiwake and Neighbouring Fixed Installations

3.1.3 Environmental Data

Environmental data relating to KLB including wind, wave, current and seabed data can be found in Section 10. “Environmental Impact Assessment”.

3.1.4 Kittiwake Loading Buoy

KLB is an Exposed Location Single Buoy Mooring system (ELSBM). It was originally installed at Auk in 1974 where, as the Auk ELSBM, it was used as a crude oil offloading facility. KLB is not an oil storage facility and is not capable of being used for that purpose.

Auk ELSBM was taken off station in 1989 and towed to Loch Kishorn for a major refit. This refit included complete replacement of the topsides and all supporting structure above “E” Deck (Ref 18.1 [2]). In 1990 it was towed to Kittiwake where, as the Kittiwake Loading Buoy, it served as the crude oil export route until 2005. Crude oil was pumped from Kittiwake through an export pipeline to KLB. KLB was connected to the export pipeline by means of two risers connected to a pipeline end manifold (PLEM). Valves on the PLEM controlled flow to KLB and these valves were operated from KLB by a hydraulic umbilical riser. The export crude passed through fixed risers and piping on KLB to a flexible offloading hose. The shuttle tanker was connected to KLB for filling by means of a coupler on the hose. There was no crude oil inventory on KLB other than the contents of the risers, piping and hose.

KLB was taken out of service in November 2005 and replaced with a Submerged Anchor Loading (SAL) system. Until this time, KLB had been the sole means of exporting oil from the Kittiwake platform. However her availability was weather dependent and very poor, and cost of maintenance high relative to modern systems. It was clearly demonstrated that installing a SAL provided a more economic solution than keeping KLB in service. It was subsequently decided to construct an export pipeline from Kittiwake to the BP Unity Platform. This pipeline came into service in November 2007 and is now the sole route for Kittiwake crude oil export.

When KLB was taken out of service, the export pipeline, pipeline end manifold (PLEM), risers and loading hose were thoroughly flushed to the shuttle tanker and left filled with inhibited seawater. The connecting spool between the Kittiwake Export Riser and the KLB pipeline was removed and the pipeline was sealed with a blind flange. A minimum maintenance regime is now in place for KLB.

Before the decision was taken to construct the GKA Export Pipeline, consideration was given to retaining KLB as a back up to the SAL, or as a future means of supplementing the export capacity from Kittiwake. However, the same economics that were used to justify the SAL clearly demonstrate that these are not viable options. Now that the GKA Export Pipeline is in service, both SAL and KLB are redundant. SAL will be retained at least until 2010 (See 4.2.3).

Keeping KLB on-station until the Cessation of Production (COP) of Kittiwake and the Greater Kittiwake Area (GKA) Development was also considered. KLB in its

redundant condition represents a potential hazard to other users of the sea and navigation aids would have to be maintained until its eventual removal, as would the inspection programmes for the topsides, buoy structure and moorings. As the helideck is the only means of access, it would also have to be maintained along with its systems until COP. KLB is a difficult installation to access and these activities involve additional risks to the personnel involved. Undertaking these activities, together with any essential repairs or remedial work identified by the inspection programmes, provides no commercial benefit therefore the decision was taken to remove KLB before COP of Kittiwake.

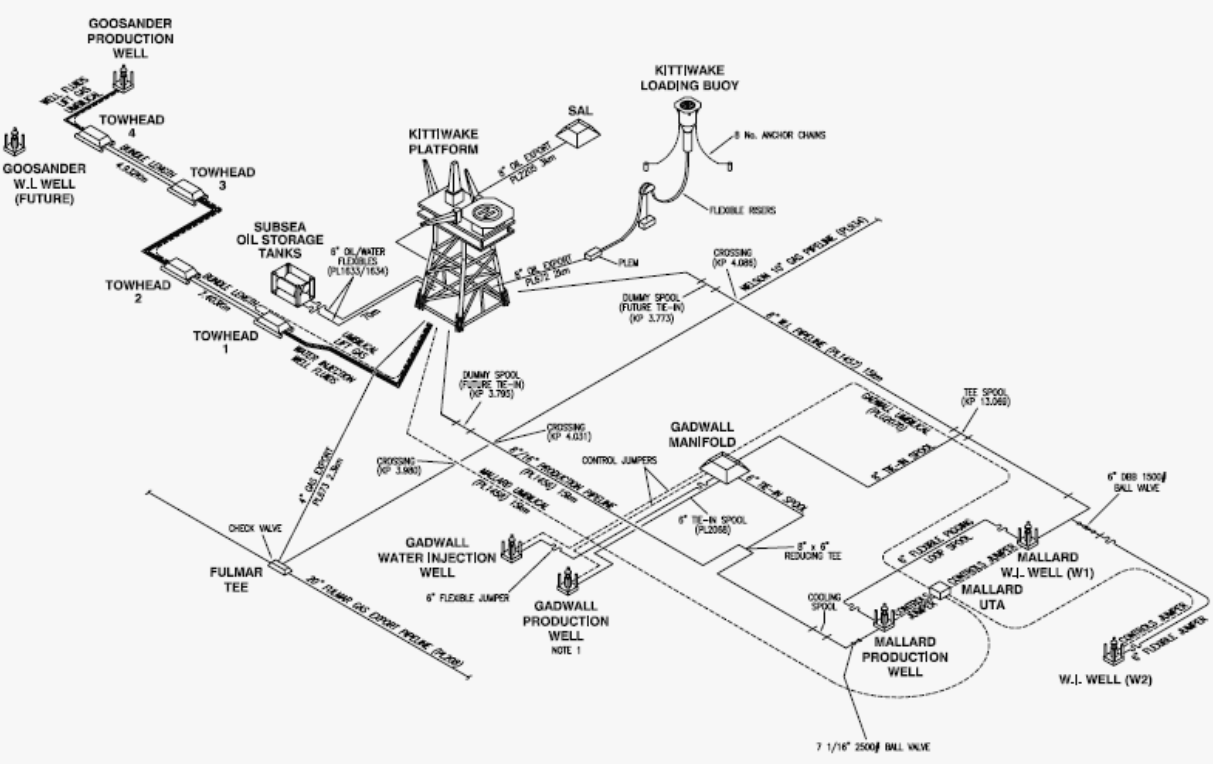


Figure 3.3 Greater Kittiwake Facilities Schematic
(GKA Export Pipeline not shown)

4. SCOPE OF DECOMMISSIONING

See Figure 3.1 for the location of the facilities described in this section.

4.1 FACILITIES INCLUDED IN THE SCOPE

4.1.1 Installations

- Kittiwake Loading Buoy. Ref 18.1 [1], [2], [3], and [4].
- Moorings (8 No chain and wire rope moorings). Ref 18.1 [6].

4.1.2 Pipelines

- Pipeline End Manifold Ref 18.1 [11]
- Tie-in Spool (Pipeline to PLEM)

The export pipeline (PL672) will be retained. See 4.2 below.

4.1.3 Umbilicals

- One off 3" hydraulic umbilical riser from KLB to the PLEM. Ref 18.1 [5}.

4.1.4 Risers

- Two off 8" flexible risers. Ref 18.1 [5]
- Riser buoyancy unit, tethers and two off clump weights. Ref 18.1 [5]
- Two off rigid risers (part of KLB structure). Ref 18.1 [7], [8] and [9].
- One off 8" flexible offloading hose and associated rigging. Ref 18.1 [3]

4.1.5 Materials on the Seabed

Deposition on the seabed of materials of any kind has never been part of KLB operations.

4.2 FACILITIES EXCLUDED FROM THE SCOPE

4.2.1 KLB Export Pipeline

The KLB pipeline (PL672) is specifically excluded from the scope of work. Economics dictate that this pipeline will be removed at COP along with the other Kittiwake pipelines to achieve cost synergy. There may also be an opportunity to make further use of this pipeline. For this reason it is currently part of the Interim Pipeline Regime. This is being reviewed as part of the consideration of the KLB

decommissioning programme and it is Venture's recommendation that the PL672 continues to be part of the IPR. The pipeline has been left filled with inhibited seawater and is buried for most of its length. Once the tie-in spool has been removed, the pipeline will be sealed with a blind flange and the unburied section will be protected by mattresses to ensure that it does not constitute a snagging hazard or other threat to users of the sea.

The pipeline will continue to be routinely inspected to ensure that the protection described above remains in place and effective and that the blind flanges remain secure.

4.2.2 Kittiwake Subsea Storage

Kittiwake Subsea Storage was used as temporary crude oil storage to allow production to continue uninterrupted between shuttle tanker operations. This facility will not be required once the export pipeline is in operation.

Subsea Storage will be left in place until COP on the basis that:

- There is no synergy with KLB removal operations as a different vessel spread is required,
- It is within the 500m safety zone of a live platform and adjacent to live pipelines. Its early removal presents an unnecessary and unacceptable safety, environmental and business risk.

Now that the GKA Export Pipeline is in service, the storage facility has been thoroughly flushed and filled with inhibited seawater to prevent internal corrosion and the inlet and outlet has been sealed with blind flanges. An appropriate inspection regime will be established to monitor the condition of the facility and its corrosion protection system so that any necessary remedial action can be identified and implemented in good time.

4.2.3 Kittiwake SAL and Pipeline

SAL is leased to Venture by Nordic Troll & Trym. SAL represents an opportunity to supplement the GKA export pipeline at some future date. The SAL and its pipeline will therefore be retained during the remainder of its lease period (2010) at which time Venture will consider whether to purchase it for future use or decommission it.

When the GKA Export Pipeline came into service, the SAL and its pipeline were thoroughly flushed, filled with inhibited seawater, and sealed. An appropriate inspection regime will be established to ensure the ongoing integrity of the system with a view to future reuse. An application will be made to add the SAL pipeline (PL2205) to the IPR.

4.2.4 Greater Kittiwake Area Export Pipeline

The GKA export pipeline (PL2403) came into service in November 2007 and will remain in service until at least 2018.

4.3 DEROGATIONS REQUIRED (NOT APPLICABLE TO KLB)

OSPAR Decision 98/3 recognises that it may be appropriate to leave the footings of large steel structures or concrete structures in place. This applies to structures installed before 9th February 1999.

KLB does not fall into this category and will be removed in its entirety. No derogations are therefore required.

4.4 KITTIWAKE LOADING BUOY

KLB is classified as a Normally Unmanned Installation (NUI). It was originally an ELSBM design but was modified to improve its performance before being moved to Kittiwake.

The buoy body is a fabricated steel vessel divided internally into compartments or tanks. Stability is achieved by filling the tanks with either ballast (water or permanent heavy ballast) or buoyancy (air). The bulk of the permanent heavy ballast is slurry made by mixing crushed barium sulphate rock (barites) and seawater. Heavy ballast added in 1990 is plain concrete.

KLB is not and never has been a crude storage facility and cannot be used for that purpose. Its function was purely to provide a means of delivering crude from Kittiwake via the pipeline, riser and offloading hose, to a shuttle tanker

The buoy topsides are mounted on a slew ring, the purpose of which was to allow the offloading hose to align with the direction of the wind to facilitate tanker operations.

The export piping system on KLB is very simple. The rigid risers are located on the outside of the buoy and merge at a wye piece on the topsides. There is an 8" full-bore ball valve at the top of each riser just before the wye. A swivel assembly allows the pipework to articulate with the topsides. From the swivel, the pipework runs along a loading boom. The offloading hose is connected to the pipework at the end of the boom and suspended into the sea from whence it could be recovered by a tanker using a mooring line provided for that purpose. (Ref 18.1 [3], [5], [7], [8] & [9])

Two diesel generators originally powered the facilities on KLB. These facilities and the generators are now redundant.

4.5 MOORINGS

KLB is fixed to the seabed using an eight-point mooring system. Each mooring line consists of a length of 3-1/4" chain at each end with a wire rope middle section. Each mooring line is attached to a pile the head of which has been driven below the seabed. It is apparent that a late change was made to the pile design and there is no definitive record of the intended or achieved depth of cover to the piles. The depth of cover to each pile was therefore determined during the June 2007 Pile and Mooring Survey (Ref 17.[G]). The survey confirmed that the piles are buried and that the depth of cover ranges from 0.54m to 1.26m.

4.6 HYDRAULIC UMBILICAL (RISER)

A 3" umbilical, consisting of 4 No $^{3}/_{8}$" hydraulic hoses, delivered hydraulic power to operate the PLEM valves during offloading operations. The umbilical was routed adjacent to the flexible risers, passing over the riser system buoyancy module.

4.7 FLEXIBLE RISERS

There are two 8" flexible risers each in two sections. The lower sections connect the PLEM to a buoyancy module. The upper sections connect the buoyancy module to the KLB fixed risers and are suspended in a catenary to provide the required movements during extreme storms. All connections are flanged.

The buoyancy module is held down by means of two clump weights to which it is tethered by chains. The clump weights are deployed either side of the riser axes thus limiting lateral movement of the buoyancy module. The clump weights are not attached to the seabed and rely solely on their deadweight to maintain position.

The fixed risers and offloading hose are described in Section 4.4 "Kittiwake Loading Buoy".

4.8 REFERENCE DRAWINGS

The following drawings are attached in the appendix for reference.

Ref	Drawing No.	Title
[1]	KW-R-01101	ELSBM General Arrangement
[2]	KW-R-01103	ELSBM Buoy Refurbishment Layout
[3]	KW-R-01104	ELSBM Mooring Line & Loading Hose Configuration
[4]	KW-R-01105	ELSBM Compartment Layout
[5]	KW-R-03505	ELSBM Flowline Ball Valve Control System Layout
[6]	KW-U-10212	KLB Composite Mooring Line Assembly

[7]	KW-R-05303	ELSBM Buoy Body Piping – Swivel Room
[8]	KW-R-05304	ELSBM Buoy Body Piping – Riser Arrangement
[9]	KW-R-05309	ELSBM Flowline Iso of Crude Oil Piperun & MTO
[10]	KW-R-05401	ELSBM Underwater Hoses Configuration GA
[11]	KW-R-07101	ELSBM PLEM General Arrangement

5. INVENTORY OF MATERIALS

5.1 TRANS-FRONTIER SHIPMENT OF WASTE REGULATIONS

If KLB is taken to an overseas disposal site, she will be exported under the Trans-frontier Shipment of Waste Regulations 2007 and the UK Plan for Shipments of Waste (Dec 2006).

5.2 CLASSIFICATION

The bulk of materials in KLB fall into the category of "Green" waste but there is a small quantity of materials the category of which cannot be easily determined whilst KLB remains on station. This difficulty is typically because the material cannot be accessed or sampled until deconstruction begins, or access involves safety risks that cannot be justified. The Scottish Environment Protection Agency has agreed that KLB will be treated as a vessel and categorised as "Unclassified" in its entirety for the purposes of trans-frontier waste shipment.

A waste materials inventory was prepared as a desk study and verified as far as was practicable during the offshore survey. The inventory therefore represents Venture's best endeavours to identify and categorise the materials on KLB and will be used to support the Trans-frontier Shipment of Waste application.

As it is not possible to confirm the presence or otherwise of certain contaminants, the inventory deliberately errs on the cautious side by assuming that they are present. Examples of this are polychlorinated biphenyls (PCB's), which can sometimes be present in older electrical systems, and asbestos, which could be present in the HVAC system.

5.2.1 Ballast Water

It is understood that the ballast water is raw seawater and that no biocides or inhibitors were added to the tanks. This assumption is supported by the fact that there is no obvious way of adding these chemicals as the tanks are filled through a sea chest in the vessel hull. However, this possibility cannot be completely eliminated, as it is not feasible to sample the ballast water without exposing personnel to unnecessary risk and compromising the stability of the buoy. The ballast water must therefore be sampled once it has been moored at the disposal site.

Notwithstanding the presence of biocides or inhibitors, there is a possibility that Hydrogen sulphide will have formed within the tanks and a safe method of handling and disposal will be put into place to deal with this eventuality.

Ballast water has been conservatively identified as "Amber" waste.

5.2.2 Electrical and Electronic Waste

Electrical wastes present the highest potential for hazardous materials. Mercury, polychlorinated biphenyls (PCB's), plasticizers and brominated flame retardants (BFR's) can be present in lighting, electrical components and insulation.

5.2.3 Polychlorinated Biphenyls

PCB's are dielectric filler liquids used in transformers and capacitors. They persist in the environment and are toxic and their use was banned by Statutory Instrument (1986 No209).

The Health and Safety Executive (HSE) advise that PCB's should be assumed to be present in transformers and capacitors made before 1976 and that the presence of PCB's should be considered as a possibility in equipment made between 1976 and 1986.

During the 1989/90 refit, the structure and all equipment above "E" Deck (Ref 18.1 [2] was removed and replaced in its entirety. PCB's should not exist in the equipment installed at this time. Whether or not the electrical equipment below "E" Deck was replaced cannot be confirmed but the equipment that may contain this material is limited to starters in light fittings and capacitors (if they are present) in the ballast pumps.

Following the HSE advice and good practice, the materials inventory conservatively assumes that PCB's could be present in equipment where PCB's were formerly used even though most of this equipment dates from 1989. This will help ensure that there is no possibility of any such material going undetected. Nevertheless electrical waste has been categorized as "Green" waste on the basis that the potential quantities involved are very small and will not exceed the threshold level above which the material would have to be shipped as "Red" waste.

5.2.4 Contaminated Metals

Piping which has been used to transport oil, hydraulic fluids, diesel etc, falls under the category of "metal waste contaminated with dangerous substances". This also applies to the slew bearing on the rotating head and any other surfaces that have been lubricated by grease or oil.

However there is no reason to believe that the level of contamination is such as to justify categorising these materials as hazardous waste. These items have been categorised as "Green" waste.

5.2.5 Crude Oil

KLB is not a storage facility and is not capable of being used as such. Crude oil was passed through the pipeline, risers, pipework and loading hose directly to the shuttle tanker. The pipeline, risers, pipework and loading hose were thoroughly flushed through to the shuttle tanker when KLB was taken out of service and left filled with inhibited seawater. There is no crude oil inventory on KLB.

5.2.6 Hydrocarbons, Lubricants and Hydraulic Fluids

The generator fuel tanks are partially filled with diesel. A number of drums are stored on KLB containing lubrication oil and hydraulic fluid. The diesel and hydraulic lines were not drained down when KLB was taken out of service.

These materials are classified as “Amber” waste.

5.2.7 Low Specific Activity Scale

Low specific activity scale (LSA) has never been encountered on Kittiwake. The loading hose has been replaced at least once in the lifetime of KLB. The old hose was cut open and examined for LSA but no indication of radioactivity above the background level was detected. In addition, the pipeline, riser and loading system was thoroughly flushed and left filled with inhibited seawater when KLB was taken out of service. There is therefore no reason to anticipate the presence of LSA scale on KLB

5.2.8 Heavy Ballast

Heavy ballast contained in KLB falls into two categories:

- Heavy ballast used in the construction of the Auk ELSBM
- Heavy ballast added during the 1989/90 refit.

Heavy ballast placed during the original construction is a dense slurry made by mixing crushed barium sulphate rock with seawater. Barium sulphate, also known as barites and other trade names, is commonly used as the weight component in drilling mud. Drilling mud of this period was oil based therefore, in the interests of clarity, it should be noted that the barites ballast in KLB is not drilling mud.

Heavy ballast installed during the refit is plain concrete.

5.3 TRANS-FRONTIER SHIPMENT OF WASTE IMPLICATIONS

KLB is essentially a steel floating structure containing fixed heavy ballast (barites/seawater slurry) and water ballast. Almost all of KLB is categorised as “Green” and has a high [potential for recycling. However there are small quantities of materials that cannot be sampled and analysed before being brought ashore. Venture has therefore taken a precautionary approach when classifying such

materials to ensure that, should unidentified contaminants exist, they will be identified and dealt with safely. By adopting this approach, Venture anticipates that trans-frontier shipment of waste issues will be avoided.

However, in the very unlikely event that LSA scale is detected, Venture recognises that this material will have to be repatriated to the UK for disposal and will put in place contingency measures to cover this unlikely eventuality.

5.4 LISTING

The following lists are attached:

- Table 5.1 Parts Inventory by Area
- Table 5.2 Summary of Applicable Waste Classification Codes
- Table 5.3 Waste Classification Inventory

Figure 5.1 defines the areas described in Table 5.1 below.

Table 5.1 Parts Inventory by Area	QUANTITY	UNIT
KLB TOTAL DISPLACEMENT (excluding suspended chain & risers)	**4132.640**	Tonne
1) ROTATING HEAD (Installed 1989/90)	**248.616**	Tonne
Head Superstructure	63.130	Tonne
Loading Boom Structure	16.906	Tonne
Helideck Aluminium Sections Stainless steel bolts Safety nets Deck surface coating Guttering & pipework	26.750	Tonne
Turntable Structure	43.333	Tonne
Outfitting Handrails Ladders & Stairs Temporary Shelter, bunks plumbing & fittings Halon Cabinet (redundant – halon system removed) Miscellaneous items	57.116	Tonne
Paint	1.060	Tonne
Vessel Mooring System Wire rope Various rigging items	3.600	Tonne
Inhibited Water in pipework	1.160	Tonne
Crude Oil System Carbon Steel Pipework Flexible Loading Hose (composite)	9.206	Tonne

Table 5.1 Parts Inventory by Area (continued)	QUANTITY	UNIT
1) ROTATING HEAD (Installed 1989/90) - Continued		
Mechanical Systems 10te Winch 3te winch Winch wire Generators x 2 HVAC Unit/fan/ductwork/filters Diesel Tank $2m^3$	8.815	Tonne
Electrical Systems Control Panel Switchboard 440v Switchgear MCC with 440/240v Transformer 220v distribution panel Wiring harnesses Lighting Cable trays & ladders Telecoms System Fax & Radio Equipment Satellite Comms Equipment Helideck Lighting Telemetry – various Navaids 24v DC Supply (Battery) Wind Generator Portable battery lamp/torches	10.790	Tonne
Hydraulic Systems HPU Hydraulic piping/tubing/hoses	5.000	Tonne
Loss Prevention and Safety Systems Alarm Systems Fire & Gas Detection CO_2 Monitors Portable Fire Extinguishers – Powder Portable Fire Extinguishers – CO_2 Navaids – general electrics Navaids – Lights Navaids – Signal Emitters Navaids – Control Panel Navaids – Sun Switch Foghorn	0.850	Tonne

Table 5.1 Parts Inventory by Area (continued)	QUANTITY	UNIT
1) ROTATING HEAD (Installed 1989/90) - Continued		
Consumables Stored Materials Lubricants Diesel in tank	2.900	Tonne
2) SLEWING BEARING SECTION (Installed 1989/90)	**46.838**	Tonne
Slewing Bearing Slew bearing Main Bearing Lubricant (grease & oil)	14.830	Tonne
Brake System Hydraulic equipment Hydraulic oil	3.317	Tonne
Outfitting Handrails, Stairs, Ladders & Walkways	28.691	Tonne
3) UPPER BUOY EXTENSION (Installed 1989/90)	**122.212**	Tonne
Structure	101.650	Tonne
Outfitting Ladders, Handrails, Access Platforms, Hatches	9.812	Tonne
Paint	0.690	Tonne
Piping	3.760	Tonne
Inhibited Water in Pipes	1.200	Tonne
Electrical Systems Lighting Wiring Cable Trays & Ladders	5.100	Tonne

Table 5.1 Parts Inventory by Area (continued)	QUANTITY	UNIT
4) LOWER BUOY EXTENSION (Installed 1989/90)	**118.388**	Tonne
Structure	98.450	Tonne
Outfitting Ladders, Handrails Access Platforms	9.890	Tonne
Paint & Corrosion Protection Paint Anodes & Fittings	4.120	Tonne
Piping	4.628	Tonne
Inhibited Water in Pipes	0.800	Tonne
Electrical Systems (estimate) Lighting Wiring Cable Trays & Ladders	0.500	Tonne

5) FENDER (Installed 1989/90)	284.623	Tonne
Structure	263.220	Tonne
Outfitting Accessways, Tow Points	8.653	Tonne
Paint & Corrosion Protection Paint Anodes & Fittings	12.750	Tonne

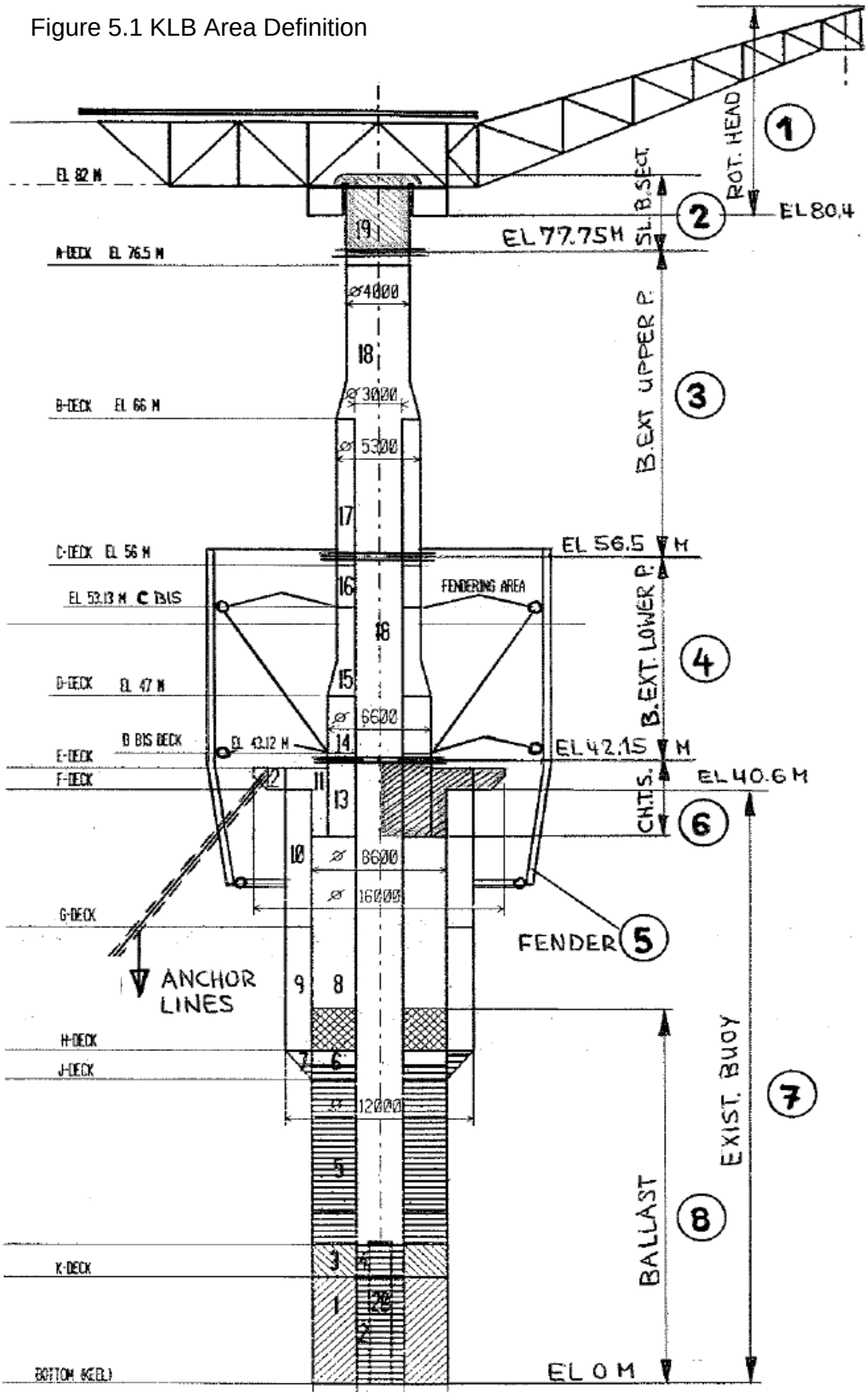
6) CHAIN TABLE (Modified 1989/90)	**187.772**	Tonne
Structure	179.362	Tonne
Mechanical Systems Chain Hawse	0.430	Tonne
Paint & Corrosion Protection Paint Anodes & Fittings	7.980	Tonne

Table 5.1 Parts Inventory by Area (continued)	QUANTITY	UNIT
7) MAIN BUOY Constructed c1974)	**620.433**	Tonne
Structure	569.644	Tonne
Mechanical Systems Ballast Pumps (estimate)	0.500	Tonne
Outfitting Ladders, Accessways, Hatches	9.060	Tonne
Paint & Corrosion Protection Paint Anodes & Fittings	24.780	Tonne
Piping	11.678	Tonne
Inhibited Water in Piping	4.271	Tonne
Electrical Systems (estimate) Wiring Lighting Cable trays & Ladders	0.500	Tonne

8) BALLAST (Installation dates as noted)	2501.758	Tonne
Heavy Ballast Barytes/Seawater Slurry in Tanks 1 & 3 (1413te) (c1974) Concrete (350te)in Tank 8 (1989/90)	1763.000	Tonne
Draft Adjustment Water Ballast in Tank 6	73.758	Tonne
Water in Trim Tank 7A	8.617	Tonne
Water in Trim Tank 7B	5.150	Tonne
Water in Trim Tank 7C	3.383	Tonne
Water in Trim Tank 7D	6.850	Tonne
Operational Water Ballast in Tanks 2,4, 5 & 20	641.000	Tonne

Table 5.1 Parts Inventory by Area (continued)	QUANTITY	UNIT
MOORINGS, RISERS & SUBSEA INFRASTRUCTURE		
Mooring Chain (Steel)	350	Metre
Mooring Rope (Steel)	725	Metre
Risers (Composite)	314	Metre
Umbilical (Composite)	130	Metre
Riser Buoyancy Module Structural Steel (4.401te) Carbon Steel Piping (0.445te) Rubber (0.026te) Anode (Al-Zn) (0.118te)	4.990	Tonnes
PLEM	15.000	Tonne
Pile Offcuts (Estimate)	4.000	Tonne
Clump Weights Structural Steel (1.618te) Concrete (39.92te)	41.538	Tonnes
Buoyancy Module Chain	43.2	Metre
Tie-in Spool	40.000	Metre

Figure 5.1 KLB Area Definition



Venture Production- Kittiwake Loading Buoy

Waste Classification Inventory - 10 August 2006

Table 5.2 Summary of applicable waste classification codes

EWC classification	
Waste from thermal processes	
	Waste from other non-ferrous thermal metallurgy
100814	anode scrap
Oil wastes and wastes of liquid fuels	
130113*	other hydraulic oils
130403*	bilge oils from other navigation
130701*	fuel oil and diesel
Wastes not otherwise specified in the list	
	End of life vehicles from different means of transport (including off road machinery) etc
160108*	Components containing mercury
160199	Waste otherwise not specified
	Waste from electrical and electronic equipment
160209*	Transformers and capacitors containing PCBs
160213*	Discarded equipment containing hazardous components other than those mentioned in 160209 to 160212
160214	Discarded equipment other than those mentioned in 160209 to 160213
160215*	Hazardous components removed from discarded equipment
160216	Components removed from discarded equipment other than those mentioned in 160215
	Gases in pressure containers and discarded chemicals
160504*	Gases in pressure containers (including halons) containing dangerous substances
160505	Gases in pressure containers other than those mentioned in 160504
	Batteries and accumulators
160601*	lead batteries
160602*	Ni-Cd batteries
160603*	Mercury containing batteries
	Wastes from transport tank, storage tank and barrel cleaning (except 05 and 13)
160799	Wastes not otherwise specified
Aqueous liquid waste destined for off-site treatment	
161001*	Aqueous liquid wastes containing dangerous substances
Construction and demolition waste (including excavated soil from contaminated sites)	
	Concrete, bricks and ceramics
170101	Concrete
170103	Tiles and ceramics
	Wood, glass and plastic
170201	Wood
170203	Plastic
	Metals (including their alloys)
170402	Aluminium
170405	Iron and steel
170407	Mixed metals
170409*	Metal waste contaminated with dangerous substances

Venture Production- Kittiwake Loading Buoy

Waste Classification Inventory - 10 August 2006

Table 5.2 Summary of applicable waste classification codes

170411	Cables other than those mentioned in 170410
	Other construction and demolition wastes
170903*	Other construction and demolition wastes (including mixed wastes) containing dangerous substances
Municipal waste (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions	
	Separately collected fractions (except 1501)
200111	Textiles
200135*	Discarded electrical and electronic equipment other than those mentioned in 200121 and 200123 containing hazardous components
200199	Other fractions not otherwise specified

Transboundary classification

Green

B1010 (Annex B)/GA140	Metal and metal alloy wastes in metallic, non dispersible form
GC 020	Electronic scrap (e.g. printed circuit boards, electronic components, wire, etc) and reclaimed electronic components suitable for base and precious metal recovery
GC 030 ex 890800	Vessels and other floating structures for breaking up, properly emptied of any cargo and other materials arising from the operation of the vessel which may have been classified as a dangerous substance
GH 014 ex 391590	Solid plastic waste - polymers or copolymers
GJ 130 ex 6310	Used rags, scrap twine, cordage, rope and cables and worn out-articles of twine, cordage, rope or cables of textile materials
GK 030 ex 4017 00	Wastes and scrap of hard rubber (for example, ebonite)
GL 010 ex 440130	Wood waste and scrap, whether or not agglomerated in logs, briquettes, pellets or similar forms

Regardless of whether or not wastes are included on this list, they may not be moved as green wastes if they are contaminated by other materials to an extent which (a) increases the risks associated with the waste sufficiently to render it appropriate for inclusion on the amber or red lists, or (b) prevents the recovery of the waste in an environmentally sound manner"

Amber

AC030	Waste oils unfit for their originally intended use
AC 060 ex 381900	Hydraulic fluids
AC160	Halons
AD 060	Waste oils/water, hydrocarbons/water mixtures, emulsions

Regardless of whether or not wastes are included on this list, they may not be moved as amber wastes if they are contaminated by other materials to an extent which (a) increases the risks associated with the waste sufficiently to render it appropriate for inclusion on the red list, or (b) prevents the recovery of the waste in an environmentally sound manner"

NOTE: 1. Any waste marked with an asterisk is considered as a hazardous waste pursuant to the Directive 91/689/EC. If a waste is identified as hazardous by a specific or general reference to dangerous substances, the waste is hazardous only if the concentrations of those substances are such (i.e. percentage by weight) that the waste presents one or more of the properties listed in Annex III to Council Directive 91/689/EEC.

Table 5.3 Waste Classification Inventory

Sub Unit	Description of waste (Principal components)	EWC	TSWR 2007
Mooring head			
Turntable & main bearing			
Mooring head	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Emergency shelter/accommodation cabin	**Metals (including their alloys)** 1) Metal waste contaminated with dangerous substances	170409*	GC 030 ex 8908 00
Slewing bearing	**Metals (including their alloys)** 1) Metal waste contaminated with dangerous substances (oil and grease)	170409*	GC 030 ex 8908 00
Locking system	**Metals (including their alloys)** 1) Metal waste contaminated with dangerous substances (oil and grease)	170409*	GC 030 ex 8908 00
Turntable	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Turntable - rotating joint - grease and oil	**Metals (including their alloys)** 1) Metal waste contaminated with dangerous substances (oil and grease)	170409*	GC 030 ex 8908 00
Wind generator			GC 030 ex 8908 00
Loading boom			
Loading boom	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Tanker loading hose (Caternary 8 inch)	**Other construction and demolition wastes** 1) Other construction and demolition wastes including mixed wastes containing dangerous substances	170903*	Not classified
Helideck			
Helideck - structure - aluminium	**Metals (including their alloys)** 1) Aluminium	170402	B101(Annex B)
Helideck lighting	**Waste from electrical and electronic equipment** 1) Mercury containing components 2) Transformers and capacitors containing PCBs 3) External electrical cables	160108* 160209* 160213*	GC 020
Helideck - bearing point	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Helideck bolting - stainless steel	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Helideck - anti skid netting	**Municipal wastes (Household and similar commercial, industrial wastes)** 1) Textiles (rope)	200111	Not classified
Helideck - surface	**Metals (including their alloys)** 1) Aluminium	170402	B101(Annex B)
Helideck - open drain guttering (aluminium) and pipe work (steel)	**Metals (including their alloys)** 1) Aluminium 2) Iron and steel	170402 170405	GC 030 ex 8908 00
Helideck - synthetic safety netting	**Wood glass and plastic** 1) Plastic	170203	Not classified
Emergency shelter/accommodation cabin			
Emergency shelter/accommodation cabin	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Cabin roofs/ corrugated	**Metals (including their alloys)** 1) mixed metals	170407	GC 030 ex 8908 00
Hand railing	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Bunks etc	**Wood glass and plastic** 1) wood		Not classified

Sub Unit	Description of waste (Principal components)	EWC	TSWR 2007
Mooring head			
Power generation room			
Power generation room - structure	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Power generation room - equipment	**Waste from electrical and electronic equipment** 1) Capacitors containing PCBs including Transformers 2) External electrical cables	160209* 160213*	GC 020
Generators 1 and 2	**Metals (including their alloys)** 1) Metal waste contaminated with dangerous substances	170409*	GC 030 ex 8908 00
Generator exhausts and silencers	**End of life vehicles from different means (including off road machinery)** 1) Wastes not otherwise specified	160199	GC 030 ex 8908 00
diesel tank 2 m3	**Metals including their alloys** 1) Metal waste contaminated with dangerous substances	170409*	GC 030 ex 8908 00
diesel from diesel tank	**waste of liquid fuels** fuel oil and diesel	130701*	Not classified
Halon cabinet - structure	**Metals (including their alloys)** 1) mixed metals	170407	GC 030 ex 8908 00
Hydraulic power unit	**Metals (including their alloys)** 1) Metal waste contaminated with dangerous substances	170409*	GC 030 ex 8908 00
Hydraulic oil from power unit	**waste hydraulic oils** 1) Other hydraulic oils	130113*	AC 060 ex 381900
Control panel	**Waste from electrical and electronic equipment** 1) External electrical cables 2) Plastics containing BFRs, plasticizers or Phthalates 3) Discarded equipment general	1) 160213* 2) 160215* OR 160216 3) 160214	GC 020
Switch board	**Waste from electrical and electronic equipment** 1) External electrical cables 2) Plastics containing BFRs, plasticizers or Phthalates 3) Discarded equipment general	1) 160213* 2) 160215* OR 160216 3) 160214	GC 020

Sub Unit	Description of waste (Principal components)	EWC	TSWR 2007
Cylindrical buoy column			
Superstructure	**Metals (including their alloys)**		
A deck (main deck) - galvanised steel/paint coating)	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Lighting	**Waste from electrical and electronic equipment** 1) Mercury containing components 2) Transformers and capacitors containing PCBs 3) External electrical cables (discarded electrical equipment containing hazardous components etc.)	160108* 160209* 160213*	GC 020
Cable tray	**Waste from electrical and electronic equipment** 1) External electrical cables (discarded electrical equipment containing hazardous components etc.)	160213*	GC 020
walkway, handrails, framing and ladders (galvanised steel and coating) el 78100	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
ladders, handrails, walkway supports, framing and deck grating galvanised steel and paint /coating) el 69700	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
walkway, handrails, framing and ladders (galvanised steel and paint/coating) el 63500	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Deck gratings - all other areas - galvanised steel and paint/coating	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Vertical ladder access route - galvanised steel and paint/coating	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Compartment 19 - open	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Service room			
Service room - structure	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
440v column switchboard	**Waste from electrical and electronic equipment** 1) Transformers and capacitors containing PCBs 2) External electrical cables (discarded electrical equipment containing hazardous components etc.)	1) 160209* 2) 160213*	GC 020
MCC with 440/240 V transformer	**Waste from electrical and electronic equipment** 1) Capacitors containing PCBs including Transformers 2) External electrical cables (discarded electrical equipment containing hazardous components etc.)	160209* 160213*	GC 020
220v distribution panel	**Waste from electrical and electronic equipment** 1) Capacitors containing PCBs including Transformers 2) External electrical cables (discarded electrical equipment containing hazardous components etc.)	160209* 160213*	GC 020
Internal lighting (fluorescent tubes/bulbs?)	**Waste from electrical and electronic equipment** 1) Mercury containing components 2) Capacitors containing PCBs including Transformers 3) External electrical cables (discarded electrical equipment containing hazardous components etc.)	160108* 160209* 160213*	GC 020
HVAC unit (buoy structure)	**Metals (including their alloys)** 1) Mixed metals	170407	GC 030 ex 8908 00
HVAC fan	**Waste from electrical and electronic equipment** 1) External electrical cables (discarded electrical equipment containing hazardous components etc.)	160213*	GC 020
HVAC duct work	**Metals (including their alloys)** 1) Mixed metals	170407	GC 030 ex 8908 00
HVAC filters	**Municipal wastes (Household and similar commercial, industrial wastes)** 1) Other fractions not specified.	200199	Not classified
Hydraulic power unit (PLEM Valves)	**Waste from electrical and electronic equipment** 1) External electrical cables (discarded electrical equipment containing hazardous components etc.) 2) Discarded equipment general	160213* 160214	GC 020

Sub Unit	Description of waste (Principal components)	EWC	TSWR 2007
Cylindrical buoy column			
Control room			
Control room - structure	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Telephone equipment	**Waste from electrical and electronic equipment** 1) External electrical cables (discarded electrical equipment containing hazardous components etc.) 2) Plastics containing BFRs, plasticizers or Phthalates	1) 160213* 2) 160215* OR 160216	GC 020
Fax and radio equipment	**Waste from electrical and electronic equipment** 1) External electrical cables (discarded electrical equipment containing hazardous components etc.) 2) Plastics containing BFRs, plasticizers or Phthalates	1) 160213* 2) 160215* OR 160216	GC 020
Satellite comms	**Waste from electrical and electronic equipment** 1) External electrical cables (discarded electrical equipment containing hazardous components etc.) 2) Plastics containing BFRs, plasticizers or Phthalates	1) 160213* 2) 160215* OR 160216	GC 020
Navaids - general electrics	**Waste from electrical and electronic equipment** 1) External electrical cables (discarded electrical equipment containing hazardous components etc.) 2) Plastics containing BFRs, plasticizers or Phthalates 3) Capacitors including transformers containing PCBs	1) 160213* 2) 160215* OR 160216 3) 160209*	GC 020
Navaids - lights	**Waste from electrical and electronic equipment** 1) Mercury containing components 2) Capacitors containing PCBs including Transformers 3) External electrical cables (discarded electrical equipment containing hazardous components etc.)	160108* 160209* 160213*	GC 020
Navaids - signal emitters	**Waste from electrical and electronic equipment** 1) External electrical cables 2) Plastics containing BFRs, plasticizers or Phthalates 3) Discarded equipment general	1) 160213* 2) 160215* OR 160216 3) 160214	GC 020
Navaids - control panel	**Waste from electrical and electronic equipment** 1) External electrical cables (discarded electrical equipment containing hazardous components etc.) 2) Plastics containing BFRs, plasticizers or Phthalates 3) Discarded equipment general	1) 160213* 2) 160215* OR 160216 3) 160214	GC 020
Navaids - sun switch	**Waste from electrical and electronic equipment** 1) External electrical cables (discarded electrical equipment containing hazardous components etc.) 2) Plastics containing BFRs, plasticizers or Phthalates 3) Discarded equipment general	1) 160213* 2) 160215* OR 160216 3) 160214	GC 020
Navaids - 24 V DC power system - battery	**Waste from electrical and electronic equipment** 1) External electrical cables 2) Batteries 3) Discarded equipment general	1) 160213* 2) 160601*, 160602*, 160603* 3) 160214	GC 020
Telemetry - various	**Waste from electrical and electronic equipment** 1) External electrical cables (discarded electrical equipment containing hazardous components etc.) 2) Plastics containing BFRs, plasticizers or Phthalates 3) Discarded equipment general	1) 160213* 2) 160215* OR 160216 3) 160214	GC 020
Foghorn	**Waste from electrical and electronic equipment** 1) Discarded equipment general	1) 160214	GC 020
alarm systems	**Waste from electrical and electronic equipment** 1) Batteries 2) Circuit boards 3) External electrical cables (discarded electrical equipment containing hazardous components etc.) 4) Plastics containing BFRs, plasticizers or Phthalates 5) Discarded equipment general	1) 160601*, 160602*, 160603* 2) 160213* 3) 160213* 4) 160215* OR 160216 5) 160214	GC 020

Sub Unit	Description of waste (Principal components)	EWC	TSWR 2007
Cylindrical buoy column			
Fire and gas detection systems	**Waste from electrical and electronic equipment** 1) Batteries 2) Circuit boards 3) External electrical cables (discarded electrical equipment containing hazardous components etc.) 4) Plastics containing BFRs, plasticizers or Phthalates 5) Components containing radioactive substances above exemption thresholds 6) Discarded equipment general	1) 160601*, 160602*, 160603* 2) 160213* 3) 160213* 4) 160215* OR 160216 5) N/A (No classification under EWC 6) 160214	GC 020
CO2 monitors	**Waste from electrical and electronic equipment** 1) External electrical cables (discarded electrical equipment containing hazardous components etc.) 2) Plastics containing BFRs, plasticizers or Phthalates 3) Discarded equipment general	1) 160213* 2) 160215* OR 160216 3) 160214	GC 020
Portable fire extinguishers - powder	**Gases in pressure containers and discarded chemicals**	1605	Not classified
Portable fire extinguishers - CO2	**Gases in pressure containers and discarded chemicals** 1) gases in pressure containers	160505	Not classified
B deck	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Compartment 18 - Buoyancy 532m3	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
C Deck	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Compartment 17 - Buoyancy 147m3	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
D Deck	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Compartment 15 - Buoyancy 105m3	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
E Deck	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Compartment 14 - Buoyancy 103m3	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
F Deck	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Compartment 11 - Buoyancy 2*96m3	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Compartment 12 - Buoyancy - 8 * 10m3	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
G Deck	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Compartment 10 - Buoyancy 8*63m3	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
H Deck	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Compartment 8 - Buoyancy 731 m3 partially filled with concrete	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Concrete from compartment 8	**Concrete, bricks, tiles and ceramics** 1) concrete	170101	Not classified
Compartment 9 - Buoyancy 8*52m3	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
J Deck	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Compartment 6 - Buoyancy 100 m3 water ballast	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Water ballast from compartment 6	**aqueous liquid wastes destined for offsite treatment** 1) aqueous liquid wastes containing dangerous substances	161001*	Not classified
Compartment 7 - Buoyancy 4*12 m3 water ballast	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Water ballast from compartment 7	**aqueous liquid wastes destined for offsite treatment** 1) aqueous liquid wastes containing dangerous substances	161001*	Not classified

Sub Unit	Description of waste (Principal components)	EWC	TSWR 2007
Cylindrical buoy column			
K deck	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Compartment 3 - Buoyancy 111m3 barytes ballast (concrete)	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Barytes ballast from compartment 3 (concrete)	**Concrete, bricks, tiles and ceramics** 1) concrete	170101	Not classified
Compartment 4 - Buoyancy 13 m3 water ballast	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Water ballast from compartment 4	**aqueous liquid wastes destined for offsite treatment** 1) aqueous liquid wastes containing dangerous substances	161001*	Not classified
Compartment 5 - Buoyancy 561m3	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
2 * Bilge pumps	**Metals (including their alloys)** 1) metal waste contaminated with dangerous substances	170409*	GC 030 ex 8908 00
Oily slops from bilge pumps	**bilge oils** 1) bilge oil from other navigation	130403*	Not classified
Base	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Compartment 1 - Buoyancy 366 m3 barytes ballast (concrete)	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Barytes ballast from compartment 1 (concrete)	**Concrete, bricks, tiles and ceramics** 1) concrete	170101	Not classified
Compartment 2 - Buoyancy 41 m3 water ballast	**Metals (including their alloys)** 1) Iron and steel	170405 160799	GC 030 ex 8908 00
Water ballast from compartment 2	**aqueous liquid wastes destined for offsite treatment** 1) aqueous liquid wastes containing dangerous substances	161001*	Not classified
Compartment 20 - Buoyancy 111 m3 water ballast	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Water ballast from compartment 20	**aqueous liquid wastes destined for offsite treatment** 1) aqueous liquid wastes containing dangerous substances	161001*	Not classified
Fender structure			
Fender structure - 250.0 tonnes	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Wooden bumper boards	**Wood, glass and plastic** 1) wood	170201	Not classified
Internal vertical ladders	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Portable battery lamps/torches	**Waste from electrical and electronic equipment** 1) Plastics containing BFRs, plasticizers or Phthalates 2) Discarded equipment general	1) 160215* OR 160216 2) 160214	GC 020
Crude lines (TVP crude)	**Other construction and demolition wastes** Other construction and demolition wastes including mixed wastes containing dangerous substances	170903*	Not classified
Tanker mooring line	**Municipal wastes (Household and similar commercial, industrial wastes)** 1) Textiles (rope)	200111	Not classified
Valve and swivel room	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Swivel seal	**Metals (including their alloys)** 1) metal waste contaminated with dangerous substances	170409*	GC 030 ex 8908 00
Control umbilicals	**Waste from electrical and electronic equipment** 1) External electrical cables	160213*	GC 020

Sub Unit	Description of waste (Principal components)	EWC	TSWR 2007
Cylindrical buoy column			
Chain table			
Chain handling rigging	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Chain hawse units	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
8 anchor legs			GC 030 ex 8908 00
8 k Anchor chains 5 t	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Ballast piping (7.9 tonnes	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Trim tanks - containing water	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Water from trim tanks	**aqueous liquid wastes destined for offsite treatment** 1) aqueous liquid wastes containing dangerous substances	161001*	Not classified
Anodes	**Wastes from other non -ferrous thermal metallurgy** 1) Anode scrap	100814	GC 030 ex 8908 00
725 m Wire rope	**Metals (including their alloys)** 1) cables	170411	GC 030 ex 8908 00
Substructure pipes - flushed (previously containing oil - 13.9 tonnes)	**Metals (including their alloys)** 1) metal waste contaminated with dangerous substances	170409*	GC 030 ex 8908 00
Subsea hose (strings) *2	**Other construction and demolition wastes** 1) Other construction and demolition wastes including mixed wastes containing dangerous substances	170903*	Not classified
Riser piping	**Metals (including their alloys)** 1) metal waste contaminated with dangerous substances	170409*	GC 030 ex 8908 00
New chimney - steel/coated/anodised	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00

Sub Unit	Description of waste (Principal components)	EWC	TSWR 2007
Seabed infrastructure			
Buoyancy module	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Temporary clump weight	**Concrete, bricks, tiles and ceramics** 1) concrete	170101	Not classified
Temporary clump weight chains	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
PLEM (Pipeline manifold)	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00
Mooring chains	**Metals (including their alloys)** 1) Iron and steel	170405	GC 030 ex 8908 00

6. REMOVAL AND DISPOSAL OPTIONS

6.1 OPTIONS SUMMARY

OSPAR Decision 98/3 presumes that all installations will be returned to shore for re-use, recycling or final disposal on land. Accordingly the following options were considered:

- Transfer of ownership for re-use by another operator
- Removal for deconstruction, recycling and disposal.

6.1.1 Transfer of Ownership

The potential opportunities for transferring ownership for re-use were investigated. However it became clear that the costs of recovering KLB, refurbishing her and installing her at a new location are much greater than installing a modern offloading system such as the SAL now used on Kittiwake. KLB is old technology and not efficient. There was no serious interest from the market.

6.1.2 Removal for Deconstruction, Recycling and Disposal

This is the only feasible option for dealing with KLB.

Two methods of removal were considered:

- The heavy lift option involving lifting, upending and laying down KLB onto a transportation barge for shipment to a suitable deconstruction yard.
- The wet tow option involving towing the buoy in the upright position to a deconstruction yard with mooring facility capable of handling the draft of 54m.

The method of removal involves technical restrictions resulting from the original method of construction. The Auk ELSBM was constructed on its side in a fabrication yard in Holland and loaded out onto a launch barge. It was taken to a fjord in Western Norway with sufficient depth to accommodate its draft, and launched and upended. From there, it was towed in the vertical to the Auk field and moored. When the ELSBM was no longer required at Auk, it was towed to Loch Kishorn for a major refit and subsequently re-used at Kittiwake as the KLB.

KLB has no lift points for upending and lifting and the design of the structure did not provide for handling in this way.

Two major heavy lift contractors were invited to look at the heavy lift option and propose a methodology. Both confirmed that a heavy lift solution was not a feasible option.

The conclusion was that removal of KLB to a suitable disposal site would have to be by wet tow. This is consistent with the procedure used to transfer the buoy from Auk

to Kittiwake. The Auk ELSBM was towed to Loch Kishorn off the West coast of Scotland. After the refit was completed, KLB was towed from Kishorn to Kittiwake

KLB's draft is over 50m. The selected disposal yard must therefore have a deep water mooring facility capable of accommodating this draft. In accordance with the waste hierarchy (reduce, reuse, recycle), consideration was given to reusing components of KLB in preference to recycling. However an inventory survey carried out during August 2006 concluded that there was very little scope for this. Only the wind turbines, fitted when KLB was taken out service, were regarded as having scope for reuse. Although opportunities for reuse of individual components will be considered should they arise, it was concluded that the bulk of KLB materials would be recycled or sent for disposal where appropriate.

6.2 REMOVAL AND DISPOSAL OPTIONS – CONCLUSION

The only feasible option for the removal of KLB is a wet tow to a disposal yard with a mooring facility capable of accommodating the required draft.

KLB will be towed in the vertical to a specialised deconstruction yard with a suitable deep-water mooring for dismantling and recycling/disposal.

7. SELECTED REMOVAL AND DISPOSAL OPTION

7.1 SCOPES OF WORK

There are three main scopes of work:

- KLB Disconnection and Tow
- KLB Deconstruction, Recycling and Disposal
- PLEM Removal and Disposal

7.2 REMOVAL – GENERAL

It is not desirable to deploy divers within the anchor pattern of KLB and this will be avoided if at all possible. Venture's preference is that subsea operations in the KLB removal scope will be carried out by ROV. This will include inspection, attachment of lifting equipment and cutting operations.

It is not Venture's intention to use explosives for cutting operations. However, should it be necessary to use explosives, the work will follow the guidance given in "JNCC Guidelines for Minimising Acoustic Disturbance to Marine Mammals from Seismic Surveys".

The PLEM will be removed after KLB is off site and can be safely carried out by divers.

The following sections are taken from Reference 17.[C] and describe a typical removal process using ROV's. Other methods would follow a similar process.

7.3 PRE-SURVEY & PREPARATORY WORK

Before commencing with the disconnection procedure, a pre-survey will be carried out. The purpose of the pre-survey is to confirm that the task is as described on the available drawings and documents, and to identify any anomalies that might affect the task. The present status of the buoy, risers, moorings etc will be established.

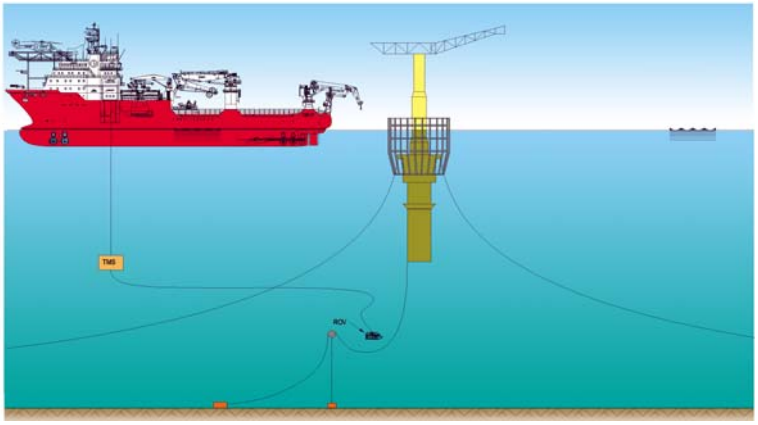


Fig 7.1 Pre-Survey

The disconnection procedures will be reviewed in the light of the pre-survey findings and updated as necessary. Once this has been done, the disconnection process will commence.

7.4 DISCONNECTION

7.4.1 Flexible Risers & Umbilical

Each riser and the umbilical will be removed in sections by cutting using diamond wire or a similar ROV based technique. Before cutting commences, the section to be cut will be rigged to the vessel crane hook. Once both ends are cut, the section of riser or umbilical will be recovered to the surface and stored on the deck of the vessel.

Once the risers and umbilical have been recovered, the buoyancy module tethers will be cut and the module recovered to the surface followed by the tethers and the clump weights.

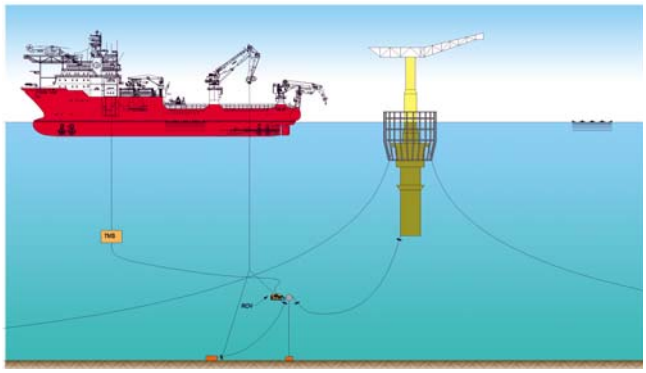


Fig 7.2 Cut & Recover Risers 1

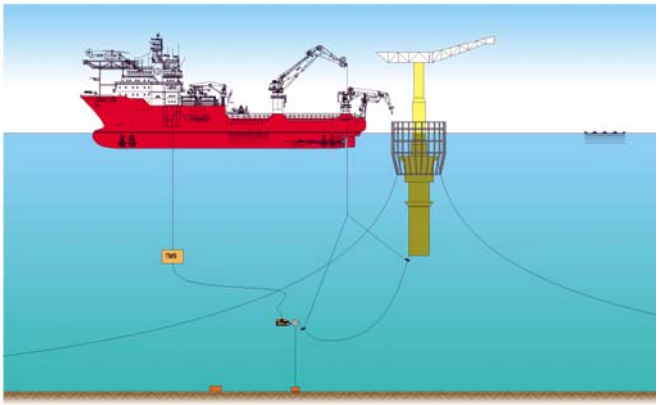


Fig 7.3 Cut & Recover Risers 2

7.4.2 Cutting and Retrieving Moorings

Six of the mooring lines will be cut approximately 50m from the touchdown point to release the tension in the chain. Rigging will be attached to each chain in turn before it is cut close to the buoy and recovered to the surface. The part of the mooring lines attached to the mooring piles will be left in situ until KLB is removed.

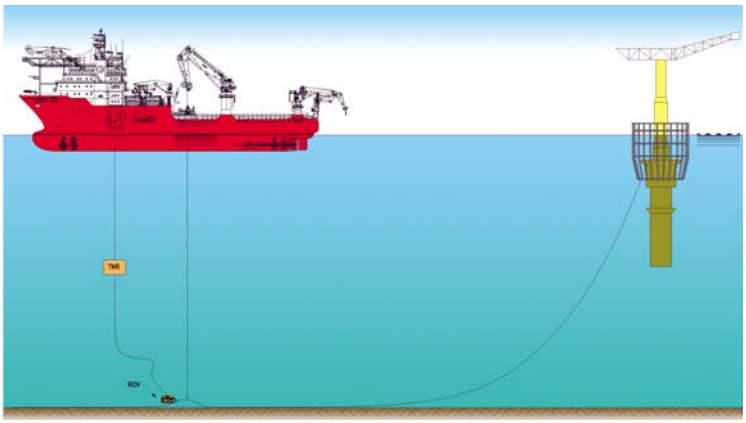


Fig 7.4 Cut Chains to Release Tension

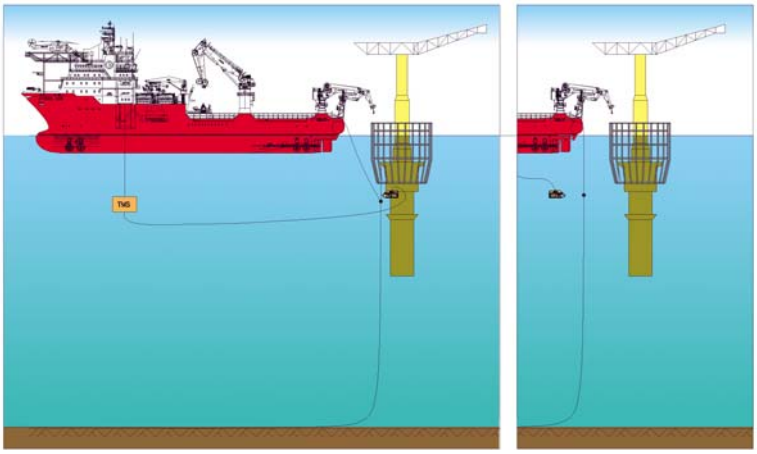


Fig 7.5 Cut & Recover Chains

The order of cutting will depend on the wind direction at the time but the two remaining lines will be diagonally opposite each other and aligned with the wind direction. When the lead tug is deployed and the tow harness tensioned, the second last mooring line will be cut. The auxiliary tug will then be deployed, the towing harness tensioned, and the final mooring line cut. At this stage, the tow will commence as described in Section 7.4.

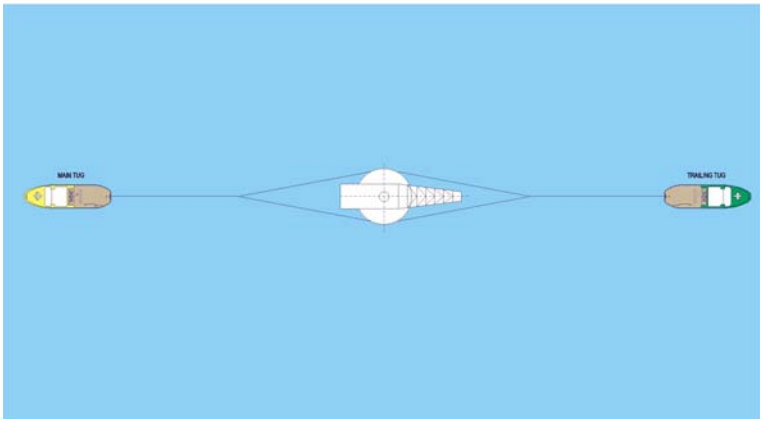


Fig 7.6 Tow Tugs Deployed

Once KLB is off-station, the remaining parts of the mooring lines can be recovered. Refer to Section 7.5.. .

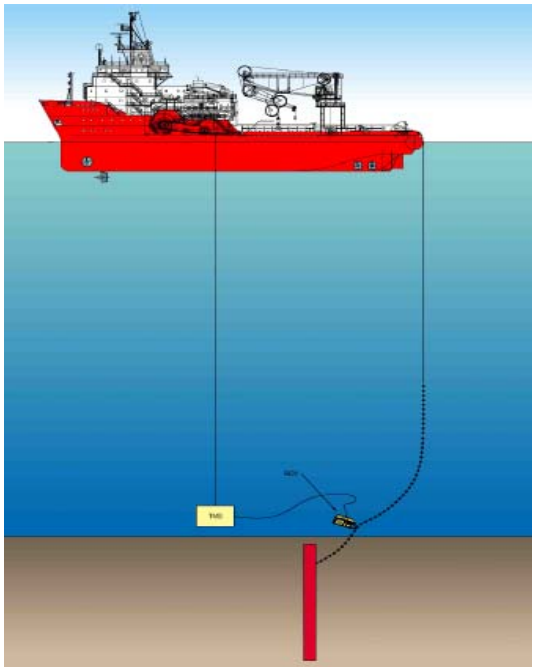


Fig 7.7 Cutting Chains at Seabed

Once the remaining chains have been recovered, a survey of the area will be carried out to confirm and record the status of the seabed as left at the completion of this stage of the work.

7.5 TREATMENT OF THE SEABED AT MOORINGS

7.5.1 Mooring Assembly

Details of the mooring assembly are given in 18.1 [6]. Note that this is a configuration sketch and is not to scale horizontally

The KLB Pile and Mooring Survey carried out in June 2007 (Ref 17.[G}) determined that the cover to the pile heads ranged between 0.54m and 1.26m. Reference is made to Section 10.5.2 for a discussion on the nature of the seabed at KLB. The surface materials are a mixture of sand and broken shell with a hard surface crust which is stable if left undisturbed. As there is no visible evidence of scour around the PLEM piles (as would be expected if the suface materials were unstable), the cover to the mooring piles is considered to be adequate. The mooring piles will therefore be left undisturbed in place.

Figure 7.8 gives a more realistic representation of the mooring line in the vicinity of the pile.

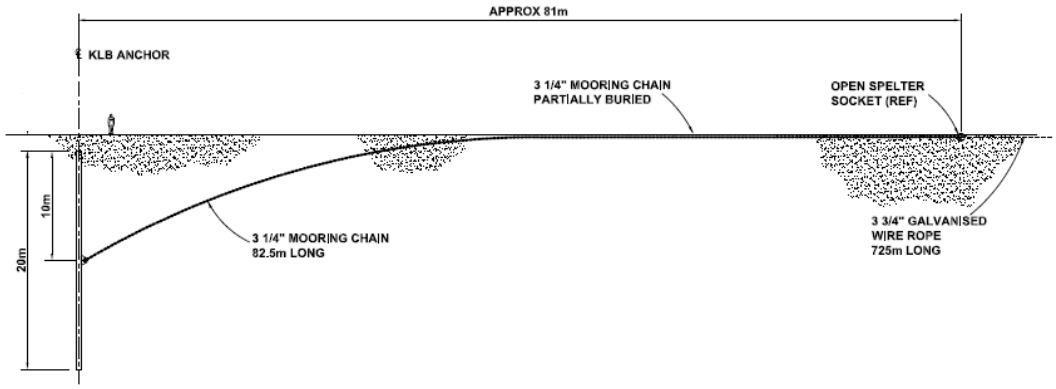


Fig 7.8 Mooring Line Profile at Anchor Pile (Idealised)

7.5.2 Dredging to Achieve Burial

Consideration was given to dredging to achieve a nominal 1m minimum depth to the portion of moorings left in place below the seabed. This operation would be carried out using a high-pressure water jet in combination with a dredge hog. However, it was concluded that this option is not practicable for removing buried chain because

the nature of the seabed is not best suited to dredging operations. Refer to Section 10.5.2 for a discussion on the potential impact of dredging.

The seabed consists of soft to very soft clay with a covering of a mixture of shells and sand. Although the surface "crust" is hard, this material is not ideal for dredging and it is questionable whether a satisfactory trench could be cut to achieve the required depth. This is not a precision operation, and it is expected that considerable disruption to the seabed would result.

In summary, dredging would result in extensive disruption to the seabed. However there is no guarantee that the objective of this operation would be achieved.

7.5.3 Proposed Solution

The proposed solution involves pulling the mooring line vertically so that as much of the mooring chain as is practicable is exposed. The mooring will then be cut as close to the seabed as possible and allowed to drop back and left on the seabed to self-bury. The target for this residual length is three clear links left to self bury.

Figure 7.9 is a conceptual representation of the three stages for the proposed solution. Position 1 indicates the mooring line as laid. Position 2 indicates the mooring line pulled vertically and being cut by an ROV. Position 3 indicates two to three links left on the surface.

Discussions have been held with SFF on this proposal and they have indicated that this will not be an issue. This is reported in Section 11.0.

Venture proposes this method on the basis that it avoids extensive damage to the seabed but presents little, if any, snagging risk. Over time, the exposed links can be expected to "self-bury" partly as a consequence of their weight, and partly as a consequence of sediment deposition.

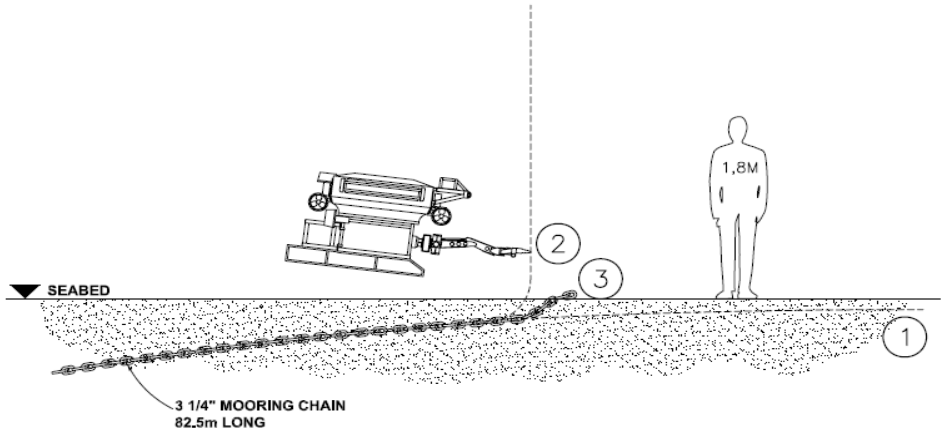


Figure 7.9 Proposed Solution

7.6 TOW TO DISMANTLING SITE

Before starting the tow, the buoy will be inspected by ROV to determine if there are any items that require securing or removal prior to the tow to remove any threat to the trailing tug and submarine pipelines on the tow route. Should such items be found, they will be removed and recovered to the surface.

The tow route will be planned to avoid subsea installations and minimise the number of subsea pipelines that will be crossed on route to the deconstruction site.

The tow harnesses will be preinstalled on KLB along with contingency trail lines, ready to be picked up by the tugs. There are a number of options being considered for attachment points including:

- Reusing the original tow points (main attachment eye on protection fender, secondary attachment to a trunnion through the buoy pedestal),
- Attaching both harnesses to the protection fender,
- Making use of the moorings (subject to a satisfactory structural check on the chain table).

The method of attachment will be selected based on condition, structural integrity, ease of deployment and safety.

Upon arrival at the decommissioning site, KLB will be secured to a purpose designed, pre-laid temporary mooring system adjacent to the facility. At this point, KLB will be handed over to the demolition team.

7.7 REMOVAL OF THE PLEM

7.7.1 PLEM Removal Scope

The PLEM (Ref 18.1 [11]) is a simple structure weighing approximately 15 tonnes (excluding the piles). It is supported by three piles to which it is attached by a simple pin arrangement. The PLEM will be removed and the piles cut of at approximately 1m below the seabed. The method of cutting and the detailed procedure will be developed with the contractor but an outline removal scope is as follows (see Fig 7.10):

- Disconnect and remove of the Pipeline to PLEM tie-in spool
- Remove pins connecting the PLEM to its piles
- Cut piles at approximately 1m below the seabed and retrieve
- Retrieve PLEM
- Recover any grout bags deployed to support the PLEM during pile cutting
- Recover any surplus mattresses and ensure site is clear.

A nominal depth of 1m has been adopted for pile cut off on the basis that it provides adequate protection at reasonable cost and effort.

The pipeline to PLEM tie-in spool is flanged at both ends and will be removed by unfastening the flanges and retrieving the spool to the surface.

A blind flange will be fitted to the KLB pipeline to protect its flange and preserve tha pipeline.A short length of the pipeline is unburied local to the connection with the tie-in spool. This unburied length will be covered by mattresses to protect it against damage and prevent any risk of the pipeline becoming a snagging hazard.

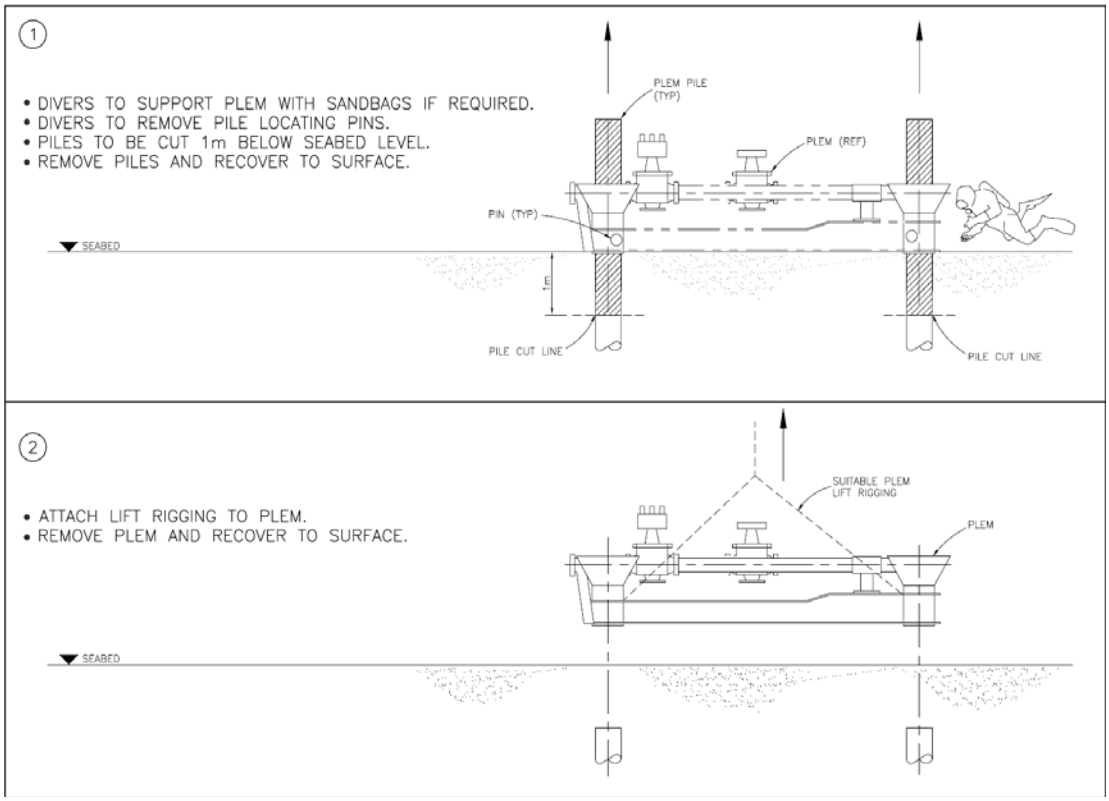


Figure 7.10 Outline PLEM Removal Procedure

7.8 DISMANTLING AND DISPOSAL

7.8.1 Transfer to Shore

The detailed method of transferring KLB to shore will be developed by the contractor undertaking the deconstruction, recycling and disposal activities. The techniques adopted will depend to a large extent on the availability of suitable construction vessels and the nature of the contractor's facilities. Methods that might be adopted include partial deconstruction using heavy lift vessels (involving loading in the rotating head, pedestal, fender and main buoy as separate components), and a process of reverse load-out aimed at minimising the number of heavy lifts required.

The attached photographs were taken at Loch Kishorn during the refit and illustrates that the upper part of the buoy could be dealt with by reversing this process.

Figure 7.11 Kishorn 1990 Installation of Pedestal & Fender

Figure 7.12 Kishorn 1990 Installation of Rotating Head

7.8.2 Preparation for Deconstruction

Preparatory engineering will be completed well in advance of KLB being received.

Once KLB has been transferred to shore, a safety inspection will be carried out to identify all potential hazards including obstructions, missing handrails, fire hazards, explosion hazards, asphyxiation or poisoning risks, hazardous substances, lack of safe access and egress etc.

Any measures required to make the worksite safe will be carried out (for example providing safe access and escape and eliminating risks of falling).

Any hazardous substances found will be removed by specialist teams or made safe until removal is possible.

7.8.3 Deconstruction Methods

A competent and experienced contractor specialising in the deconstruction and disposal of offshore facilities will perform this scope. The following sections are based on Reference 17.[B].

Exposure of personnel to risks will be kept as low as reasonably practicable. To achieve this, deconstruction will be carried out as far as possible by specialist machinery. Lifting activities will be avoided as far as possible by cutting the facility into pieces that can be easily and safely handled at ground level by machines.

Hydraulic excavators equipped with shears will carry out the bulk of deconstruction work. The emphasis will be on minimising direct human involvement at the work face and, where appropriate, remote-cutting techniques will be utilised. Every effort will be made to reduce hand cutting on site, but where this is necessary, the work place will be secured and made as safe as possible, and all necessary precautions taken.

Fig 7.13 Cutting with Hydraulic Shear

Fig 7.14 Breaking Concrete Ballast

Steel materials and other recyclable metals will be sorted by type and sent to a foundry for recycling. Other materials will be processed for recycling or safe disposal.

Fig 7.15 Gas-Cut Heavy Walled Tubulars Ready for Recycling

The facility chosen will be licensed to handle all hazardous wastes. Should hazardous materials be encountered, they will be removed and isolated in preparation for treatment and safe disposal.

Fig 7.16 Temporary Storage for LSA Contaminated Pipe

7.8.4 Final Documentation

Final documentation will include a completion certificate and a complete environmental account. The environmental account includes:

- A material accounting report in which the weighing records of all materials and items are logged,
- Emissions from project activities calculated in accordance with established industry practice,
- Impacts resulting from transporting materials to other locations for reuse, recycling and disposal.

8. WELLS (NOT APPLICABLE TO KLB)

There are no wells associated with KLB. This section is therefore not applicable.

9. DRILL CUTTINGS (NOT APPLICABLE TO KLB)

There are no drill cuttings associated with KLB. This section is therefore not applicable.

10. ENVIRONMENTAL IMPACT ASSESSMENT

10.1 ENVIRONMENTAL LEGISLATION

Environmental legislation applicable to the decommissioning of the Kittiwake Loading Buoy is listed in table 10.1

Table 10.1 Environmental Legislation

Legislation	
The Offshore Petroleum Activities (Conservation of Habitats) Regulations 2002	These regulations apply to the Habitats Directive and the Wild Birds Directive in relation to offshore oil and gas plans and projects wholly or partly on the UKCS. The regulations apply to decommissioning proposals and in the light of the information provided in the EIA, BERR in consultation with the JNCC and/or the Countryside Agencies, will decide whether the proposals are likely to have a significant effect on the habitats and species covered by the regulations, and whether there is a requirement to undertake a more detailed 'Appropriate Assessment'.
	Applicability to KLB No Natura 2000 sites have been identified from surveys in the area which could potentially be affected by KLB decommissioning operations. An extensive search of recent video footage by BMT Cordah revealed no protected species on KLB or in the vicinity of the moorings. R
The Offshore Chemical Regulations 2002	These regulations implement, on the UKCS, OSPAR Decision 2000/2 on a Harmonised Mandatory Control System for the Use and Reduction of the Discharge of Offshore Chemicals. Where it is proposed to use or discharge chemicals during the decommissioning of an offshore installation or pipeline, the Operator will need to apply to the BERR for the appropriate permit.
	Applicability to KLB No chemical discharge will occur during KLB decommissioning in UK waters

The Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005	These regulations prohibit the discharge of oil into the sea from an offshore installation or pipeline, except under authority of a permit. Operators will be required to make provision for the removal and recycling of oil recovered during the decommissioning, but it will be possible to apply for a permit for the discharge or reinjection of certain types and quantities of oil.
	Applicability to KLB All oil has already been removed from flowlines and risers attached to the KLB and the buoy has not been used for oil storage whilst at this location. The structure will be made sea tight by the contractor prior to tow away and any residual oil (hydraulic oil) will be recovered and recycled at the decommissioning yard in Norway.
The Offshore Combustion Prevention and Control of Pollution) Regulations 2003	These regulations implement the Integrated Pollution Prevention and Control (IPPC) Directive for offshore oil and gas installations. Under the regulations a permit is required from the BERR if the aggregated thermal capacity of the combustion equipment on the installation exceeds 50 MW(th).
	Not applicable to KLB
The Greenhouse Gases Emission Trading Scheme (ETS) Regulations 2003	These regulations implement the EU Emissions Trading Scheme. Under the regulations, operators are required to apply to the BERR for a permit covering the emission of greenhouse gases (currently only CO2), if the aggregated thermal capacity of the combustion equipment on the installation exceeds 20 MW(th). Such permits will have been issued prior to decommissioning, and must be surrendered when the aggregated thermal capacity falls below the threshold.
	Not applicable to KLB

The Merchant Shipping (Oil Pollution Preparedness, Response and Cooperation convention) Regulations 1998	Under these regulations operators of offshore oil and gas installations and pipelines are responsible for preparing and submitting an Oil Spill Response Contingency Plan (OSCP) to the BERR. The expectation is that the OSCP will cover all activities where there is a risk of a hydrocarbon spill, including activities relating to decommissioning. This may be achieved by incorporating decommissioning activities into the existing field OSCP or by producing a decommissioning specific OSCP
	Applicability to KLB Onsite operations are adequately covered by the existing Kittiwake Oil Spill Contingency arrangements. During the tow and in Norway accidental spills will be covered by contractor's emergency plans approved by the relevant national authority

10.2 IMPACT OF THE SELECTED OPTION

This section considers the environmental impact of the selected option. This section should be read in conjunction with Section 6. in which the selected option is described. Removal is planned for the 2008 construction season. For project key dates, reference should be made to Section 14.

The impacts of decommissioning can be considered under the following headings:

- Disturbance to the Seabed
- Hydrocarbon and Chemical Releases
- Impacts of Towing
- Emissions from Vessels
- Dismantling Activities

10.2.1 Disturbance to the Seabed

Some temporary seabed disturbance is unavoidable. However, the methods to be adopted have been developed to avoid the risers and chains being dropped onto the seabed. While this will be done to make the recovery process safer and quicker, this approach will also minimise disturbance of the seabed.

Work Class Remotely Operated Vehicles (WROV) equipped with cutting tools will perform all cutting activities. It is not Venture's intention to use explosives for cutting operations. However, should it be necessary to use explosives, the work will follow the guidance given in "JNCC Guidelines for Minimising Acoustic Disturbance to Marine Mammals from Seismic Surveys". When cutting the flexible risers and moorings, each section will be pre-rigged to the vessel's crane hook before cutting so that it can be safely lifted once it is cut free.

The mooring chains will be cut approximately 50m from the touchdown point on their seabed. As the touchdown point is approximately 100m from KLB, a circle of 300m diameter may be expected to be directly affected by this part of the removal process. In all likelihood, the area of disturbance is likely to be restricted to smaller areas around each cutting point and where the chain will be lifted to provide access for cutting. The chain is then cut at the buoy and recovered to the construction vessel. By adopting this system along with cutting the chains in a sequence selected to suit the wind and wave direction, the risk of chain dragging is minimised.

Final recovery of the remaining chain will take place after KLB is removed. Each chain will be rigged to the vessel crane and lifted clear of the seabed and cut as close to the seabed as possible. The short length of chain remaining will be left on the seabed. Observations suggest that these short lengths of chain will silt over very quickly and become buried over time. Adopting this approach avoids causing the very significant seabed disturbance associated with dredging. (Ref Section 7.5)

Once all subsea activities have been completed, a survey will be carried out to ensure that the seabed is free of debris.

10.2.2 Hydrocarbon and Chemical Releases

The KLB export pipeline, risers, piping and loading hose were thoroughly flushed and left filled with inhibited seawater to prevent internal corrosion when the KLB was taken out of service. Releases of hydrocarbons from the riser system are therefore not anticipated. It is however unavoidable that the inhibited seawater will be released to the sea. The volume of inhibited seawater that will be released has been calculated as shown in table 10-2 below

Table 10.2 Volumes of inhibited seawater

Equipment	Volume ($m^{3)}$
KLB Riser, pipework and hose	6.6
Flexible riser	2.8
PLEM	0.6
PLEM pipeline spool	1.3
Total	**11.3**

The inhibitor used is TROS 650R (combined biocide, corrosion inhibitor and oxygen scavenger) OCNS silver, at 500ppm concentration. CHARM calculation for batch discharge gives an RQ value under 1 and considering the current and small volume (11.3 m^3) being released there is not likely to be any significant impact from this discharge.

The PLEM control umbilical is filled with hydraulic fluid. This is a mineral oil. There is no practicable way of flushing this hydraulic fluid as it is a "closed" system. The contractor performing the disconnection and tow will be required to develop a methodology for removing the umbilical that avoids the loss of this fluid to the sea.

10.2.3 Impacts Arising From Towing

The length and location of the tow route will vary depending on which decommissioning contractor is selected.

On the basis of available survey data and published data, there are no Natura 2000 sites or other seabed habitats which are of special importance in the area of the KLB. The decommissioning contractor, and therefore the site of decommissioning, has not yet been finalised however the location of Natura 2000 sites will be taken into account when tow routes to the decommissioning yard are planned.

Interaction with other sea users, particularly shipping lanes and commercial fishing areas will also be taken into account when selecting the tow route.

10.2.4 Vessel Emissions

Typical emissions during marine operations have been estimated as follows. Emissions to air from vessel fuel use have been calculated as 381 tonnes $C0_2$; 0,.47 tonnes SO_x and 7.6 tonnes NO_x using the fuel use and duration of operation provided by Aker Kvaerner based on their FEED study, UKOOA factors and a diesel density of 820kg/m^3

Vessel type	Duration of use	Fuel consumption	Tonnes diesel for duration of use
Tug (small)	80	30 l/hr	47.2
Tug (large)	4	50l/hr	3.92
Lift vessel (400 tonnes)	5	100 l/hr	9.8
Lift vessel (600 tonnes)	6	500 l/hr	58.8

Table 10.3 Anticipated vessel use and fuel consumption

10.2.5 Dismantling Activities

On arrival the buoy will be temporarily moored adjacent to the deconstruction yard the buoy will be deconstructed by reverse installation of the rotating head, chimney and fender and transferred to shore. To reduce the weight to be lifted, the ballast water will be removed from the main buoy body while it is moored off the yard. According to the waste inventory (Lloyds 2006) a total of 313m3 of ballast water is located within compartments on the KLB. The ballast water will be analysed once the KLB is safely moored and, following dialogue with the Norwegian regulators, will be disposed of in accordance with current local regulation.

A minimum of cutting will be carried out to release the rotating head (topsides) as it is envisaged that this can be removed by unbolting the swivel ring. All other components are fully welded and will require gas cutting and/or grinding as appropriate.

Materials and wastes will be sorted as dismantling proceeds. The selected contractor will have an established waste management system and recycling policy in place. All waste handling, transport and final disposal (or re-use) will be carried out in accordance with Norwegian regulations.

A clear objective is to recycle as much of the buoy structure as possible. Water ballast (approximately 739 tonnes) will be discharged after treatment (if required). Barium Sulphate is often used as the weight component for drilling mud and as aggregate in high-density concrete used to screen hospital radiography facilities. It is therefore anticipated that the barium sulphate slurry (approximately 1433 tonnes) can be recovered and sold on for reuse. Concrete ballast (approximately 350 tonnes) is more difficult to reuse. Opportunities will be sought to use this material as, for example, road making material. The remaining buoy materials (approximately 1630 tonnes) consist mainly of steel and other metals but electrical wastes, composites, insulating materials and other non-metallic items are also present. A target of 95% will be set for recycling this material. The flexible risers and offloading hose are not expected to be recyclable and will go to landfill.

All available evidence suggests that there is no LSA scale present on KLB. However, in the event of any LSA scale being found this will be returned to the UK for disposal. It is stressed however that this is considered to be highly unlikely.

10.3 METHODOLOGY

In order to determine the impact that a proposed project may have on the environment it is necessary to conduct an environmental assessment. This should be a structured methodology for the identification and quantification of emissions and discharges in order to determine the significance of the impact on the environment and put in place appropriate mitigation measures to reduce the impacts where required.

Potential impacts are assessed both in terms of their likelihood, how often they occur, and their potential significance,

10.3.1 Likelihood

The likelihood of occurrence of each potential impact was given a score between 1 and 5, (see Table 10.4)

Planned Activities Duration	Accidental Events Duration	Likelihood Categories
Year to many years	Likely – more than once a year	5
Month to a year	Possible – less than once per year and more than once per 10 years	4
Week to a month	Unlikely – less than once every 10 years and more than once per 100 years	3
Day to a week	Remote – less than once every 100 years and more than once per 1,000 years	2
Less than a day	Extremely remote – less than once every 1,000 years and more than once every 10,000 years	1

Table 10.4 Likelihood of occurrence

10.3.2 Significance

The significance of each potential environmental impact was also rated on a scale of one to five, five being the most severe, as shown in Table 10.5 Where significance appears to fall within 2 categories, the higher category was selected in each case.

Significance		Definition
5	**Severe**	Change in ecosystem leading to long term (>10 years) damage and poor potential for recovery to a normal state. Likely effect on human health. Long term loss or change to users or public finance.
4	**Major**	Change in ecosystem or activity over a wide area leading to medium term (>2 years) damage but with a likelihood of recovery within 10 years. Possible effect on human health Financial loss to users or public.
3	**Moderate**	Change in ecosystem or activity in a localised area for a short time (<2 years), with good recovery potential. Similar scale of effect to existing variability but may have cumulative implications. Potential effect on health unlikely, may cause nuisance to some users.
2	**Minor**	Change which is within scope of existing variability but can be monitored and/or noticed. May affect behaviour but not a nuisance to users or public.
1	**Negligible**	Changes which are unlikely to be noticed or measurable against background activities. Negligible effects in terms of health or standard of living.
0	**None**	No interaction and hence no change expected.
	Beneficial	Likely to cause some enhancement to ecosystem or activity within existing structure. May help local population.

Table 10.5 Definition of significance of environmental impact

10.3.3 Combining Likelihood and Significance to Establish Risk

The overall environmental risk was assessed shown in Table 10.5 below

		Significance				
		5	4	3	2	1
Likelihood of	5	High	High	Moderate	Moderate	Low
	4	High	High	Moderate	Moderate	Low
	3	High	High	Moderate	Low	Low
	2	High	High	Moderate	Low	Low
	1	High	Moderate	Low	Low	Low

Table 10.6 Environmental risk classification matrix

This process was undertaken for all potential impacts For those impacts identified as a moderate risk, additional mitigation measures were considered to demonstrate that the risk was as low as reasonably practicable. No high-risk impacts were identified.

10.4 ASSESSMENT

10.4.1 Baseline Environment

This section contains a condensed baseline environmental description of the offshore environment. Aspects of the environment which are likely to be affected by the KLB decommissioning are described in more detail. Impacts on commercial shipping routes have been summarised in this section but are also addressed in the Venture safety risk assessment for KLB decommissioning.

Information on the baseline environment is derived from the Fugro 2005 survey commissioned by Venture Production Company (North Sea Developments) Ltd. The programme consisted of pipeline route surveys in the central North Sea, blocks 16/12, 21/12, 21/17, 21/18 and 22/2, February-April 2005 and environmental surveys for Goosander-Kittiwake-Whinchat-Wagtail Development in blocks 21/12, 21/17 & 21/18.

The environmental surveys were carried out to provide baseline data and investigate selected anomalous seabed features identified from the geophysical data, in particular to confirm the presence or absence of active pockmarks. The surveys also included grab sampling for physico-chemical and biological analysis and seabed photograph and video investigations carried out using ROV-mounted cameras. In total, 9 grab stations and 8 camera stations were investigated.

Offshore

Metocean data

Windspeed and direction

There is frequent passage of mobile depressions through this area of the CNS. The wind characteristics at the KLB site are variable. The KLB removal operation is planned for the 2008 construction season, therefore the spring, summer and autumn wind roses are shown in figure 10.1 below.

The predominant wind directions are NW, S and SSW.

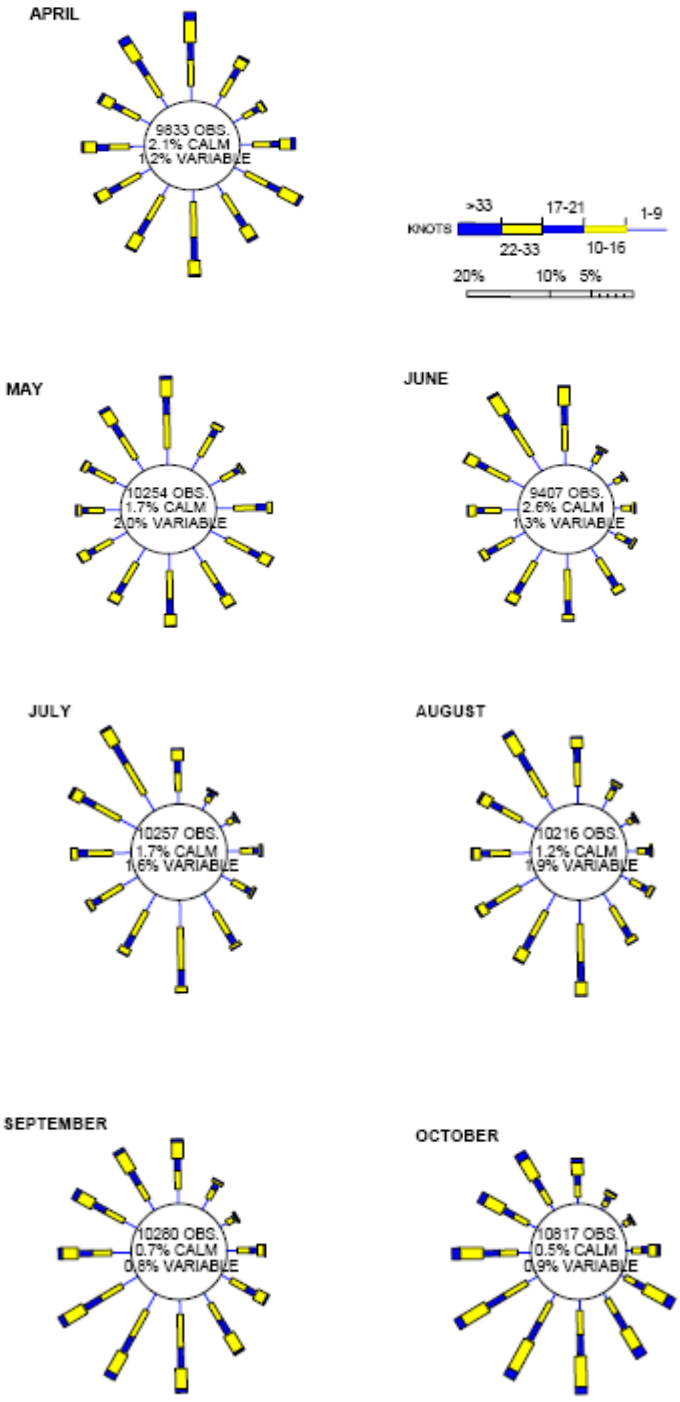


Figure 10.1 wind roses for the KLB area

(Source: meteorological office)

Tides and currents

The circulation of water in the North Sea is mainly driven by tides. Tidal stream data from a Kittiwake area survey (Metocean 1989a, Shell 1990) shows the tidal current directions are north to north eastwards on the flood, and south to south westwards on the ebb. Maximum spring and neap tidal currents are 0.7 knots (0.35m/s) and 0.4 knots(0.2m/s) respectively. Under normal conditions current flow is relatively uniform in the surface and mid water layers. Storm conditions can produce a higher current flow in the surface layer. The tidal range in the Central North Sea is generally about 0.8m. Low-pressure storm surges can increase the range. Tidal measurements from the Kittiwake field are given in table 10.7

Instrument Depth	Max. spring tide current m/s	Mean spring tide current m/s	Max. residual current
69m	0.64	0.51	0.23
47m	0.63	0.51	0.32
5m	0.43	0.36	0.32

Table 10.7 Summary of current data for the Kittiwake area

Waves

Data recorded over the period 1974 to 1987 for conditions in the BP Forties field are considered representative of the Kittiwake area. and have been used in planning KLB removal operations. A 100-year maximum wave height of 26.4m, a non-directional 100-year significant wave height of 12.8m and a maximum wave height of 23.8m. OSPAR reports (2000) give a 50-year extreme wave height for this area of the North Sea as 20-30m with a period of 17 seconds.

Seabed sediments

On the basis of sidescan sonar images from the 2005 Fugro survey, the bottom sediments consist predominantly of moderately sorted fine sand with local mega ripples. These are oriented east – west perpendicular to the current direction. Any features not easily identified were further inspected by ROV video. No pockmarks were identified. Some areas of scattered boulders with encrusting organisms were found.

Sediment sampling by Fugro showed typical Central North Sea Total; Organic Content (TOC) values for the sediments 0.7-1.1%. Heavy metal contents were generally uniform over the area values were as shown in table 10.8 These are not likely to be impacted by KLB removal apart from some long term local increases in

iron concentration from decay of remains of the anchor chains chains left on the seabed.

Element	Concentration in sediment
barium	147-209 µg/g
arsenic	3-7 µg/g
chromium	15-29 µg/g
copper	3-8 µg/g
lead	10-14 µg/g
nickel	3-10 µg/g
vanadium	16-26 µg/g
zinc	9-30 µg/g

Table 10.8 Heavy metal content of sediments in KLB area

Biological baseline

Plankton

Phytoplankton populations peak twice during the year, once in April and again in September with the greatest concentrations within the 30-50m layers. The zooplankton populations correspond with this and display a maximum abundance two months after the peak in phytoplankton biomass. These peaks in phytoplankton and zooplankton productivity can influence fish and shellfish numbers and their feeding grounds. Where fish shoals / stocks will often move with currents (that can also be affected by temperature and salinity), to stay in close proximity with the increased food supply. In July, the abundance and biomass of plankton within the Central North Sea is between 0.3-10g dry weight/m^3.

Benthos

Benthic organisms are organisms living in, or on, bottom substrates in aquatic ecosystems. They may be impacted by any activities which disturb or contaminate seabed sediments. Sessile benthic organisms are prone to smothering. The presence of benthic organisms varies as a consequence of changes in water depth, sediment organic content, sediment particle size, and the degree of particle sorting and sediment mobility, as affected by the strength of the tidal currents.

In the area of the KLB survey findings (Fugro 2005) identified 105 infaunal taxa of which 48% were annelids, 21% crustacea, 15% molluscs, 10% echinoderms and 6% other groups. The most abundant taxa were the echinoderms (33% of total abundance). *Echinocyamus pusillus* was the most abundant species and is characteristic of gravel and sand substrates. The survey report concluded that the dominant fauna within the samples are characteristic of fine sandy sediments. There were no clear environmental gradients, suggesting that the Kittiwake area is a relatively homogenous environment .

Fish

The central North Sea holds important pelagic and demersal fish stocks. Pelagic species are dominated by herring (*Clupea harengus*) although mackerel (*Scomber scombrus*) and sandeel (*Ammodytes tobianus*) are also common. Demersal stocks are characterized by cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinns*), whiting (*Merlangius merlangus*), plaice (*Pleuronectes platessa*), lemon sole (*Microstomus canicula*), saithe (*Pollachius virens*), dogfish (*Scyliorhinus canicula*), dab (*Limanda limanda*) and anglerfish (*Lophius piscatorius*).

Fish species are particularly vulnerable to water quality and contaminants during spawning and eggs can absorb toxins across their surface membrane and are susceptible to damage through shock. The KLB area lies within the Norway pout spawning area however spawning occurs in January to May. Offshore activities will not start before mid April at the earliest and therefore should have minimum impact. It also lies within the Norway lobster (*Nephrops norvegicus*) spawning and nursery area. This species usually spawns throughout the year but is confined to softer muddy substrates therefore may not be particularly abundant in the immediate area of the KLB as the bottom sediments here are predominantly sand.

Marine mammals

Marine mammals include cetaceans (whales, dolphins and porpoises), pinnipeds (seals) and mustelids (otters), all of which are susceptible to chemical and noise pollution, e.g. seismic surveys, DP barges. Seals also tend to frequent inshore waters but have been seen from a number of platforms in the North Sea (Cosgrove 1996). Information on the numbers and distribution of cetaceans is often limited and general, due to difficulties in observation and species identification.

Cetaceans

The Central North Sea does not support a large diversity of marine mammal species nor a particularly high abundance. Cetaceans are protected in UK waters under Schedule 5 of the Wildlife and Countryside Act 1981, the Conservation (Natural Habitats and Conservation) Regulations 1994 and the Petroleum Activities (Conservation of Habitats) Regulations 2001.

Low densities of cetaceans have been recorded in the KLB area (Reid *et al*, 2003; Stone 1998, and UKDMAP, 1998). Sightings suggest that the Atlantic White Sided Dolphin is the most frequently sighted in the area with peak numbers occurring in July. The White Beaked Dolphin, Harbour Porpoise and Minke Whale are also recorded in the area, albeit in low numbers, between July and August, September and November. Table 10.9 indicates species and reported occurrences.

Species	J	F	M	A	M	J	J	A	S	O	N	D
Atlantic White Sided Dolphin												
White beaked dolphin												
Harbour porpoise												
Minke whale												
Killer whale												
Risso's dolphin												

Rare/none	
Occasional	
Common	
Peak sightings	

Table 10.9 Cetacean sightings

The most common cetaceans recorded in proximity to the KLB area are White-beaked Dolphin (*Lagenorhyncus albirostris*), Harbour Porpoise (*Phocoena phocoena*), Atlantic White-sided Dolphin (*Lagenorhynchus autos*) and Minke Whale

(*Balaenoptera acutoristrata*). Also recorded, although in lower abundances, were the Killer Whale (Orcinus orca), Pilot Whale (*Globicephala melaena*), Bottlenosed Dolphin (*Tursiops truncatus*), Common Dolphin (*Delphinus delphis*), Whitesided dolphin (*Lagenorhynchus actus*) and Risso's Dolphin (*Grampus griseus*). Temporal distributions of these species show increased numbers in late spring and early summer (June-July), with populations at the highest between July and October (JNCC 2000). The closest known resident population of cetaceans is a population of Bottlenose Dolphin (Tursiops truncatus) in the Moray Firth.

Pinnipeds

The common seal (*Phoca vitulina*) and grey seal (*Haliocherus grypus*) both frequent theNorth Sea, Both species congregate on the British coast, including northeastScotland, to breed over the summer months but disperse over a widespread feeding area during the winter and this may include the area around KLB

Tagging studies of grey seals (McConnell et al. 1999) indicate that they spend the majority of their time in close proximity to haul out sites, with the majority of trips less than 3 days, although they occasionally make much longer trips of up to 100km. Common seals were shown to predominantly spend much more of their time at or near haul out sites, with short trips to localized areas, with the duration of most trips being less than 12 hours.

Given the distance of the KLB from the coast (approximately 130km from nearest coastline), it is unlikely that common seals will be observed in the area. However, it is possible that low numbers of grey seals will be occasionally present, though this will only be for a short period of time before they return to their haul out site. Seals are inquisitive animals and, if in the vicinity, are likely to come and investigate the DP vessel and ROV activities.

Habitats Directive

The Habitats Directive (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, requires all Member States of the European Union to protect certain species and specified habitat types. These habitats and species are to be protected by the creation of a series of 'Special Areas of Conservation' (SACs), and by various other safeguard measures for particular species. The Birds Directive (Council Directive 79/409/EEC) on the Conservation of Wild Birds requires member states to nominate sites as Special Protection Areas (SPAs). Together with adopted SACs, the SPA network will form the 'Natura 2000' network of sites protected by the Habitats Directive.

The Directive focuses on the expression 'integrity of the site', and prohibits the destruction of a site or part of it because of the conservation status of the habitat types and species it hosts. Site integrity has been defined as the 'coherence of the site's ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or populations of species for which the

site is or will be classified'. In the case of the KLB it is potential impacts of removal activities on Natura 2000 sites that are considered.

There are four habitats listed in Annex I to the Habitats Directive that occur or potentially occur in the UK offshore area

- Sandbanks which are slightly covered by sea water at all times
- Reefs
- Submarine structures made by leaking gases*
- Submerged or partially submerged sea caves

* it is generally considered that areas of gas seepage and associated pockmark features in the North Sea may fall in line with the Annex I definition of 'submarine structures made by leaking gases'. Pockmarks are shallow seabed depressions, typically several tens of metres across and a few metres deep (Judd, 2001). They are generally confined to north of 56° in the North Sea with the highest densities being found west of the Norwegian trench within the North Sea Plateau and the Witch Ground Basin of the central North Sea, a potential area for an SAC

The only likely Annex 1 habitat in the Kittiwake Loading Buoy area would be pock marks. The KLB is anchored to the seabed in Block 21/18 which lies outside the pock mark location area identified in SEA 2 and no pock marks were identified in the 2005 Fugro survey.

Protected species

Cold-water coral *Lophelia pertusa* occurs on sandy bottoms forming large deepwater reef structures. It has also been found as an encrusting organism on some oil and gas production facilities. It is a protected species under the Habitats Regulations and, because KLB is to be dismantled in Norway, the Convention on International Trade in Endangered Species (CITES) may apply if Lophelia P is present. For this reason, BMT Cordah undertook a search of all recent survey videos covering the buoy hull, fender, mooring chains and riser system to establish whether or not Lophelia P was present. No evidence of this coral was found.

Sabellaria Spinulosa (Ross Worm) lives in tubular structures built from sand and fine gravel. When these worms occur in large numbers, the tubes can clump together and form reefs associated with rich fauna. These reefs are protected by the Habitats Regulations. Sabellaria is commonly associated with the Southern North Sea basin and has never been encountered in the Kittiwake area. The search of recent inspection footage of the moorings revealed no evidence of Sabellaria P.

Fishing Industry

The KLB lies in ICES rectangle 43F0. There is fishing activity in this area throughout the year. There will be some limited loss of access during the dismantling and tow away operations but overall access will be increased when the KLB is removed.

Commercial shipping

Venture commissioned the Anatec study (2005) on shipping routes and vessel traffic within 10 nautical miles of Goosander area this also covers the KLB location. At this stage the tow route from the area is not finalised so commercial routes that may be affected have been noted. This will be addressed in more detail in the safety risk assessment when the tow route details are finalised with the decommissioning contractor. The shipping routes below were identified using Anatec's Ship Routes database and exclude the movements of 'non-route-based' traffic such as fishing vessels, naval vessels, tugs, dredgers, yachts and offshore service vessels to mobile drilling installations.

The pipeline routes in the Greater Kittiwake Area are shown in figure 10.2 route 5 (Boknafjörden to Tay – 8 ships per year) passes closest to the KLB location.

The location and timing of all KLB decommissioning operations will be notified to the marine authorities.

Figure 10.2 Shipping Routes in the Greater Kittiwake area

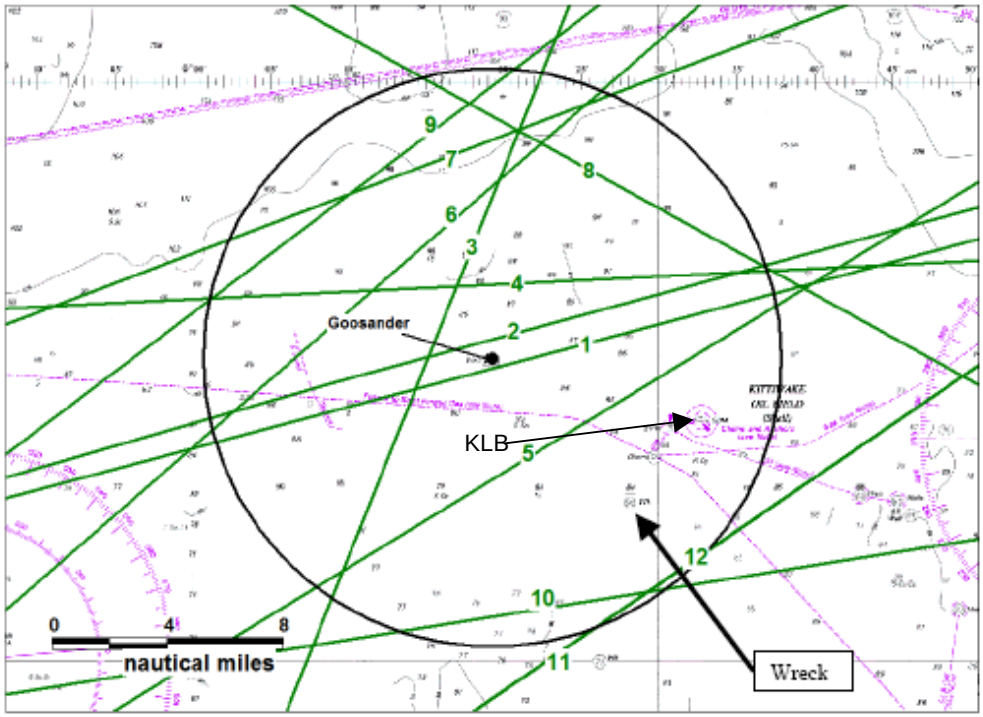


Table 10.10 Summary of Environmental Sensitivities for KLB area

J	F	M	A	M	J	J	A	S	O	N	D

Benthos and plankton

No significant benthic sensitivities identified in the KLB area. Benthic populations are typical of CNS.

No significant sensitivity among the planktonic populations (although vulnerable to hydrocarbon and chemical spills). The main bloom periods are spring and autumn. KLB offshore activities will take place between mid April Earliest start) and mid September (latest finish). He impact should therefore be minimal.

Fish

Fish are vulnerable to pollution, particularly during egg, larval and juvenile stages of their lifecycle. Demersal spawning fish and fish/shellfish that live in close association with seabed sediments are vulnerable to sediment disturbance. The species of fish found in proximity to the KLB are found throughout the North Sea. The KLB lies within the the Norway Pout concentrated spawning area. The spawning time is March to May. Offshore activities will not start before mid April at the very earliest and therefore should have minimal effect.

The number of demersal fish species spawning in the area of KLB in any one month has been used to determine sensitivity. The proposed development is in proximity to spawning areas for four demersal species, from which eggs could be susceptible to smothering

Marine mammals

Several species are recorded in the central North Sea. Populations are at the highest between June and October. Sensitivity is considered to be low even during the months with highest populations in the area as the species are highly mobile.

Seabirds

Due to the interaction of seabirds with the marine environment sensitivity is considered relatively high. Specific sensitivities

- April and May (Kittiwake, maximum density)
- July to November (Fulmars, maximum density).
- July to September (Auks, (razorbills and guillemots) move offshore after breeding and become vulnerable to oil pollution and disturbance displacement.

Commercial fishery

The value of commercial fisheries and fishing effort in the area of proposed development peaks during the summer. The sensitivity has been determined from the number of days fished and the size of the landings. It is considered to be high Apr- Aug, moderate Mar and Sept and low or negligible for the remainder of the year. The removal of the KLB will lead to a temporary but only very local disruption of fishing activity and not have any overall impact on commercial fisheries.

Low	
Minor	
Medium	
High	

10.4.2 Impact Assessment

Impacts from activities associated with the decommissioning of the Kittiwake Loading Buoy have been assessed using methodology described in section 10.3. The impacts are identified in table 10.11. Those identified as potentially significant are discussed in more detail under mitigation in section 10.5 otherwise mitigation and prevention measures in place are listed in table 10. 11.

Table 10. 11			
Activity / Source of Potential Impact	**Potential Environmental Effects**	**Prevention, Control & Mitigation Measures**	**Significance Rating (refer Table 10.4 for key)**
1. Removal operations on location			
1.1 Use of tow vessels and **ROV** support vessel	a. Emission to air :GHG emission and acid rain contribution from vessels NOx , SOx from fuel combustion	• Efficient well serviced vessels • short duration temporary impact • smaller vessels will be using low sulphur diesel	Negligible (1)
	b. Noise disturbance to marine mammals	• Short duration of operation • Similar levels of noise to commercial shipping and oil industry supply vessels. • Likely that marine mammals will be habituated to the passage of commercial vessels	Negligible (1)
	c.Discharges to sea	• Short duration of operation • grey water only	Negligible (1)
1.2 Fuel leakage from tow vessels	a. Oil /diesel spill	• There will be continual monitoring of fuel and visual inspection of the sea surface • Any spills are likely to be minor and both in the UK and	Negligible (1)

Table 10. 11			
Activity / Source of Potential Impact	**Potential Environmental Effects**	**Prevention, Control & Mitigation Measures**	**Significance Rating (refer Table 10.4 for key)**
		Norwegian sectors will be covered by the decommissioning contractor's Emergency Preparedness Procedure P-003	
1.3 Cutting and removal of riser sections	Discharges to sea	• The risers have been flushed and are filled with inhibited seawater(No release of hydrocarbons anticipated) • Small volume of inhibited seaweater will be released during removal	Negligible (1)
1.4 Cutting and lifing anchor chains	Area of seabed disturbance, smothering of benthos, local water quality impacts	• Area of seabed which may potentially be impacted is a circle 300m in diameter (ref section 10. 1) approx. 71,000 m^2 • The disturbance will not be over the whole area at once as the chains will be cut and lifted sequentially. • Disturbed bottom sediments will settle rapidly and/or be	Moderate (3)

Table 10. 11			
Activity / Source of Potential Impact	**Potential Environmental Effects**	**Prevention, Control & Mitigation Measures**	**Significance Rating (refer Table 10.4 for key)**
		dispersed by current action	
	Impacts on Natura 200 sites	• None have been identified in the KLB area	None (0)
1.5 Presence of ROV vessel and tugs	Access to fishing issues	• Short tem loss of access •	Negligible (1)
1.6 Residual chain on seabed	Potential snagging hazard leading to possible fishing compensation clams	• Chain likely to self bury rapidly in soft sediments	Minor (2)
1.7 Removal and disposal of waste materials	Onshore disposal of waste oils etc for incineration producing GHG emissions to air Hazardous wastes (refer to Waste Inventory) requiring landfill in England due to lack of facilities in Scotland	• No waste disposal to the UK • All spaces and containers will be sealed	Negligible (1)
2. Towing			
2.1 Fuel combustion on Towing vessels	Emissions of GHG and gases contributing to acid rain	• Use of well maintained, efficient marine engines. • The tugs all use low sulphur diesel Temporary impact	Negligible (1)

Table 10. 11			
Activity / Source of Potential Impact	**Potential Environmental Effects**	**Prevention, Control & Mitigation Measures**	**Significance Rating (refer Table 10.4 for key)**
2.2 Vessel operation	Discharges	• No use of chemicals is anticipated • Grey water only	Negligible (1)
	Noise disturbance to marine mammals	• Similar levels of noise to commercial shipping and oil industry supply vessels. • Likely that marine mammals will be habituated to the passage of commercial vessels	None (0)
2.3 Towing operation in UK and Norwegian waters	Obstruction to shipping	• The tow will cross commercial shipping routes (As many as possible will be avoided) • The towing operation will be logged and reported by the UK and Norwegian shipping authorities and other users made aware of the operation. • The towing operation is estimated to take 5 days i.e.	Negligible(1)

Table 10. 11			
Activity / Source of Potential Impact	**Potential Environmental Effects**	**Prevention, Control & Mitigation Measures**	**Significance Rating (refer Table 10.4 for key)**
		temporary impact on other shipping only.	
2.4 Fuel leakage from tow vessels	Oil /diesel spill	• There will be continual monitoring of fuel and visual inspection of the sea surface • Any spills are likely to be minor and both in the UK and Norwegian sectors will be covered by the contractor's Emergency Preparedness Procedure	Negligible (1)
2.5 Removal of marine growth	Smothering and increased BOD, organic loading in bottom sediment if discharged to sea.	• Marine growth will be removed onshore in Norway (see dismantling) small amounts may detach during buoy detachment and when under tow but this will not pose any risk to the marine environment)	Negligible(1)
3. Dismantling KLB			
3.1 Vessel, vehicle, generator exhausts	GHG and gases contributing to acid	• Optimise work locations logistic to minimise onsite	Negligible (1)

Table 10. 11			
Activity / Source of Potential Impact	**Potential Environmental Effects**	**Prevention, Control & Mitigation Measures**	**Significance Rating (refer Table 10.4 for key)**
Cutting and transport oprtaion onshore	rain emissions to air	transport • Use of energy conservation measures: no running on idle, minimise machinery use required.	
3.2 Onshore removal of marine growth	Smothering and increased BOD, organic loading in bottom sediment if discharged to sea.	• Marine growth will be removed onshore in Norway. • Small amounts may detach during buoy detachment and when under tow but this will not pose any risk to the marine environment) • Removed growth will be composted at suitable facility	None (0)
3.3 Cleaning and dismantlling of HC carrying components	VOC release	• No HC have been stored in the buoy column. • Little residue expected in the attached riser section and hoses in the swivel head	Negligible (1)
3.4 Dismantling of substructure pipework	Oil spill	• Approximately 40litres of hydraulic oil is contained in the PLEM operating system. This will be drained off and	Moderate (3)

Table 10. 11			
Activity / Source of Potential Impact	**Potential Environmental Effects**	**Prevention, Control & Mitigation Measures**	**Significance Rating (refer Table 10.4 for key)**
		recovered during dismantling. • This will be dismantled onshore in special breakdown area (see below)	
3.5 Use of cutting torches. Welding equipment	Welding gases combustion products, metal fumes,	• Reduction of manual cutting as far as practicable by use of hydraulic rams cutters.	Negligible (1)
3.6 Breakdown area drainage discharge	Oily water, chemical run off to sea	• All dismantling will place on a specially designed breakdown area with a closed drainage system. • any oily discharges are passed through an O/W separator prior to discharge	Negligible (1)
3.7 Discharge of ballast water from KLB	Ballast water may be contaminated with chemicals (corrosion inhibitor, biocide, O2 scavenger plus possible hydraulic oil, HCs (lubricants) metals, other . Being released into restricted	• Analysis of ballast water will be carried out prior to discharge . and discussed with SFT to confirm compliance with the site's discharge licence • Not anticipated that there will be a significant amount of HC	Minor (2)

Table 10. 11			
Activity / Source of Potential Impact	**Potential Environmental Effects**	**Prevention, Control & Mitigation Measures**	**Significance Rating (refer Table 10.4 for key)**
	circulation inshore waters In total there are 313 m^3 of ballast water	as the water has been for ballast only and the buoy has not been used for oil storage	
3.8 Disposal of barites ballast from KLB	Total of 477 m3 of barites/seawater slurry used as ballast to be removed and reused.	As it has not been in contact with HCs the slurry can be recovered and reused. It will not be discharged to the environment	None/benefit (0)
4. Waste disposal			
4.1 Marine growth	Smell, organic loading if discharged to sea	Not discharged to sea from the dismantling site but sent for treatment for composting , landfill	None (0)
4.2 Scrap steel		Recycled for iron / steel aim to recycle near to 100% of the KLB steel components	None/benefit (0)
4.3 Hazardous waste	Discharges to the environment from electrical components, hydraulic oils, insulation materials	• Contractor will have a full auditable waste management plan in place. Disposal routes for different waste streams are licenced by the Norwegian authorities. • Not anticipated to be large	Negligible (1)

Table 10. 11			
Activity / Source of Potential Impact	**Potential Environmental Effects**	**Prevention, Control & Mitigation Measures**	**Significance Rating (refer Table 10.4 for key)**
		amounts of hazardous waste on the KLB. (As far as practicable, loose drums etc will be removed by Venture prior to shipping. Any loose items to be shipped with KLB will be securely seafastened by the contractor.)	
4.4 Radioactive waste		No LSA scale has been identified and no radioactive sources are reported in the KLB waste inventory	None (0)

Table 10. 12 Summary environmental risk assessment

Activity	Impact	Significance	Frequency	Overall risk
Removal operations on location				
1.1 Use of tow vessels and ROV support vessel	Emission to air	1	3	Low
	Noise	1	3	Low
	Discharges to sea	1	3	Low
1.2 Fuel leakage from vessels	Oil/diesel spill	1	3	Low
1.3 Cutting and removal of riser sections	Discharges to sea	1	2	Low
1.4 Cutting and lifting anchor chains	Seabed disturbance	3	2	Moderate
1.5 Physical presence of vessels	Access	1	1	Low
1.6 Residual chain on seabed	Snagging hazard	2	5	Moderate
1.7 Removal of waste materials	Onshore disposal	1	1	Low
Towing				
2.1 Fuel combustion	Emissions to air	1	3	Low
2.2 Vessel operation	Discharges	1	3	Low
	Noise	1	3	Low
2.3 Towing in UK and Norwegian waters physical presence	Obstruction to shipping	1	3	Low
2.4 Fuel leakage	Oil/diesel spill	1	3	Low

2.5 Detachment of marine growth	Smothering, raised BOD	1	1	Low
Dismantling KLB				
3.1 Fuel combustion emissions	Emissions to air	1	3	Low
3.2 Removal of marine growth	Smothering , increased BOD	0	3	Low
3.3 Dismantling, cleaning HC carrying components	VOC release	1	2	Low
3.4 Dismantling substructure pipework	Chemical spill	1	2	Low
3.5 Use of cutting welding equipment	Emissions to air	1	1	Low
3.6 Breakdown area drainage discharge	Oily water/chemical run off to sea	1	3	Low
3.7 Discharge of KLB ballast water	Contaminated water discharge to sea	2	2	Low
3.8 Disposal of barites ballast	Smothering and contamination of bottom sediments	0	1	Low
4. Waste disposal				
4.1 Marine growth	Smell, organic loading if discharged to sea	0	1	Low
4.2 Scrap metal	Loss of primary source	0	1	Low

4.3 Hazardous waste	Discharges to the environment from electrical components, hydraulic oils, insulation materials	1	1	Low
Radioactive waste	Discharge to sea	0	1	Low

10.5 PREVENTION, CONTROL AND MITIGATION MEASURES

Prevention and mitigation of the impacts are discussed here for all impacts which were categorised as moderate:

10.5.1 Seabed disturbance from lifting and cutting the anchor chains.

This was assessed as moderate overall as it will take a week to carry out the operation and the impacts are assessed as moderate i.e. “change in the ecosystem in a localised area for a short time (<2 years) with good recovery potential”.

No long term negative impacts are anticipated and there are no Natura sites in the vicinity. Care is being taken to minimise seabed disturbance in the removal method but some impact will be unavoidable. Not excavating will reduce seabed disturbance and avoid smothering impacts from blowing loose sediment over a wider area.

Overall this is not assessed as a significant long term impact

10.5.2 Leaving residual chain length on the seabed

This was assessed as moderate overall due to the permanence of the chains as a potential snagging hazard although this is strictly a safety issue and not an environmental hazard.

Consideration was given to removing the anchor chains to depth of 1m. However, experience has shown that the bottom sediments in this area are very difficult to dredge. The soils around KLB consist of soft clays overlain with a mixture of fine sand and broken shell. The surface layer varies in thickness up to a maximum of 1.5m. A feature of the sandy layer is a hard surface crust which, if left undisturbed, is stable. However, if this crust is broken, stability is lost and the excavation would continually back fill preventing the WROV gaining proper access to cut the chain at its base. Dredging will give rise to large quantities of fine materials being dispersed in clouds. This will not only hamper the WROV but will also constitute a significant

threat of suffocation to marine flora and fauna in the vicinity. Given the technical difficulties and the likely limited visibility, it is questionable whether the objectives of the operation could be achieved or verified.

Given the nature of the sediment it is predicted that the remaining links of chain will self bury in a short period of time and present no further problem. Evidence for this comes from the mooring surveys that have been carried over the life of KLB. Although the mooring chains and ropes will have experienced “threshing” (vertical and horizontal displacement) during winter storms, the survey videos show that by late spring/early summer the moorings have already started to settle into the surface sediment.

On this basis, leaving up to three links on the surface of the seabed is considered to be the better option in terms of environmental impact.

11. INTERESTED PARTY CONSULTATION

11.1 THE CONSULTATION PROCESS

This section will provide a record of the consultation process, the correspondence exchanged with statutory bodies and interested parties, and the extent to which the views expressed in this correspondence was taken into account. This data will be collated during the consultation period and will be included in the Final Draft when it is submitted for approval. This section therefore will remain "live" throughout the process

The consultation processes will begin when the 1st Draft of this Decommissioning Programme is submitted to BERR and to the statutory consultees for their consideration. At the same time a notice will be placed in those national and local newspapers advised by BERR, the Decommissioning Programme will be placed on Venture's website and copies will be made available at Venture's offices for collection by members of the public.

Correspondence arising from the consultation process will be included in the Appendix 18.2 Record of Consultation

11.2 STATUTORY CONSULTEES

The statutory consultees are:

- National Federation of Fishermen's Organisations (NFFO)
- Scottish Fishermen's Federation (SFF)
- Northern Ireland Fishermen's Federation (NIFF)
- Global Marine Systems Ltd (GMS)

11.3 RECENT CONSULTATIONS

11.3.1 Scottish Fisherman's Federation

The SFF were approached regarding the proposal to leave a short length of mooring chain in place. In their response, SFF indicated that they did not envisage any issues arising from leaving three links on the seabed.

11.3.2 Scottish Environmental Protection Agency

Meeting with SEPA 13th September 2006. The purpose of this meeting was to discuss:

- The waste classification of KLB and her components

- The version of the legislation under which the classification of KLB would come.

SEPA advised that KLB should be treated as a vessel and categorised as "Unassigned". This is because, like other vessels, KLB is mainly "Green Waste" but with small quantities of materials that cannot definitely be categorised until deconstruction begins. A waste materials inventory has been prepared making best endeavours to categorise all materials on KLB and this will form part of the Trans-frontier Waste Shipment application.

11.3.3 Fisheries Research Service

Meeting with FRS 19th September 2006. The purpose of the meeting with the Fisheries Research Service (FRS) was to make initial contact and present the outline proposal for removing KLB.

The conclusions of this meeting were:

- Given the nature of KLB, the activities associated with it, and the distance between it and the Kittiwake installation, FRS did not consider that a pre-removal seabed survey would be necessary.

- FRS suggested that a post-removal survey would be useful to confirm that operations had been concluded satisfactorily. This could be done on an "opportunistic" basis rather than mobilise vessels specifically for this purpose.

- FRS did not see an issue in leaving a short length of mooring chain in place.

11.4 STAKEHOLDERS AND OTHER INTERESTED PARTIES

There is nothing to report at this time, as the formal public consultation has not yet started.

12. COSTS

A project budget has been developed using a FEED study as a basis. However, formal contractual negotiations have not yet been completed. Project cost estimates and budgets are therefore sensitive at this time and VENTURE therefore wishes to keep this information confidential meantime.

This information will be supplied to BERR under separate cover meantime.

13. SCHEDULE

13.1 PROJECT KEY DATES

Figure 13.1 gives a summary schedule for the project. The final detailed schedule will depend on the availability of suitable vessels and the co-ordination of the work with other construction activities on and around Kittiwake. The detailed schedule will be developed during the early part of the contract.

The key dates for the project are:

Discussions with BERR Started	15th Mar 2006
Decommissioning Programme Index Submitted	15th May 2006
Preliminary Engineering Started	1st Aug 2006
Partner Approval/Project SANCTION	Sept 2007
Decommissioning Programme 1st Draft Submitted	28th Nov 2007
Consultation Process Started	28th Nov 2007
Consultation Process Finished	29th Feb 2008
Decommissioning Programme Final Draft Submitted	31st Mar 2008
Decommissioning Programme Approved	25th Apr 2008
Main Contract Awarded	Dec 2007
Marine Operations – Earliest Start	May 2008
KLB Removal Scope Finished	31st July 2008
Marine Operations – Latest Finish	15thAug 2008
Project - Latest Finish	28th June 2009

13.2 OFFSHORE MARINE ACTIVITIES

The offshore marine activities will take place during the 2008 construction season which is effectivelyMay to mid August. The exact timing of operations during this period will depend on vessel availability, co-ordination of ROV and diver activities, and possible synergies with other projects. The PLEM removal scope will may on from the removal of the KLB with the minimum practicable delay. The target window for completing the PLEM removal scope is one month following the completion of

the KLB removal scope. The target for completing the KLB removal scope is therefore 31st July 2008. In the event that the removal of KLB and the removal of the PLEM are awarded as a single contract, the PLEM may be removed before KLB.

13.3 DISPOSAL YARD ACTIVITIES

The heading "Disposal Yard Activities" covers transferring to shore, deconstruction, sorting, sale or re-use, dispatch of materials for recycling and waste for disposal, processing hazardous waste (should any be found) and final documentation.

Disposal yard activities not only rely on the delivery of KLB to the disposal site, but also the availability of heavy lift barges to perform the transfer to shore. The detailed schedule must therefore be developed with the contractor early in the contract in the light of the offshore schedule and lift barge availability. Based on KLB arriving in early August, a latest completion of 28th June 2009 has been adopted as a notional target.

13.4 POST REMOVAL ACTIVITIES

All post removal activities (survey, debris removal and seabed sampling) will be completed by the Project End Date given in 13.1.

14. PROJECT MANAGEMENT AND VERIFICATION

14.1 PROJECT ORGANISATION

Figure 14.1 illustrates the project organisation.

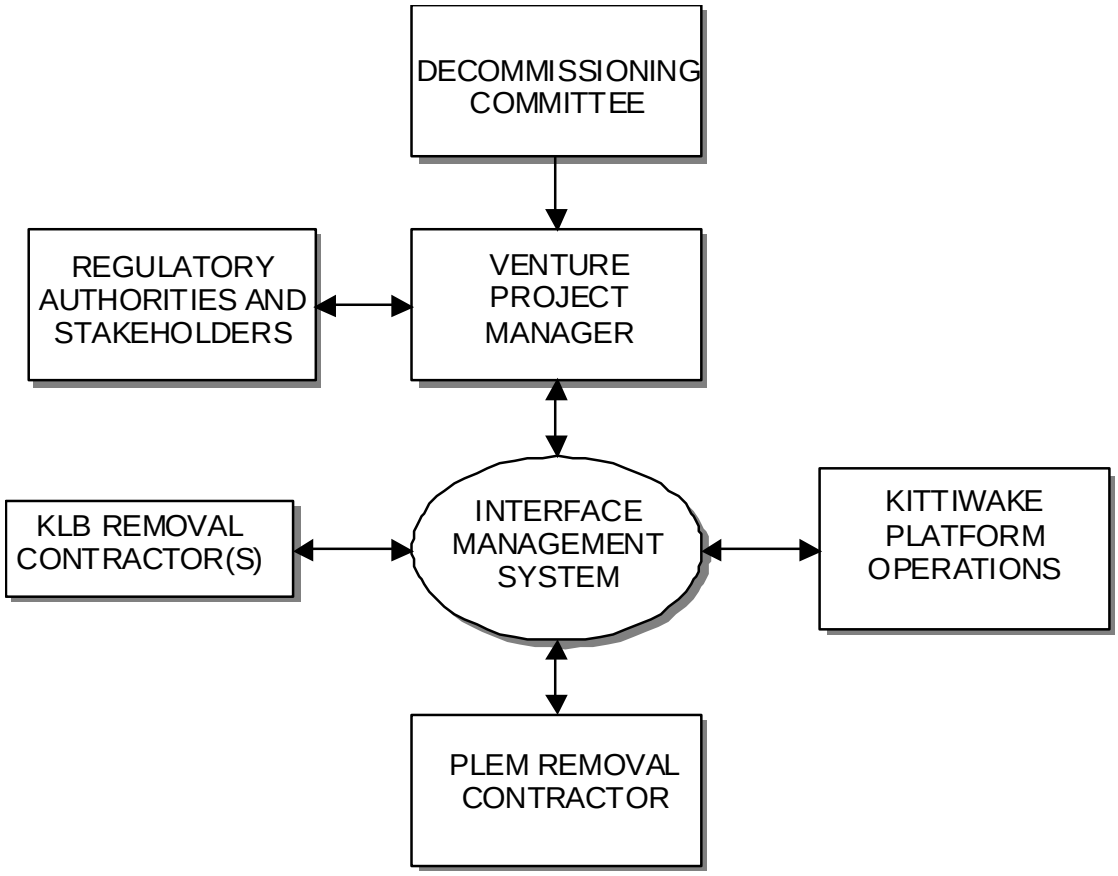


Figure 14.1 Project Organisation

14.1.1 Decommissioning Committee

The decommissioning committee is formed from representatives of the participating parties (Venture, Dana & Shell). The committee is responsible for:

- approving the project budget
- initiating discussions with BERR
- ensuring that a draft Decommissioning Programme is submitted to the BERR
- ensuring that the Decommissioning Programme is reviewed and revised if appropriate
- ensuring that any other actions required to obtain approval of the Decommissioning Programme are undertaken
- overseeing the management, implementation and operation of the approved Decommissioning Programme by the Venture Project Management Team
- reporting back to the participating parties on cost and progress.

14.1.2 Venture Project Management Team

The Venture Project Manager is responsible for:

- preparing and submitting a draft Decommissioning Programme to BERR
- liaising with BERR and other authorities
- initiating and co-ordinating the public consultation process
- Maintaining the Consents and Notifications Register and ensuring that it is acted upon
- reviewing and revising the Decommissioning Programme if necessary
- overseeing the decommissioning contract(s)
- ensuring that an effective Interface Management is in place and is efficiently and effectively operated by all parties affected by the project
- ensuring that the project objectives are met
- reporting back to the Decommissioning Committee on cost and progress
- ensuring that the audit and verification schedule is met

- ensuring that the project is closed out in accordance with Venture procedures and that all necessary documentation is complete and in place.

14.1.3 Kittiwake Platform Operations

Petrofac is the duty holder for the Kittiwake platform and are responsible for operations in the Greater Kittiwake Area and as such have a key role during the removal process. As there will be a number of projects ongoing during the time that the KLB marine operations are underway, Petrofac will be responsible for co-ordinating the activities of these contractors. Petrofac maintain an integrated plan of Kittiwake offshore activities and the KLB marine activities will be included on this.

14.1.4 Other Kittiwake Contractors

Other contractors will be present on the Kittiwake platform at the time of the KLB marine operations. Although they are unlikely to be affected by the KLB work, it is nevertheless essential that effective communications are established. As these contractors are under the direct control of the Kittiwake operations personnel, communications to these contractors shall be routed through, and co-ordinated by, the platform,

14.1.5 Interface Management

Effective interface management is essential to ensuring that this project, and the other projects going on in parallel, is performed efficiently, effectively and, above all, safely. An Interface Document will be developed to ensure effective communication and management of interfaces between all parties and will include the following principles.

During the engineering and preparation phase, interfaces will be between Venture and the contractor(s). The contractor(s) will also be managing their internal interfaces. During this phase it will be most effective if the contractor(s) manage these interfaces using there own systems.

Once the marine scope is underway it may be more appropriate to manage interfaces through the Interface Management System already in place at Venture.

Once KLB has been removed from site and no longer has the potential to affect Kittiwake operations, The main contractor will be responsible for interface management.

14.2 PROJECT PLANNING

Venture is responsible for determining and communicating the key dates and objectives for the project. These dates and objectives form the basis of detailed plans required to control the project.

The main contractor will be responsible for establishing and maintaining a detailed plan for all activities associated with the scope of work of the main contract and liaising with the diving contractor to ensure proper integration of all key activities.

The PLEM Removal contractor will be responsible for establishing and maintaining a schedule for the removal of the PLEM and liaising with the main contractor to ensure proper co-ordination with the KLB removal scope.

Petrofac will include the KLB offshore activities in their integrated plan for Greater Kittiwake Area.

14.3 AUDIT / VERIFICATION SCHEDULE

Venture will use their existing processes and procedures on this project. These systems are subject to a rolling programme of audits. System audits applied to other projects are equally applicable to KLB and actions arising from these audits shall be applied to KLB.

A capability audit of the main contractor is planned for February 2008.

A verification audit of the Disposal Yard is planned for January 2008.

The offshore and inshore marine activities will be subject to review and approval by a Marine Warranty Surveyor.

14.4 DECOMMISSIONING CLOSE OUT REPORT

A close out report will be assembled and issued to BERR within four months of the completion of the project. This will include:

- An "as implemented" record of the project describing how the key milestones were achieved, any issues that arose and how such issues were resolved.
- A description and explanation of any variances to the programme and any additional permits required as a result,
- The results of debris clearance and any monitoring that was undertaken (ref Section 15.),
- Actual versus forecast costs together with an explanation of the variances.

This report will be placed on the Venture website.

15. DEBRIS CLEARANCE

The procedures developed for the disconnection and removal of KLB are designed to avoid debris being dropped onto the seabed. All pieces being removed will be rigged to the crane hook before cutting begins. In the unlikely event that material is dropped onto the seabed, it will be found and retrieved.

There is a possibility that materials have been dropped in the past but not reported. If this should prove to be the case, such debris will be retrieved and disposed of in a safe and environmentally responsible manner.

Once the PLEM and its tie-in spool have been removed, the area will be visually inspected to ensure that all redundant mattresses, grout bags and any other materials associated with the PLEM have been removed.

Following completion of the removal works, an area with a minimum radius of 500m from the centre of KLB will be surveyed by side scan sonar to detect and recover any dropped debris. A third party will verify this process. A representative of the verifier will be present on board during the debris survey and will witness the removal process.

A report, detailing the results of the clearance process and including independent third party verification of the process, will be prepared and submitted to BERR. The third party will confirm that debris clearance has been satisfactorily completed by signing off this report. This report will be included with the Close Out Report.

For economic reasons, Venture wish to keep open an option to include this work as part of a future survey campaign rather than to mobile a vessel specifically to carry out this work. This work will nevertheless be completed within the overall timescale given in 13.1 “Project Key Dates”.

16. MONITORING AND MAINTENANCE

16.1 SEABED MONITORING

The nature of KLB is such that there has been minimal impact on the seabed resulting from her installation and operation. There is no cuttings pile or any other potentially detrimental deposits associated with KLB. The removal operation is simple and does not involve any processes likely to pollute the seabed. There is therefore no reason to believe that the seabed within the perimeter of the KLB moorings has in any way suffered detrimental change as a consequence of the presence of KLB.

As no pre-installation samples exist for the seabed in the vicinity of KLB, Venture proposes to take samples after KLB has been removed and to have these samples tested for the presence of pollutants. The results of these tests will be used to determine any ongoing monitoring requirements (including no monitoring if, as is anticipated, the samples support the assumption that no detrimental change has occurred).

This work will be done on an “opportunistic” basis to take advantage of any opportunity to achieve synergy with other projects. However, the sampling will be completed within the overall timescale of the project as given in 13.1.

16.2 KLB PIPELINE

The KLB pipeline (PL672) is part of the Interim Pipeline Regime. This is being reviewed as part of the consideration of the KLB decommissioning programme and it is Venture’s recommendation that this pipeline remains part of the IPR with a view to possible future re-use.

17. SUPPORTING STUDIES

Ref	Originator	Description
[A]	CSL	FEED Study
[B]	Aker Kvaerner Offshore Partner Ltd	Conceptual Method Statement (Proposal)
[C]	Aker Kvaerner Offshore Partner Ltd	FEED Study & Preliminary Engineering
[D]	Lloyds EMEA	Inventory of Waste Materials (Desk Study)
[E]	Genesis Oil & Gas	Environmental Impact Assessment
[F]	BMT Cordah	Review of ROV Footage from KLB
[G]	Subsea 7	KLB Pile and Mooring Survey, June 2007

18. APPENDIX

18.1 REFERENCE DRAWINGS

Ref	Drg No	Title
[1]	KW-R-01101	ELSBM General Arrangement
[2]	KW-R-01103	ELSBM Buoy Refurbishment Layout
[3]	KW-R-01104	ELSBM Mooring Line & Loading Hose Configuration
[4]	KW-R-01105	ELSBM Compartment Layout
[5]	KW-R-03505	ELSBM Flowline Ball Valve Control System Layout
[6]	KW-U-10212	KLB Composite Mooring Line Assembly
[7]	KW-R-05303	ELSBM Buoy Body Piping – Swivel Room
[8]	KW-R-05304	ELSBM Buoy Body Piping – Riser Arrangement
[9]	KW-R-05309	ELSBM Flowline Iso of Crude Oil Piperun & MTO
[10]	KW-R-05401	ELSBM Underwater Hoses Configuration GA
[11]	KW-R-07101	ELSBM PLEM General Arrangement

ITEM N°	QTY	EXTRA	DESCRIPTION	MATERIAL	UNITARY WEIGHT KG.	TOTAL WEIGHT KG.	REMARKS

SEE DWG.ASS'Y: | TOTAL WEIGHT:

REV.	DATE	BY	CHKD (CONSULTANT)	APPVD (CONSULTANT)	CHKD (SHELL)	APPVD (SHELL)	DESCRIPTION	CONSULTANT REVISION	MICROFILMED
B	10/6/88	DG	DG				ISSUED VFC (with new equipment layout)	B	
A	20/4/88	DG	DG				ISSUED C/A	A	

REVISIONS

DRAWING NO:	SUBJECT

REFERENCE DRAWINGS

BAR SCALES

ATTENTION

DO REF. NO:	
DRAWN	GASZTOWTT
DATE	20/04/88
SCALE	1/125
CHECKED	DG
APPROVED	
CONSULTANT	SHELL

KITTIWAKE PROJECT

ELSBM

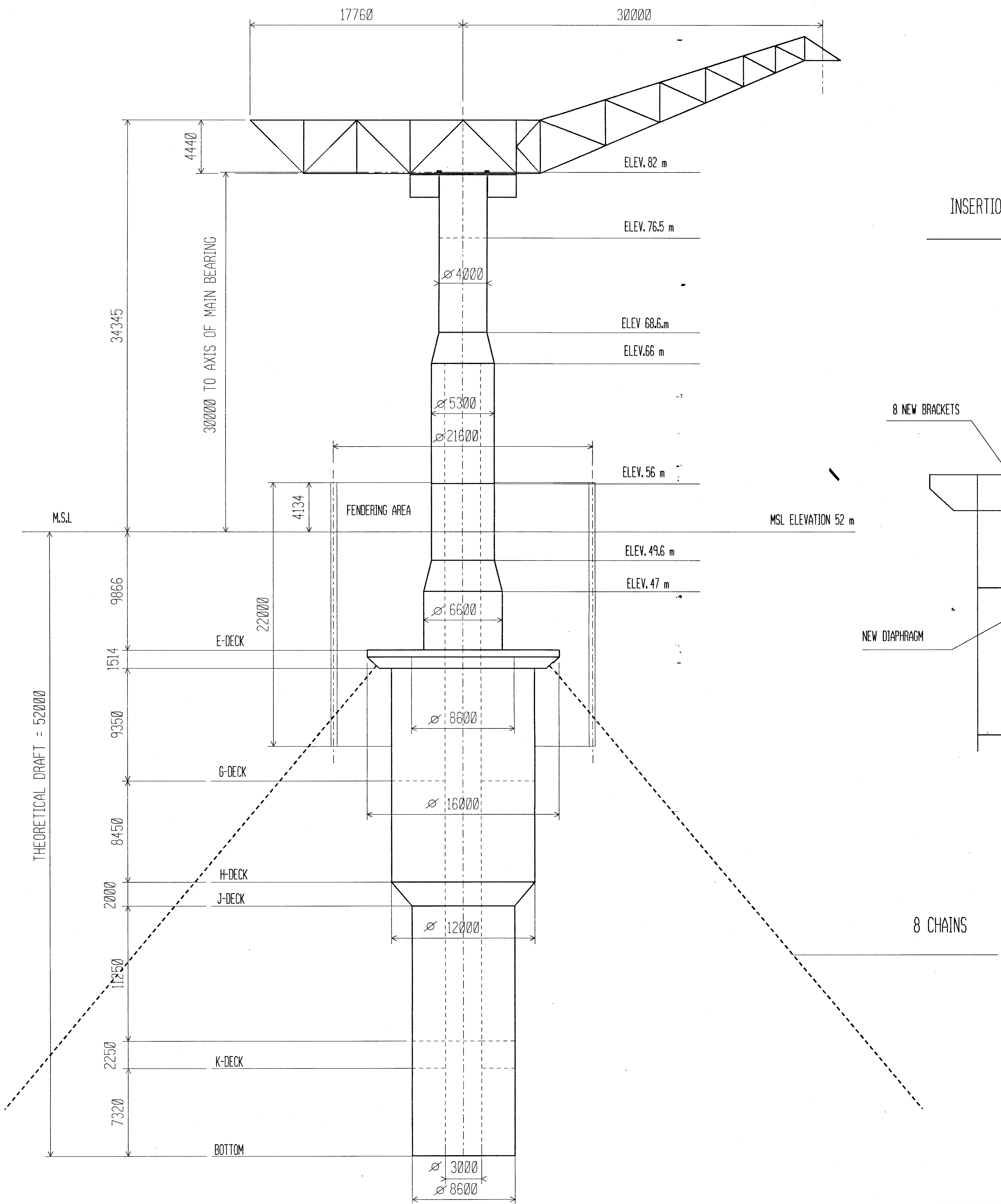
GENERAL ARRANGEMENT

SINGLE BUOY MOORINGS INC
FRIBOURG - SWITZERLAND
ENGINEERING OFFICES MONACO (PTE) PO BOX 199

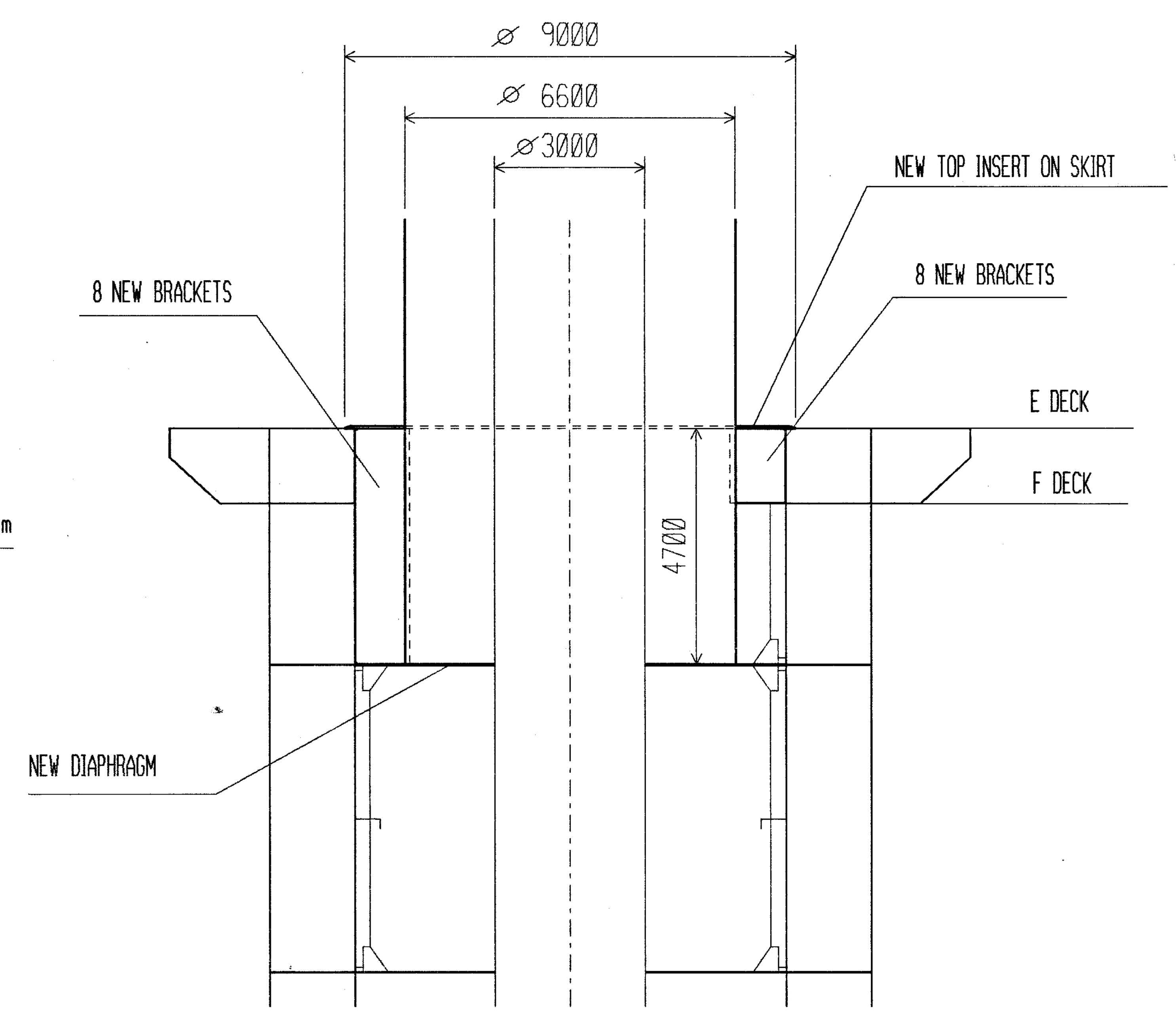
DRAWING NO: 4182.0.5.331.1.021261 REV: B

SHELL UK EXPLORATION & PRODUCTION

DRAWING NO: KW/R 01101 SHEET NO: OF REV: B



INSERTION OF NEW STRUCTURE INSIDE EXISTING SUBSTRUCTURE



ITEM N°	QTY	EXTRA	DESCRIPTION	MATERIAL	UNITARY WEIGHT KG.	TOTAL WEIGHT KG.	REMARKS

SEE DWG.ASS'Y: | TOTAL WEIGHT:

REV.	DATE	BY	CHKD (CONSULTANT)	APPVD (CONSULTANT)	CHKD (SHELL)	APPVD (SHELL)	DESCRIPTION	CONSULTANT REVISION	MICROFILMED
B	21/04/88	DG	ML	[signature]		[signature]	VFC ISSUE (see Note)		
A	12/02/88	DG	ML	CV			FIRST ISSUE		

REVISIONS

DRAWING NO:	SUBJECT

REFERENCE DRAWINGS

BAR SCALES

ATTENTION
SUPERSEDED BY DETAILED DRAWING:
4182.0.5.331.1.021261

DO REF. NO:	
DRAWN	GASZTOWTT
DATE	12/02/88
SCALE	1/200
CHECKED	M LEMOEL
APPROVED	C VOGT
CONSULTANT	SHELL

KITTIWAKE PROJECT

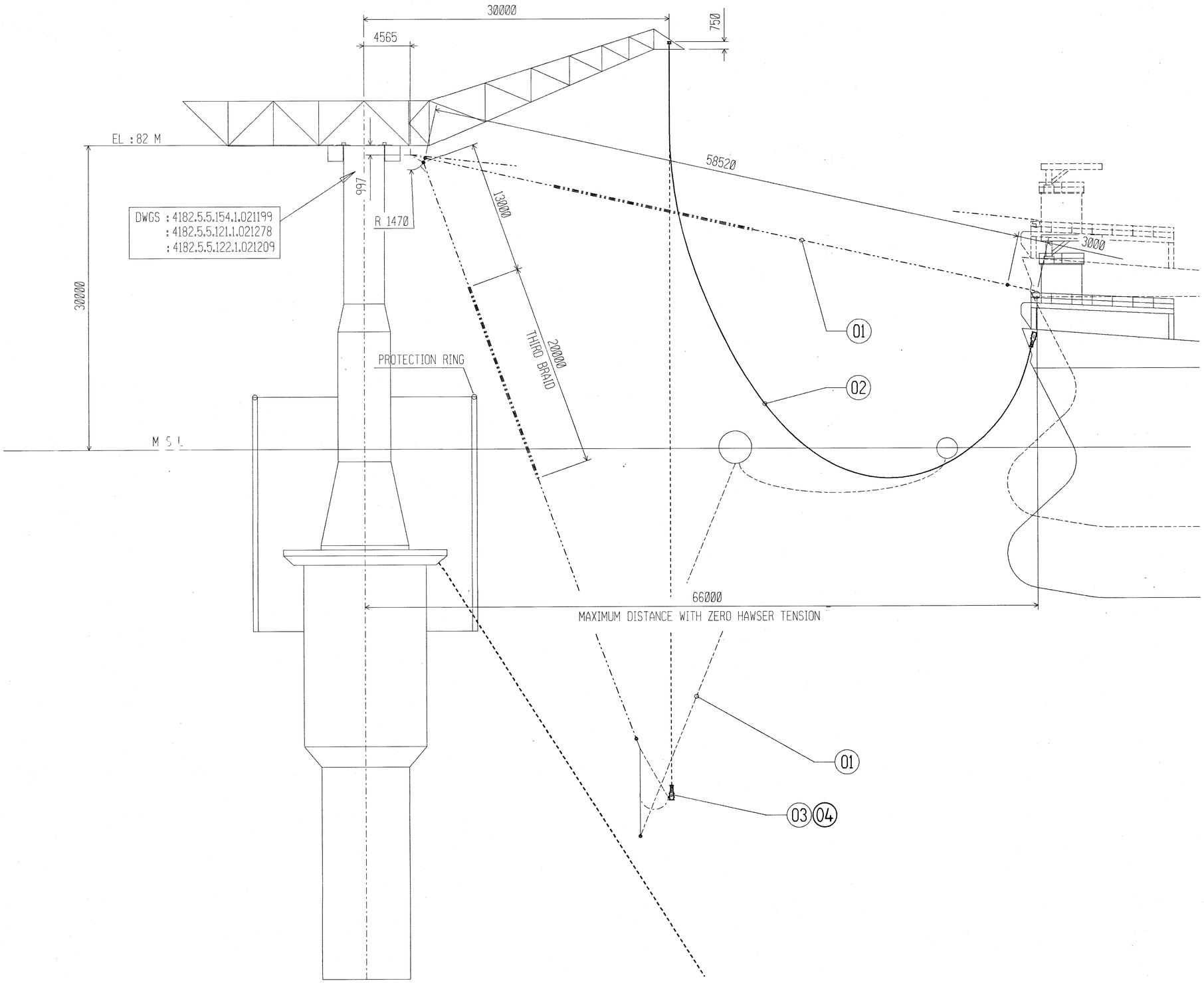
ELSBM
BUOY REFURBISHMENT
LAYOUT

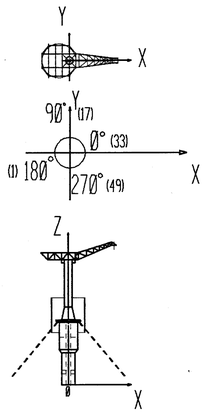
SBM OFFSHORE SYSTEMS — SINGLE BUOY MOORINGS INC
FRIBOURG - SWITZERLAND
ENGINEERING OFFICES MONACO (PTE) PO BOX 199

DRAWING NO: 4182.4.5.071.1.021892 — REV: B

SHELL UK EXPLORATION & PRODUCTION

DRAWING NO:	SHEET NO:	REV:
KW/R-01103	1 OF 1	A





HAWSER

SUSPENDED WEIGHT IN STORED POSITION : 3.6 T

AT SUSPENSION POINT X : 4565

Y : 0

Z : 81003

ITEM N°	QTY	EXTRA	DESCRIPTION	MATERIAL	UNITARY WEIGHT KG.	TOTAL WEIGHT KG.	REMARKS
04			FABRICATED 'Y' PIECE		/	176	SEE DWG: KW-R-05504
03			TANKER COUPLER PIECE		/	1306	SEE DWG : KW-R-05502
02			LOADING HOSE ASSEMBLY		/	/	SEE DWG : KW-R-05508
01			MOORING LINE ARRANGEMENT		/	3600	SEE DWG : 4182 6.0.123.1.021238

SEE DWG.ASS'Y:

TOTAL WEIGHT:

REV.	DATE	BY	CHKD CONSULTANT	APPVD CONSULTANT	CHKD SHELL	APPVD SHELL	DESCRIPTION	CONSULTANT REVISION	MICROFILMED
01	23-9-92	DS	AB				AS-BUILT AS PER C.P. KW-011		
B	21.04.88	P.P					UPDATED DRAWING . V.F.C ISSUE		
A	17.03.88	P.P	C.V				FIRST ISSUE		

REVISIONS

DRAWING NO:	SUBJECT
KW-R-05504	FABRICATED 'Y' PIECE
KW-R-05502	LOADING HOSE TANKER COUPLER PIECE O.D
KW-R-05508	LOADING HOSE ASSEMBLY
4182.6.5.123.1.021235	TANKER MOORING SYSTEM MOORING LINE ARRANGEMENT
CKW/0011/MC/SPE/0001	LOADING HOSE SPECIFICATION
4182.6.0.124.5.021237	TANKER MOORING SYSTEM MOORING LINE SPECIFICATION

REFERENCE DRAWINGS

BAR SCALES

ATTENTION

DO REF. NO:	
DRAWN	PELTIER
DATE	10.03.88
SCALE	1/200
CHECKED	
APPROVED	
	CONSULTANT / SHELL

KITTIWAKE PROJECT

ELSBM

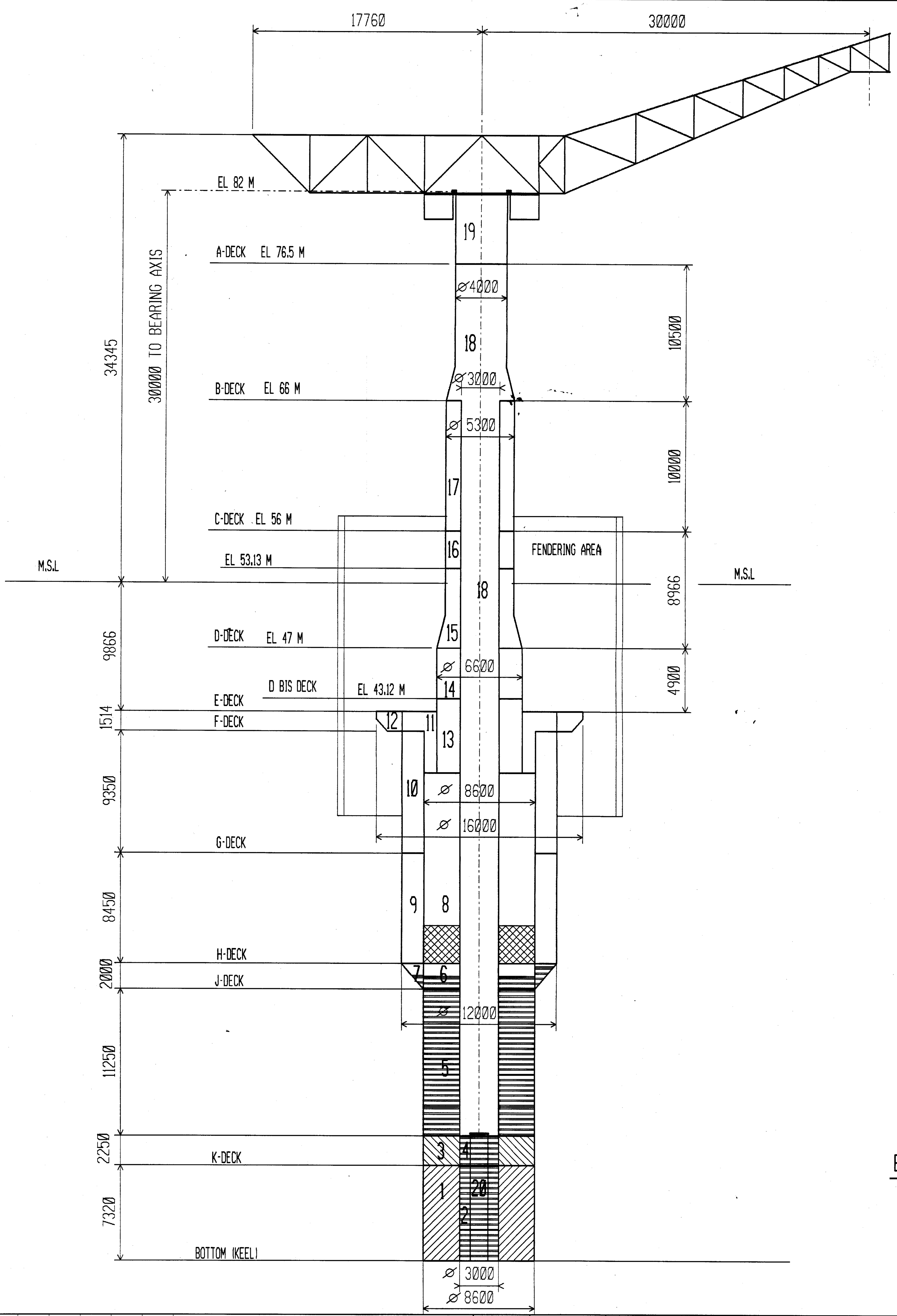
MOORING LINE & LOADING HOSE CONFIGURATION

SINGLE BUOY MOORINGS INC
FRIBOURG - SWITZERLAND
ENGINEERING OFFICES MONACO (PTE) PO BOX 199

DRAWING NO: 4182.6.5.123.1.021238 REV: B

SHELL UK EXPLORATION & PRODUCTION

DRAWING NO: KW/R-01104 SHEET NO: OF REV: 01



TANK	NETT CAPACITY	FUNCTION
1	366 M3	FIXED BALLAST
2	41 M3	WATER BALLAST
3	111 M3	FIXED BALLAST
4	13 M3	WATER BALLAST
5	561 M3	WATER BALLAST
6	100 M3	ADJUSTMENT BALLAST TANK
7	4 x 12 M3	TRIM TANK
8	731 M3	FIXED BALLAST + BUOYANCY
9	8 x 57 M3	BUOYANCY TANK
10	8 x 63 M3	BUOYANCY TANK
11	2 x 96 M3	BUOYANCY TANK
12	8 x 10 M3	BUOYANCY TANK
13	152 M3	BUOYANCY TANK
14	103 M3	BUOYANCY TANK
15	105 M3	BUOYANCY TANK
16	42 M3	BUOYANCY TANK
17	147 M3	BUOYANCY TANK
18	532 M3	SERVICE ROOM/CENT SHAFT
19	OPEN	VALVE + SWIVEL ROOM
20	12 M3	RESIDUAL CENTRAL SHAFT

BALLAST LEGEND

- EXISTING HEAVY BALLAST
- NEW HEAVY BALLAST
- WATER BALLAST

ITEM Nº	QTY	EXTRA	DESCRIPTION	MATERIAL	UNITARY WEIGHT KG.	TOTAL	REMARKS

SEE DWG.ASS'Y: TOTAL WEIGHT:

REV.	DATE	BY	CHKD CONSULTANT	APPVD CONSULTANT	CHKD SHELL	APPVD SHELL	DESCRIPTION	CONSULTANT REVISION	MICROFILMED
B	14/6/88	DG	DG	[signature]			ISSUED VFC	B	
A	9/05/88	DG	DG	[signature]			ISSUED C/A	A	

REVISIONS

DRAWING Nº	SUBJECT

REFERENCE DRAWINGS

BAR SCALES

ATTENTION

1- THE NETT CAPACITIES OF ALL COMPARTMENTS HAVE BEEN CALCULATED WITH A PERMEABILITY OF 0.98, AS REQUIRED BY BOTH DNV AND BV

2- THE EXACT AMOUNT OF WATER BALLAST IN COMPARTMENT 6 & 7 WILL BE ADJUSTED, DEPENDING OF THE FINAL AS BUILT WEIGHTS

DO REF.NO:	
DRAWN	GASZTOWTT
DATE	5/05/88
SCALE	1/200
CHECKED	MG
APPROVED	[signature] (CONSULTANT) / SHELL

KITTIWAKE PROJECT

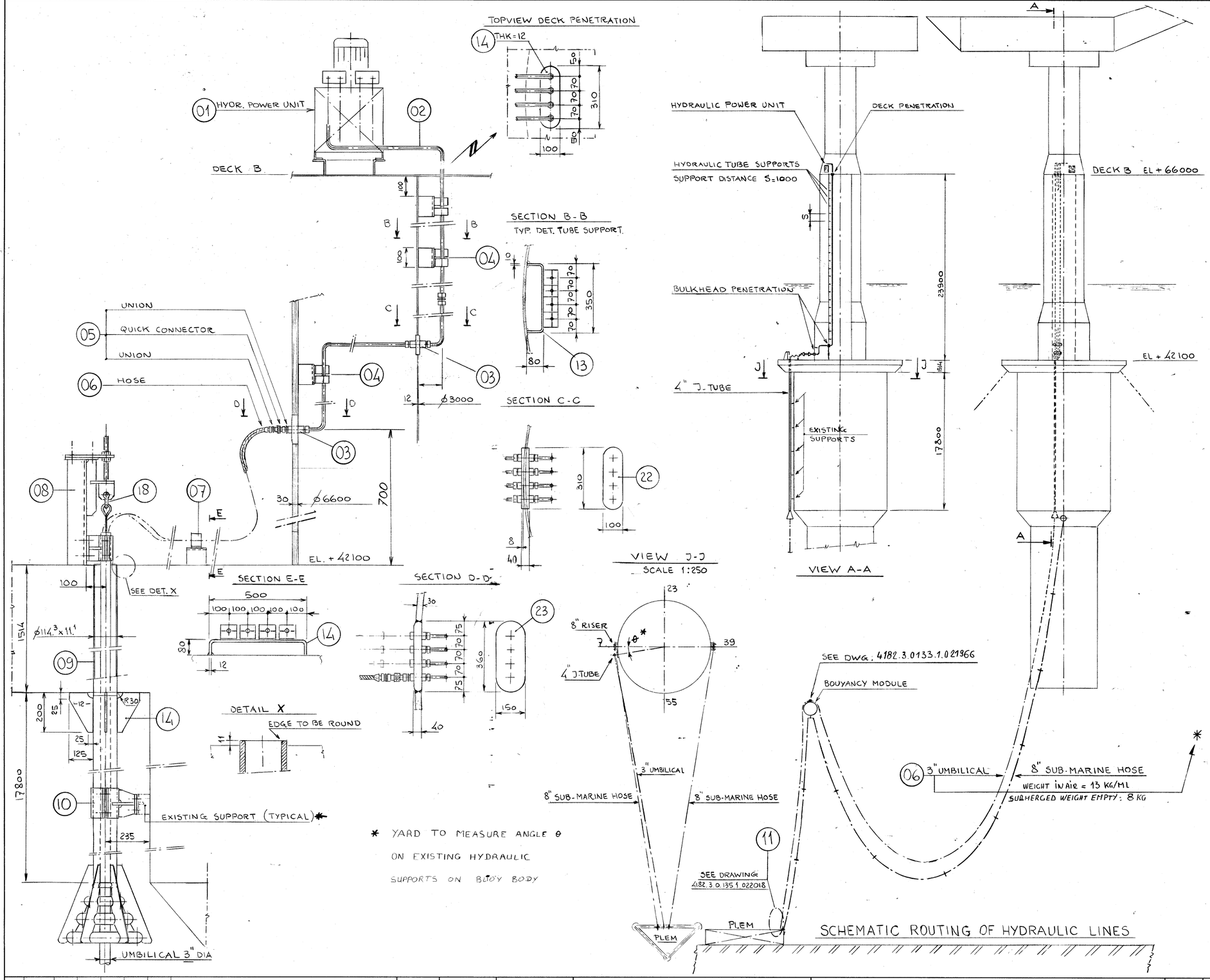
ELSBM
COMPARTMENT LAYOUT

SINGLE BUOY MOORINGS INC
FRIBOURG - SWITZERLAND
ENGINEERING OFFICES MONACO (PTE) PO BOX 199

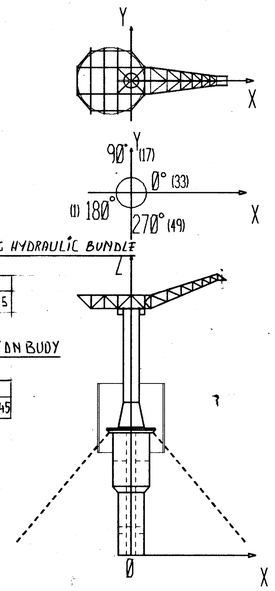
DRAWING NO: 4182.4.5.331.1.022374 REV: B

SHELL UK EXPLORATION & PRODUCTION

DRAWING NO: KW/R-01105 SHEET NO: OF REV: B



* YARD TO MEASURE ANGLE θ ON EXISTING HYDRAULIC SUPPORTS ON BUOY BODY



C.O.G EXCLUDING HYDRAULIC BUNDLE

W	X	Y	Z
1755	-4.1	1.7	52.5

HYD. BUNDLE FORCE ON BUOY

F	X	Y	Z
576	-5.7	2.5	42.45

GENERAL FOR GENERAL WELDING AND PAINTING PROCEDURES REFER TO THE PROJECT SPECIFICATIONS
- UNITS OF MEASUREMENT UNLESS OTHERWISE INDICATED : METRE (m), MILLIMETRE (mm), KILOGRAMME (Kg), TONNE (t = 10^3 Kg)
- DETAIL DRAWINGS : FOR QUANTITY AND LOCATION SEE DRAWING ASSEMBLY.

MACHINING ALL DIMENSIONS WITHOUT TOLERANCE INDICATION ARE IN ACC. WITH ISO 2768 (ROUGH FINISHED CLASS)
- ALL SURFACE ROUGHNESSES ARE GIVEN IN Ra (μm = 10^{-6}m) IN ACCORDANCE WITH ISO 1302
- THE TOLERANCES OF FORM AND OF POSITION ARE IN ACCORDANCE WITH ISO 1101/1660/1661

PIPING ALL PIPING COMPONENTS ARE IN ACC. WITH THE REGULATIONS MENTIONNED IN THE PROJECT SPEC.
- ALL PIPING WELDS ARE IN ACCORDANCE WITH THE RELEVANT SPECIFICATION

CHAMFER ONLY IF (T - t) > 3 mm

STEEL WORK WELDING ALL WELDS SYMBOLS ARE IN ACC. WITH AWS A 2-4 LAST REVISION
- ALL WELDS MUST BE CONTINUOUS AND IN ACCORDANCE WITH AWS D 1-1 LAST REVISION
- DOUBLE FILLET WELD : UNLESS OTHERWISE SHOWN THE MINIMUM WELD SIZE USED FOR PLATE THICK. < 26mm MUST BE :

t	a
t ≤ 8	5
8 < t ≤ 10	6
10 < t ≤ 12	7
12 < t ≤ 14	8
14 < t ≤ 15	9
15 < t ≤ 17	10
17 < t ≤ 19	11
19 < t ≤ 20	12
20 < t ≤ 22	13
22 < t ≤ 24	14
24 < t ≤ 26	15

t = smallest plate thickness

FOR CONTINUATION SEE DWG : 4182.3.0.135.1.022018

ITEM N°	QTY	EXTRA	DESCRIPTION	MATERIAL	UNITARY WEIGHT KG.	TOTAL WEIGHT KG.	REMARKS
11	1		LOWER UMBILICAL SUPPORT W/CLAMP	SEE DETAIL	-	30.0	DRW N° 4182.3.0135.1.022018
10	5		J-TUBE SUPPORT	SEE DETAIL	10.8	54.0	
09	1		J-TUBE 4" DIA W/TRUMPET	SEE DETAIL	-	605	
08	1		UPPER UMBILICAL SUPPORT W/CLAMP	SEE DETAIL	-	46.0	
07	4		HOSE CLAMP - 16 mm	P.V.C	-	T.B.A	STAUF TYPE OR EQUAL
06	1		UMBILICAL 3" DIA. TOTAL LENGTH (4 x 3/8" HOSES) 129.5 M	MAN ER SPEC	13.0	1683	SEE SPEC. N° 4182.30.1355.022194
05	8		QUICK CONNECTOR W/UNIONS 3/8" NPT.F. 208 bar	AISI 316 or 317	-	7.0	
04	92		TUBE CLAMP - 3/8"	P.V.C	0.033	3.0	STAUF TYPE OR EQUAL
03	12		DECK AND BULKHEAD PENETRATIONS	STEEL	195/100	2.5	
02	108m		HYDR. TUBES DIA. 3/8" W/COUPLINGS	AISI 316 or 317	-	45	
01	1		HYDRAULIC POWER UNIT	MAN ER SPEC	-	T.B.A	SEE SPEC. N° 4182.50.2035.213483

830-000065-03-1T
830000065031

SEE DWG.ASS'Y:

TOTAL WEIGHT: 3471 KG

REV.	DATE	BY	CHKD CONSULTANT	APPVD CONSULTANT	CHKD SHELL	APPVD SHELL	DESCRIPTION	CONSULTANT REVISION	MICROFILMED
B	BD	RW	CV				UPDATED. VFC issue		
A	24.3.88	H.v.W					INITIAL ISSUE		

REVISIONS

DRAWING NO:	SUBJECT
4182.3.0.135.1.022018	ELSBM FLOWLINE. BALL VALVE CONTROL SYSTEM. SUPPORT DETAILS
4182.3.0.135.5.022194	ELSBM FLOWLINE. HYD. UMBILICAL SPECIFICATION
4182.3.0.135.1.021384	ELSBM FLOWLINE. BALL VALVE CONTROL SYSTEM SCHEME

REFERENCE DRAWINGS

BAR SCALES

ATTENTION
NOTE 1 : TO BE READ IN CONJUCTION WITH DRAWING. "ELSBM FLOWLINE. BALL VALVE CONTROL SYSTEM. SUPPORT DETAILS" DWG N°: 4182.3.0.135.1.022018

DO REF. NO:		
DRAWN	H.V.WOLFEREN	
DATE	24-03-88	
SCALE	1:250/1:10	
CHECKED		
APPROVED		
	CONSULTANT	SHELL

KITTIWAKE PROJECT

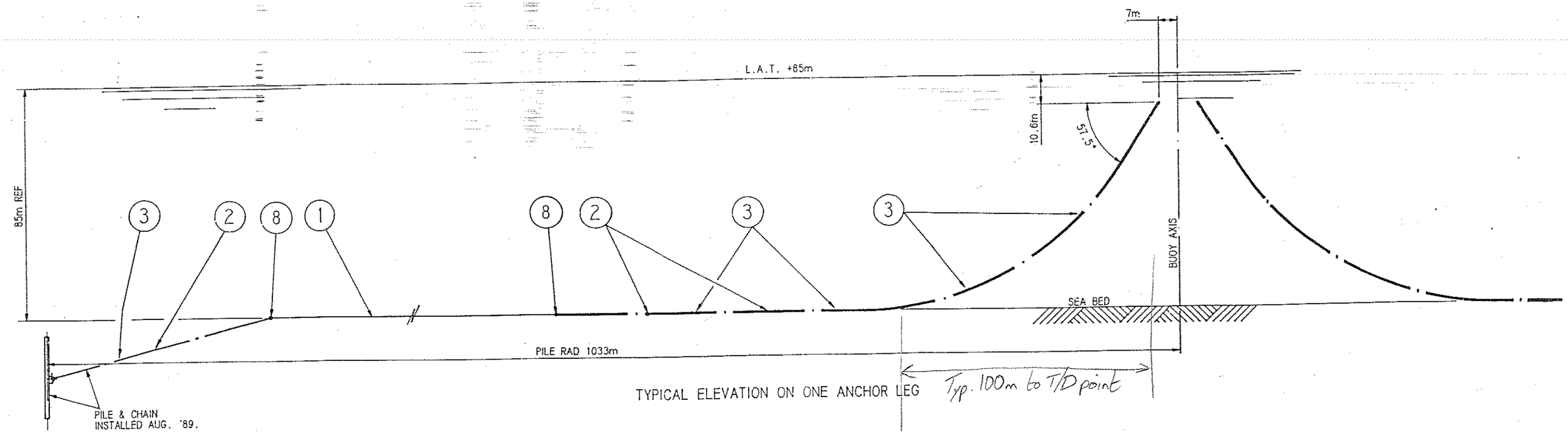
ELSBM FLOWLINE
BALL VALVE CONTROL SYSTEM LAY-OUT

SINGLE BUOY MOORINGS INC
FRIBOURG - SWITZERLAND
ENGINEERING OFFICES MONACO (TELEX PO BOX 199)

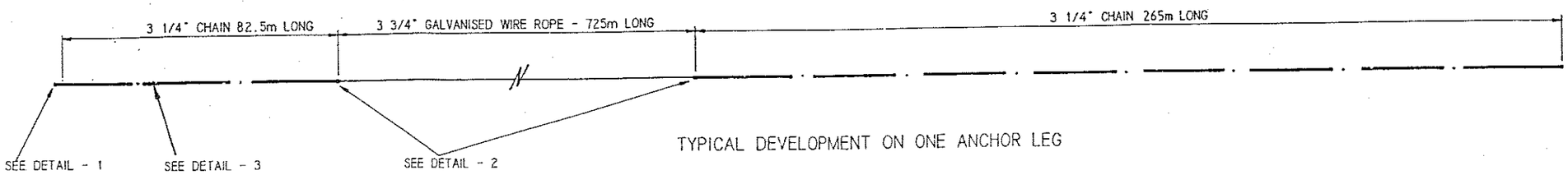
DRAWING NO: 4182.3.0.135.1.022211 REV: B

SHELL UK EXPLORATION & PRODUCTION

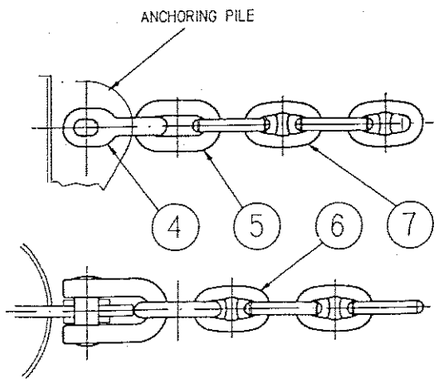
DRAWING NO: KW/R-03505 SHEET NO: 01 REV:



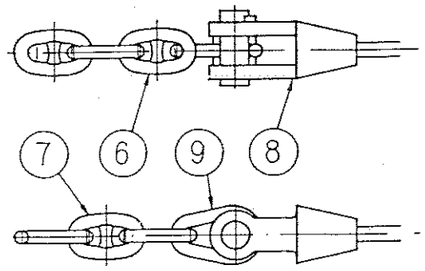
TYPICAL ELEVATION ON ONE ANCHOR LEG



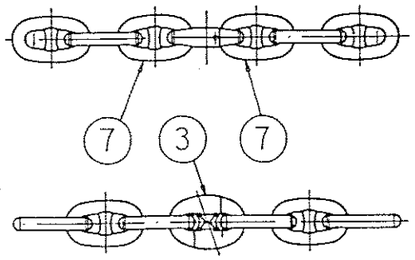
TYPICAL DEVELOPMENT ON ONE ANCHOR LEG



DETAIL - 1
SCALE 1:20



DETAIL - 2
SCALE 1:20



DETAIL - 3
SCALE 1:20

ITEM NO.	PART NUMBER/ DRW. NUMBER	NUMBER REQUIRED	DESCRIPTION
10	-	-	-
9	API 2F	8 x 2	3 1/4" PEAR LINK
8	API 2F	8 x 2	3 3/4" - 4" OPEN SPELTER SOCKET
7	API 2F	-	COMMON LINK
6	API 2F	8 x 3	3 1/4" ENLARGED LINK
5	API 2F	8 x 1	3 1/4" END LINK
4	API 2F	8 x 1	3 1/4" ANCHOR SHACKLE - TYPE 'D'
3	API 2F	8 x 6	3 1/4" KENTER SHACKLE
2	API 2F	8 x 6	3 1/4" ANCHOR CHAIN
1	API 9A	8 x 1	ANCHOR WIRE 3 3/4" - 6 x 47 IWRC 'Z' GALVANISED

REV	DATE	BY	CHKD CONSULTANT	APPVD SHELL	REVISION	MICROFILMED
Z3	9.11.90	MT			AS-LAID INCORPORATING CLIENTS COMMENTS	
Z2	5.10.90	MT			AS-LAID	

DR-ENG-049-048 GENERAL ARRANGEMENT OF ANCHOR LEG FOR BUOY (TYPICAL)
DRAWING No. SUBJECT

BAR SCALES 0 10 20 30 40 50 60 70m SCALE 1 : 750

ATTENTION

DD REF No.
DRAWN M. THOMSON
DATE 5.10.90
SCALE 1 : 750
CHECKED
APPROVED
CONSULTANT SHELL

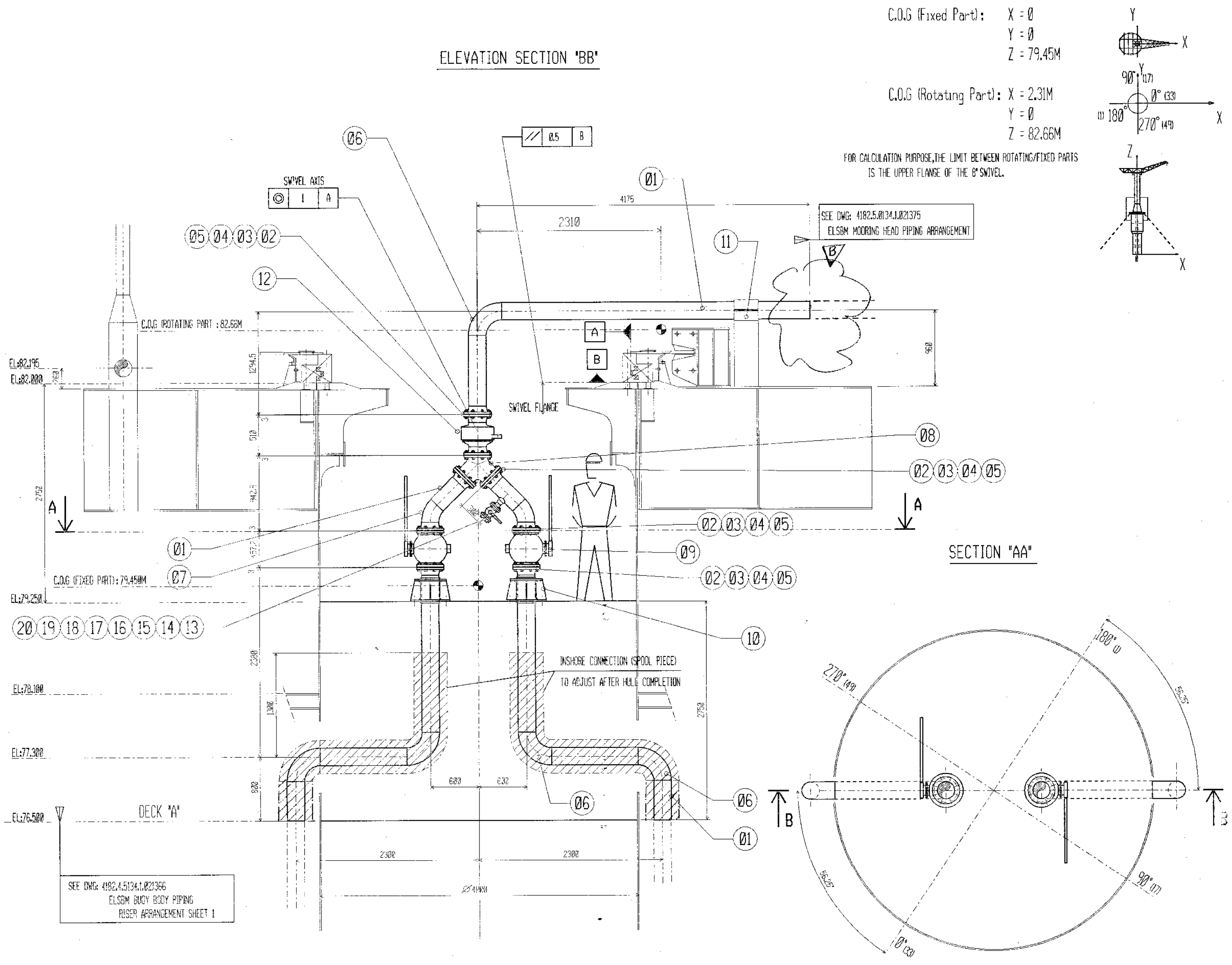
KITTIWAKE DEVELOPMENT CONTRACT No. C11320
PIPELINE AND KLB INSTALLATION

KLB COMPOSITE MOORING LINE ASSEMBLY

INSTALLATION KLB
CONSULTANT COMEX UK LTD
CONSULTANT DRG No. DR-ENG-049-101

SHELL UK EXPLORATION & PRODUCTION

DRAWING No. KW-U-10212
SHEET No. 1 - 1
REV. Z3



GENERAL FOR GENERAL WELDING AND PAINTING PROCEDURES REFER TO THE PROJECT SPECIFICATIONS
- UNITS OF MEASUREMENT UNLESS OTHERWISE INDICATED : METRE (m), MILLIMETRE (mm), KILOGRAMME (Kg), TONNE ($t = 10^3$ Kg)
- DETAIL DRAWINGS : FOR QUANTITY AND LOCATION SEE DRAWING ASSEMBLY.

MACHINING ALL DIMENSIONS WITHOUT TOLERANCE INDICATION ARE IN ACC. WITH ISO 2768 (ROUGH FINISHED CLASS)
- ALL SURFACE ROUGHNESSES ARE GIVEN IN Ra ($\mu m = 10^{-6}$m) IN ACCORDANCE WITH ISO 1302
- THE TOLERANCES OF FORM AND OF POSITION ARE IN ACCORDANCE WITH ISO 1101/1660/1661

PIPING ALL PIPING COMPONENTS ARE IN ACC. WITH THE REGULATIONS MENTIONNED IN THE PROJECT SPEC.
- ALL PIPING WELDS ARE IN ACCORDANCE WITH THE RELEVANT SPECIFICATION

CHAMFER ONLY IF (T − t) > 3 mm

STEEL WORK WELDING ALL WELDS SYMBOLS ARE IN ACC. WITH AWS A 2-4 LAST REVISION
- ALL WELDS MUST BE CONTINUOUS AND IN ACCORDANCE WITH AWS D 1-1 LAST REVISION
- DOUBLE FILLET WELD : UNLESS OTHERWISE SHOWN THE MINIMUM WELD SIZE USED FOR PLATE THICK. < 26mm MUST BE :

t	a	t	a
t < 8	5	15 < t ≤ 17	10
8 < t ≤ 10	6	17 < t ≤ 19	11
10 < t ≤ 12	7	19 < t ≤ 20	12
12 < t ≤ 14	8	20 < t ≤ 22	13
14 < t ≤ 15	9	22 < t ≤ 24	14
		24 < t ≤ 26	15

t = smallest plate thickness

UNITS OF MEASUREMENT : UNLESS OTHERWISE INDICATED : METRE (m), MILLIMETRE (mm), KILOGRAMME (Kg), TONNE ($T=10^3$ Kg)

ALL EDGES SHALL BE ROUNDED OFF

ISO 1302

GENERAL TOLERANCES FOR MACHINING AS PER ISO 2768

DIMENSIONS WITHOUT TOLERANCE				ANGLE: LENGTH OF SHORTER SIDE (mm)	TOLERANCE (DEGREE)
0 TO 6	±0.1	1001 TO 2500	±4	0 TO 10	±1°
7 TO 30	±0.2	2501 TO 4000	±6	11 TO 50	±30'
31 TO 120	±0.4	4001 TO 8000	±12	51 TO 120	±20'
121 TO 300	±0.8	8001 TO 16000	±24	> 121	±10'
301 TO 1000	±2	> 16001	±50		

SYMBOLS OF TOLERANCES OF FORM AND POSITION ISO 1101: FLATNESS, PERPENDICULARITY, CONCENTRICITY, POSITION, CYLINDRICITY, PARALLELISM, ANGULARITY, SYMMETRY, RUN OUT

ITEM N°	QTY	EXTRA	DESCRIPTION	MATERIAL	UNITARY WEIGHT KG.	TOTAL WEIGHT KG.	REMARKS
20	2		1/8" GASKET FOR 2" ANSI 150 RF FLANGE	CAF	/	/	
19	16		5/8" HEX.NUT - H=D	ASTMA194 GR.2H	/	0.9	PTFE PRO
18	8		5/8" STUDBOLT - L=80MM	ASTMA193 GR.B7	/	1.3	PTFE PRO
17	1		2" ANSI 150 RF BLIND FLANGE	ASTM A105	2.7	2.7	
16	1		2" FULL OPENING BALL VALVE ANSI 150 RF FLANGED	MANUF. SPEC.	18	18	
15	1		2" ANSI 150 RF W.N FLANGE	ASTM A105	2.7	2.7	
14	0.10 M		2" PIPE (O.D 60.3 X 6.35MM THK)	EEMUA GR 355D	10.8	1.1	
13	1		8" X 2" REDUCING SIZE WELDOLET EXTRA STRONG	A105 GR.2	0.8	0.8	
12	1		8" PIPE SWIVEL	MANUF. SPEC.	200	200	SEE DWG: 5.5132.1.021289
11	1		8" PIPE SUPPORT (ANCHOR)		198	198	SEE DWG: 4.5.134.1.022222
10	2		8" PIPE SUPPORT (ANCHOR)		77	154	SEE DWG: 4.5.134.1.022222
09	2		8" FULL OPENING BALL VALVE ANSI 150 RF FLANGED	MANUF. SPEC.	171	342	EST. WEIGHT
08	1		8" TRUE "Y" ANSI 150 RF FLANGED	MSS SP75 Gr F 52	70	70	EST. WEIGHT
07	2		8" LONG RADIUS 45° ELBOW THK = 14.3MM	MSS SP75 Gr F 52	19	38	
06	4		8" LONG RADIUS 90° ELBOW THK = 14.3MM	MSS SP75 Gr F 52	38	152	
05	8		1/8" GASKET FOR 8" ANSI 150 RF FLANGE	CAF	/	/	
04	112		3/4" HEX. NUT - H=D	ASTMA194 GR.2H	/	11.3	PTFE PROTECTED
03	56		3/4" STUDBOLT - L=110MM	ASTMA193 GR.B7	/	18.8	PTFE PROTECTED
02	7		8" ANSI 150 RF W.N FLANGE	MSS SP44 Gr F 52	18.3	147	
01	13 M		8" PIPE (O.D 219.1 X 14.3MM THK)	EEMUA GR 355D	72.1	936	

SEE DWG.ASS'Y: TOTAL WEIGHT: 2295 KG

REVISIONS

REV.	DATE	BY	CHKD (CONSULTANT)	APPVD (CONSULTANT)	CHKD (SHELL)	APPVD (SHELL)	DESCRIPTION	CONSULTANT REVISION	MICROFILMED
B	26.4.88	CLC	DG	[signature]		WR	C.O.G. SECTION AA, INSTALLATION SPOOL P., MATERIALS / VFC issue	C	
A1	24.03.88	P.P	R.W	[signature]			DIM. 4175 WAS 5000	B	
A	19/02/88	CLC	RW	[signature]			FIRST ISSUE	A	

REFERENCE DRAWINGS

DRAWING NO:	SUBJECT
4182.5.5352.1.021107	ELSBM MOORING HEAD GENERAL ARRANGEMENT
4182.5.5132.1.021289	ELSBM MAIN PRODUCT SWIVEL G.D.
4182.3.0134.5.021302	ELSBM FLOWLINE PIPING & VALVE SPECIFICATION
4182.5.0134.1.021375	ELSBM MOORING HEAD PIPING ARRANGEMENT
4182.4.5.134.1.022222	ELSBM SWIVEL ROOM PIPE SUPPORT DETAILS
4182.4.5134.1.021366	ELSBM BUOY BODY PIPING RISER ARRANGEMENT SHEET 1

BAR SCALES

ATTENTION

DO REF. NO:	
DRAWN	C.L.COLLINS
DATE	17/02/88
SCALE	1/25
CHECKED	R.WOODS
APPROVED	[signature]
CONSULTANT	SHELL

KITTIWAKE PROJECT

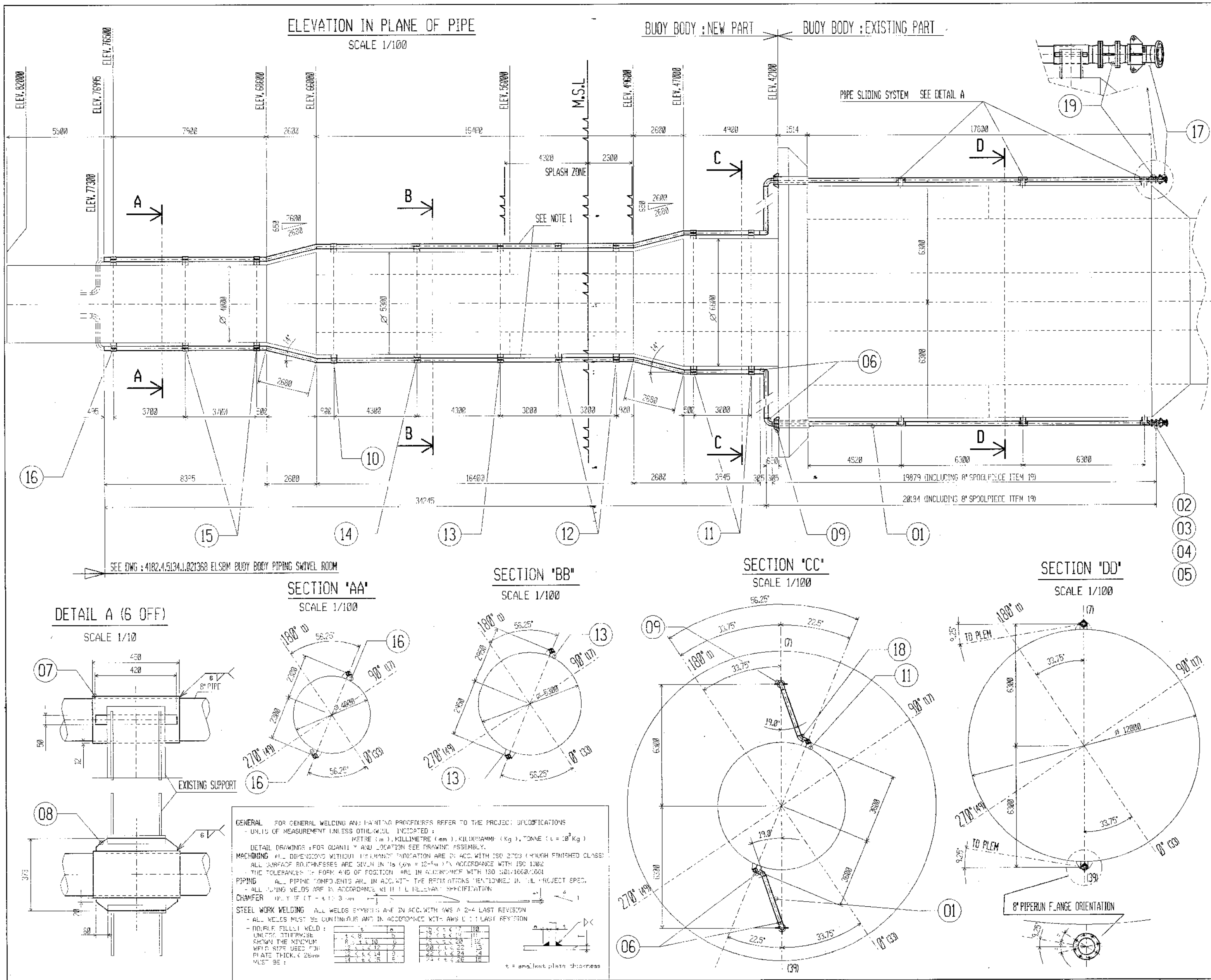
ELSBM BUOY BODY PIPING SWIVEL ROOM

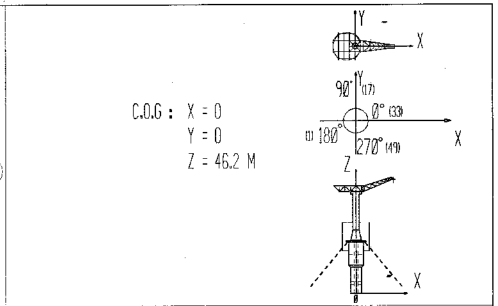
SINGLE BUOY MOORINGS INC
FRIBOURG - SWITZERLAND
ENGINEERING OFFICES MONACO (PTE) PO BOX 199

DRAWING NO: 4182.4.5.134.1.021368 REV: C

SHELL UK EXPLORATION & PRODUCTION

DRAWING NO: KW/R-05303 - SHEET NO: OF REV:





ITEM Nº	QTY	EXTRA	DESCRIPTION	MATERIAL	UNITARY WEIGHT KG.	TOTAL WEIGHT KG.	REMARKS
19	2		8" SPOOLPIECE FOR BUOY PIPERUN	/	42	84	SEE DWG : 41.. 4.5.134.1.021367
18	2		8" LONG RADIUS 90° ELBOW CUT TO 48.4°	MSS.SP75 Gr F 52	18.5	37	
17	2		8" SPOOLPIECE FOR SUBMARINE HOSE	/	88.5	177	SEE DWG : 4182 4.5.134.1.021367
16	2		8" PIPE GUIDE (SLIDING)	/	45	90	SEE DWG : 4182 4.5.134.1.021374
15	4		8" PIPE GUIDE (SLIDING)	/	40	160	↑
14	2		8" PIPE GUIDE (SLIDING)	/	40	80	
13	2		8" PIPE GUIDE (SLIDING)	/	40	80	
12	4		8" PIPE GUIDE (SLIDING)	/	40	160	
11	4		8" PIPE GUIDE (SLIDING)	/	40	160	
10	2		8" PIPE SUPPORT (ANCHOR)	/	37	74	↓
09	2		8" PIPE SUPPORT (ANCHOR)	/	65	130	SEE DWG : 4182 4.5.134.1.021374
08	0.33 M2		50MM THK PLATE	EEMUA GR 355EM	392.	129.5	
07	1.86 M2		12MM THK PLATE	EEMUA GR 275D	94.2	175.2	
06	4		8" LONG RADIUS 90° ELBOW 14.3MM THK	MSS.SP75 Gr F 52	34.5	138	
05	2		1/8" GASKET FOR 8" ANSI 150 RF FLANGE	CAF	/	/	
04	32		3/4" HEX. NUT - H=D	ASTMA194 GR.2H	/	2.8	PTFE COATED
03	16		3/4" STUDBOLT - L=110MM	ASTMA193 GR.B7	/	4.7	PTFE COATED
02	2		8" ANSI 150 RF W.N FLANGE	MSS.SP44 Gr F 52	18.3	36.6	
01	112.5 M		8" PIPE (O.D 219.1 X 14.3MM THK)	EEMUA GR 355D	72.1	8113	SEE NOTE

SEE DWG.ASS'Y:

TOTAL WEIGHT: 9859.5 KG

ATTENTION NOTES:

1. 8" PRODUCT PIPE COATED WITH NEOPRENE ON 6600 MM LENGTH

REV.	DATE	BY	DESCRIPTION	CONSULTANT REVISION
B	26.4.88	DG	MATERIALS CHANGED TO EEMUA NORMS / VFC- issue	C
A1	25.3.88	RW	MODIFIED POSITION OF SUPPORTS AND COMPLETED DRAWING.	B
A	19/02/88	RW	FIRST ISSUE	A

REVISIONS

DRAWING NO:	SUBJECT
4182.4.5134.1.021367	ELSBM BUOY BODY PIPING RISER ARRANGEMENT SHEET 2
4182.4.5134.1.021374	ELSBM BUOY BODY PIPING RISER SUPPORTS ARRANGEMENT
4182.4.0134.5.021371	ELSBM BUOY BODY PIPING RISER SPECIFICATION
4182.4.5134.1.021368	ELSBM BUOY BODY PIPING SWIVEL ROOM
4182.4.5072..021226	ELSBM BUOY EXTENSION STRUCTURAL ARRANGEMENT / DETAILS

REFERENCE DRAWINGS

KITTIWAKE PROJECT

ELSBM BUOY BODY PIPING
RISER ARRANGEMENT
SHEET 1

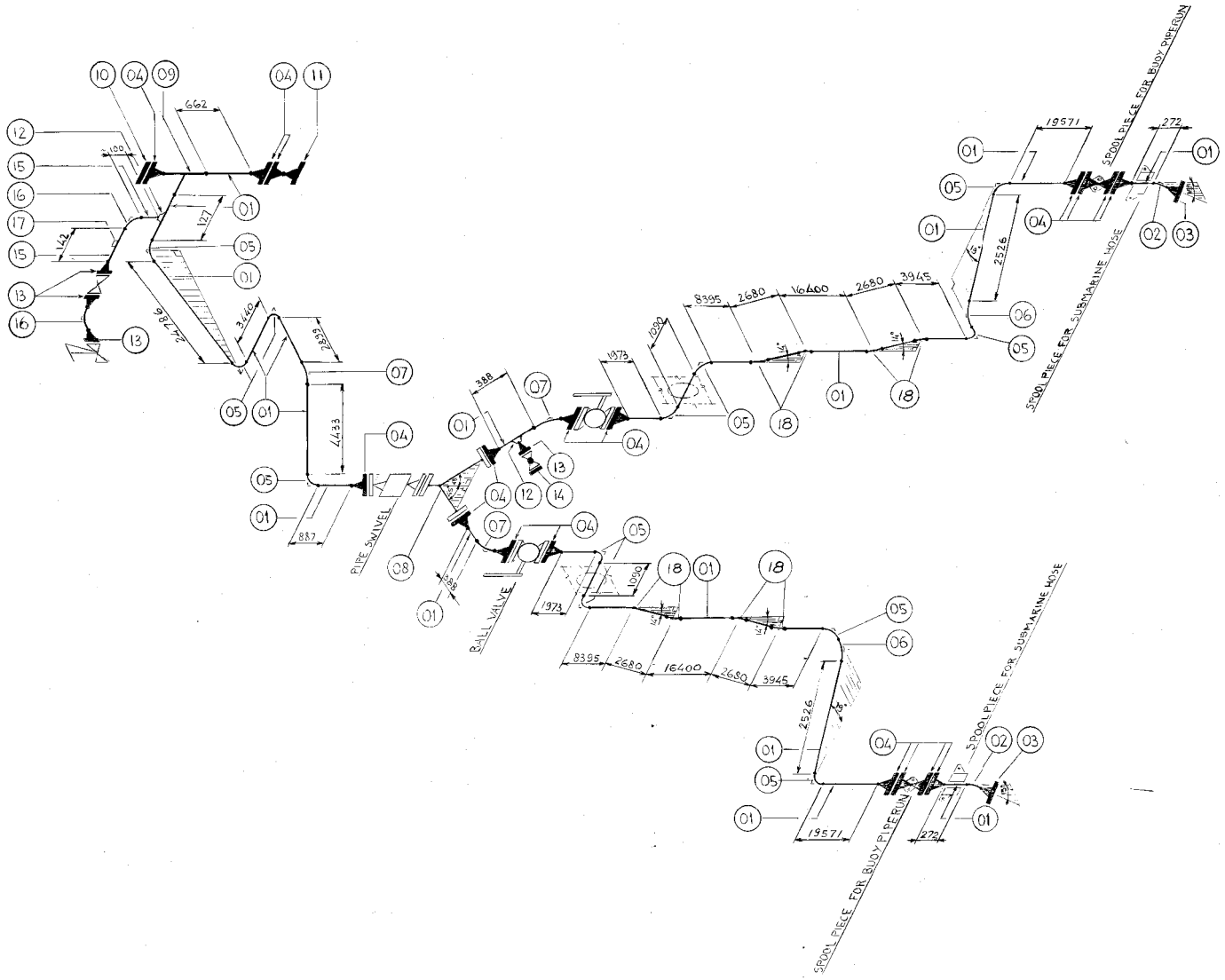
DRAWN	C.L.COLLINE
DATE	17/04/88
SCALE	1/100
CHECKED	D.G
APPROVED	C.VOGT

SINGLE BUOY MOORINGS INC
FRIBOURG - SWITZERLAND
ENGINEERING OFFICES MONACO

DRAWING NO: 4182.4.5134.1.021366 REV: C

SHELL UK EXPLORATION & PRODUCTION

DRAWING NO: KW/R- 05304



ITEM N°	QTY	EXTRA	DESCRIPTION	MATERIAL	UNITARY WEIGHT KG.	TOTAL WEIGHT KG.	REMARKS
18	8		8" LONG RADIUS 14° ELBOW - THK: 14.3 mm	MSS SP75 Gr. F52	5.4	43	
17	1		3/8" WELDING BOSS	A 350 LF2	-	-	
16	2		2" LONG RADIUS 90° ELBOW THK: 5.54 mm	A 420 WPL 6	0.9	1.8	
15	0.25 m		2" PIPE (OD 60.3 x 5.54 mm)	A 333 Gr 6	7.5	1.9	
14	1		2" ANSI 150 RF BLIND FLANGE	A 350 LF2	2.7	2.7	
13	4		2" ANSI 150 R.F. W.N. FLANGE	A 694 F52	2.7	10.8	(OR: A 350 LF2)
12	2		8"x2" REDUCING SIZE WELDOLET EXTRA STRONG	A 694 F52	0.8	1.6	(OR: A 350 LF2)
11	1		8" ANSI 300 R.F. W.N. FLANGE	MSS SP44 GR F52	31	31	
10	1		8" BLIND FLANGE 150 R.F.	MSS SP44 Gr. F52	21	21	
09	1		8" STRAIGHT TEE THK: 14.3 mm	MSS SP75 GR. F52	43	43	
08	1		8" TRUE "Y" ANSI 150 RF FLANGED	MSS SP75 GR F 52	70	70	
07	3		8" LONG RADIUS 45° ELBOW THK: 14.3 mm	MSS SP75 GR F 52	19	57	
06	2		8" LONG RADIUS 48.4° ELBOW THK: 14.3 mm	MSS SP75 GR F 52	18.5	37	
05	12		8" LONG RADIUS 90° ELBOW THK: 14.3 mm	MSS SP75 GR F 52	34.5	414	
04	18		8" ANSI 150 R.F. W.N. FLANGE	MSS SP44 GR F52	18.3	329.4	
03	2		8" ANSI 150 R.F. W.N. FLANGE	MSS SP44 GR F52	18.3	36.6	
02	2		8" LONG RADIUS 15° ELBOW THK: 14.3 mm	MSS SP75 GR F52	5°	10°	
01	157.1 m		8" PIPE (OD 219.1 x 14.3 THK)	EEMUA GR 355 D	72.1	11325.9	

SEE DWG.ASS'Y:

TOTAL WEIGHT: 12436

REV.	DATE	BY	CHKD CONSULTANT	APPVD CONSULTANT	CHKD SHELL	APPVD SHELL	DESCRIPTION	CONSULTANT REVISION	MICROFILMED
B	29/04/88	CC	CV				V.F.C. ISSUE AS PER CLIENT COMMENTS	B	
A	29/04/88	HVW	CC				FIRST ISSUE	A	

REVISIONS

DRAWING NO.	SUBJECT
4182.50134.1.021376	ELSBM MOORING HEAD PIPING DETAILS
4182.50134.1.021375	ELSBM MOORING HEAD PIPING GENERAL ARRANGEMENT
4182.4.5134.1.021368	ELSBM BUOY BODY PIPING SWIVEL ROOM
4182.4.5134.1.021367	ELSBM BUOY BODY PIPING RISER ARRANGEMENT SHEET 2
4182.4.5134.1.021366	ELSBM BUOY BODY PIPING RISER ARRANGEMENT SHEET 1

REFERENCE DRAWINGS

BAR SCALES

ATTENTION

DD REF. Nos	
DRAWN	H.v. WOLFEREN
DATE	29/04/88
SCALE	—
CHECKED	CC
APPROVED	CV
CONSULTANT	SHELL

SHELL UK EXPLORATION & PRODUCTION

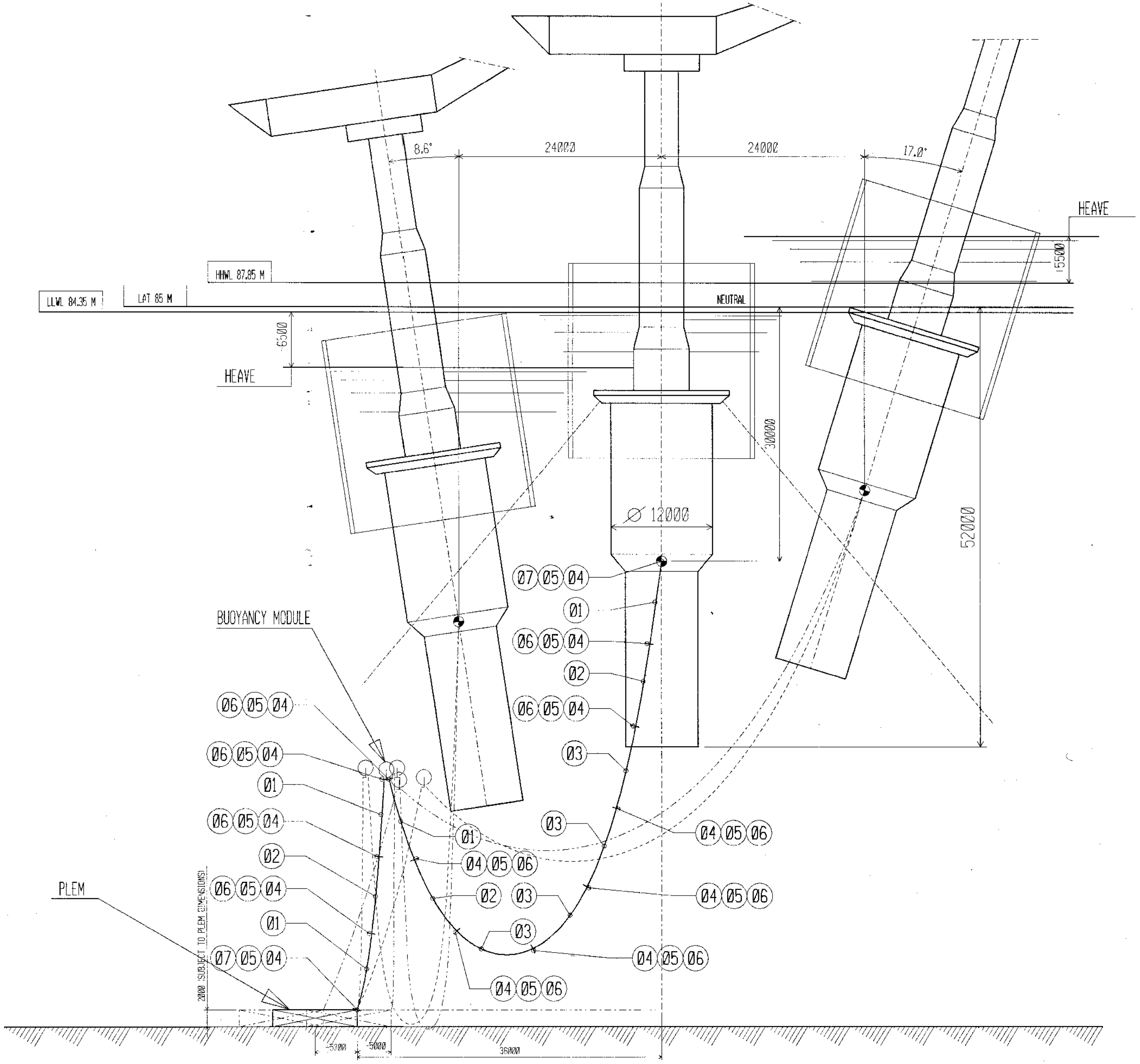
KITTIWAKE PROJECT

ELSBM FLOWLINE
150 OF CRUDE OIL PIPERUN and M.T.O

SINGLE BUOY MOORINGS INC.
FRIBOURG - SWITZERLAND
ENGINEERING OFFICES MONACO PTEYRO BOX 199

DRAWING No. 4182 3 0 131.1.022365 REV. B

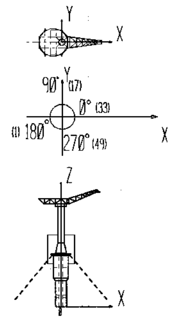
DRAWING No. KW/R-05309 SHEET No. OF REV. B



FOR FLOATING CONDITION OF BUOY

SUSPENDED WEIGHT : 2200 KG

C.O.G X = 0
Y = 0
Z = 22.0 M



FOR THE ORDER,WE NEED TWO TIMES THE ARRANGEMENT AS DRAWN.

ITEM N°	QTY	EXTRA	DESCRIPTION	MATERIAL	UNITARY WEIGHT KG.	TOTAL WEIGHT KG.	REMARKS
07	2		3MM THK GASKET FOR 8" ANSI 150 F.F. FLANGE	METAFLEX	/	/	OR EQUIVALENT
06	13		3MM THK GASKET FOR 8" ANSI 150 F.F. FLANGE	CAF	/	1	
05	208		3/4" HEX. NUT - H=D	ASTMA194 GR.2H	/	19	PTFE PROTECTED
04	104		3/4" STUDBOLT - L=110MM	ASTMA193 GR.B7	/	30	PTFE PROTECTED
03	4		8" SUBMARINE HOSE STANDARD LENGTH = 35 FEET	MANUF. SPEC.	200	800	SEE DWG : 3.0.133.5.021364
02	3		8" SUBMARINE HOSE STANDARD LENGTH = 30 FEET	MANUF. SPEC.	181	543	SEE DWG : 3.0.133.5.021364
01	4		8" SUBMARINE HOSE REINFORCED ONE END - LENGTH = 30 FEET	MANUF. SPEC.	182	728	SEE DWG : 3.0.133.5.021364

SEE DWG.ASS'Y:

TOTAL WEIGHT: ——

REVISIONS

REV.	DATE	BY	CHKD (CONSULTANT)	APPVD (CONSULTANT)	CHKD (SHELL)	APPVD (SHELL)	DESCRIPTION	CONSULTANT REVISION	MICROFILMED
B	26/4/88	CCO	DTJ	[signature]		[signature]	C.O.G , WT OF HOSES ADDED / VFC ISSUE	C	
A1	04/03/88	CCO	RW	[signature]			INTERNAL COMMENTS ADDED	B	
A	17/02/88	CCO	RW	[signature]			FIRST ISSUE FOR COMMENTS AND APPROVAL	A	

REFERENCE DRAWINGS

DRAWING No:	SUBJECT
4182.1.0.133.1.021777	ELSBM UNDERWATER HOSES CHAIN CHAFING AREAS
4182.4.5.134.1.021366	ELSBM BUOY BODY PIPING RISER ARRANGEMENT SHEET 1
4182.3.0.133.1.021363	ELSBM UNDERWATER HOSES CONFIGURATION BUOYANCY MODULE
4182.4.0.106.1.021231	ELSBM PLEM GENERAL ARRANGEMENT

BAR SCALES

ATTENTION

DO REF. No:		
DRAWN	C.L.COLLINI	
DATE	18/04/88	
SCALE	1/250	
CHECKED	D.G DG	
APPROVED	C.VOGT [signature]	
	CONSULTANT	SHELL

KITTIWAKE PROJECT

ELSBM
UNDERWATER HOSES
CONFIGURATION G.A.

SINGLE BUOY MOORINGS INC
FRIBOURG - SWITZERLAND
ENGINEERING OFFICES MONACO (PTE) PO BOX 199

DRAWING No: 4182.3.5133.1.021362 — C

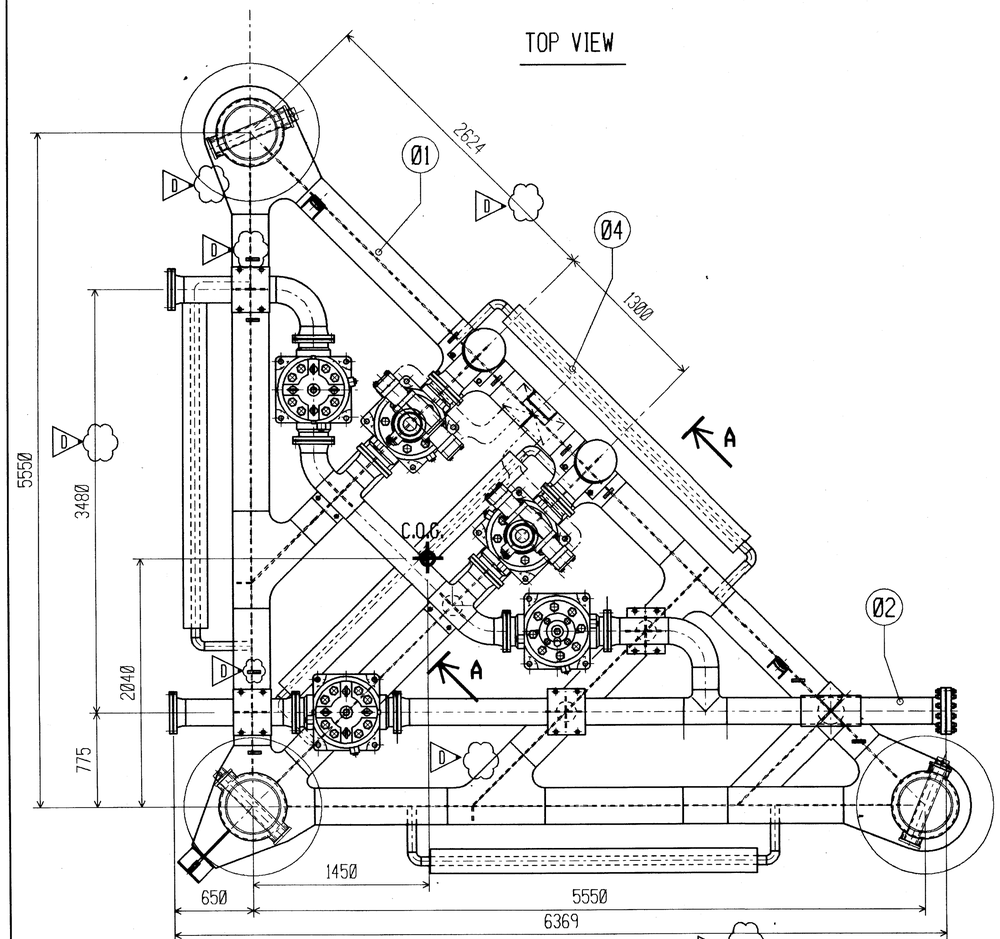
SHELL UK EXPLORATION & PRODUCTION

DRAWING No:	SHEET No:	REV:
KW/R- 05401	OF	

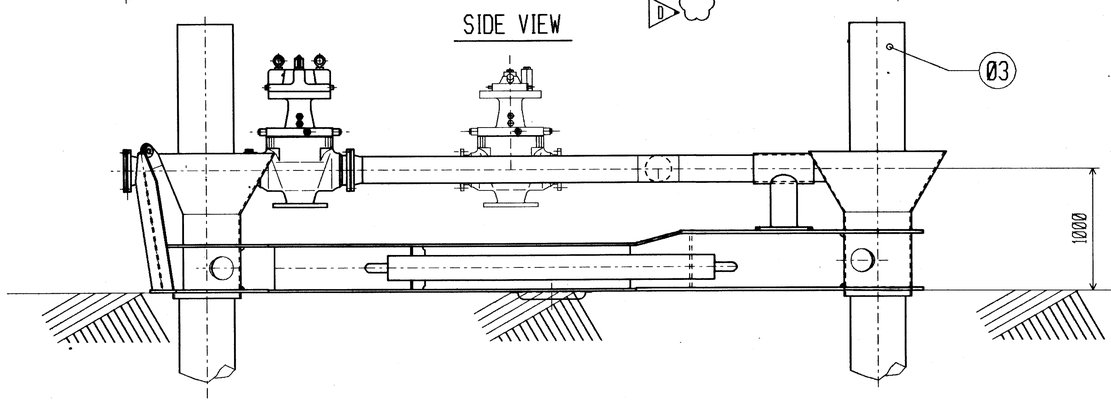
830-000069-11-1T
830000069111

Hays

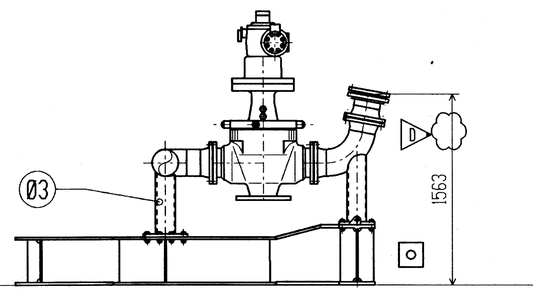
TOP VIEW



SIDE VIEW



SECTION:AA



NOTE

THE INDICATED C.O.G VALUE IS EXCLUDING ANCHORING PILES

ITEM N°	QTY	EXTRA	DESCRIPTION	MATERIAL	UNITARY WEIGHT KG.	TOTAL	REMARKS
04	Ø1		CATHODIC PROTECTION DWG 4182.1.5.102.1.021233			1291 D	
03	Ø1		PIPES SUPPORTS & PILES DWG 4182.1.5.103.1.021353			3967 D	
02	Ø1		PIPING GENERAL ARRANGEMENT DWG 4182.1.5.103.1.021352			8851 D	
01	Ø1		STRUCTURE GENERAL ARRANGEMENT DWG 4182.1.5.102.1.021232			5051 D	

VALID FOR CONSTRUCTION
DATE: 09.06.1989 ORDER N°: SO 4182 DEPT HEAD

SEE DWG.ASS'Y: TOTAL WEIGHT: 19160 KG D

REV.	DATE	BY	CHKD CONSULTANT	APPVD CONSULTANT	CHKD SHELL	APPVD SHELL	DESCRIPTION	ORIGINAT REVISION	MICROFILMED
C1	Ø4/89	BD	CC	CV			STRUCTURE MOD. D Ø ADDED MAIN DIMENSIONS	D	
C	Ø4/89	BD	CC	CV			RE-ROUTING OF PIPING	C	
B	13/Ø5/88	CC	DG				PIPING SUPPORT MODIFIED	B	
A	Ø3/88	BD	AP	CV			INITIAL ISSUE	A	

REVISIONS

DRAWING NO:	SUBJECT
4182 3 0135 1 022211	ELSBM FLOWLINE BALLVALVE CONTROL SYSTEM LAY-OUT
4182 1 5102 1 021233	CATHODIC PROTECTION
4182 1 5103 1 021353	PIPES SUPPORTS & PILES
4182 1 5103 1 021352	PIPING G.A.
4182 1 5102 1 021232	STRUCTURE G.A.

REFERENCE DRAWINGS

BAR SCALES

ATTENTION

DO REF. NO:		
DRAWN	B.DORE	
DATE	MARCH 88	
SCALE	1/25	
CHECKED	A. POLLON.	
APPROVED	C.VOGT	
	CONSULTANT	SHELL

KITTIWAKE PROJECT

ELSBM-PLEM
GENERAL ARRANGEMENT

SINGLE BUOY MOORINGS INC
FRIBOURG - SWITZERLAND
ENGINEERING OFFICES MONACO 1PTE1PO BOX 199

DRAWING NO: 4182 4 5106 1 021231 REV: D

SHELL UK EXPLORATION & PRODUCTION

DRAWING NO: KW/R-07101 SHEET NO: OF REV: C1

19. RECORD OF CONSULTATION