Section 2. Executive Summary

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2.1 Overview of the Maureen Decommissioning Programme

This Decommissioning Programme provides for the safe and orderly decommissioning of the two installations and associated pipelines and subsea equipment installed offshore to develop the Maureen and Moira Fields (the "Maureen Facilities"). The Decommissioning Programme proposes that nearly all the Maureen Facilities be removed from the seabed. The only exception is a large diameter oil loading pipeline, where environmental, safety and economic considerations make leaving it in place, cleaned and buried, the preferred option. The Maureen Owners are actively seeking reuse opportunities for the Maureen Platform, an unique steel installation that was designed to be refloated and reused, as well as for the Maureen Loading Column, which likewise can be refloated and reused. If no suitable reuse opportunities are identified, both facilities, along with all the other Maureen Facilities which have been removed, will be deconstructed and recycled onshore.

This Decommissioning Programme is fully consistent with and requires no derogation from the requirements of OSPAR Decision 98/3.

2.2 Background - The Maureen and Moira Developments

In 1973 the Maureen Owners discovered the Maureen Field in Block 16/29a of the United Kingdom Continental Shelf, approximately 260 km northeast of Aberdeen. The Maureen Owners developed the field by installing the Maureen Platform, a large steel drilling, production, storage and accommodation platform, and the Maureen Loading Column, a slim concrete structure for offloading crude production to oil tankers. The 2.3 km Maureen Oil Loading Pipeline was laid to connect the two installations. Twenty development wells were pre-drilled through the subsea Maureen Drilling Template, using a semi-submersible drilling rig, prior to installation of the Maureen Platform over the Drilling Template in 1983. Three additional wells were later drilled from the Platform. Production from the Maureen Field commenced in 1983 and in total approximately 223 million barrels of oil were produced during the field's production lifetime (almost 50% more than originally estimated).

Moira, an oil field located approximately 10 km from the Maureen Platform, was discovered in 1988. The Maureen Owners developed Moira as a satellite field with a single subsea well connected to the Maureen Platform by two small diameter pipelines and a control umbilical. Moira crude oil was processed onboard the Maureen Platform and exported to tankers via the Maureen Loading Pipeline and the Maureen Loading Column. Approximately 4 million barrels of oil were produced from Moira during field life.

2.3 Cessation of Production from the Maureen Facilities

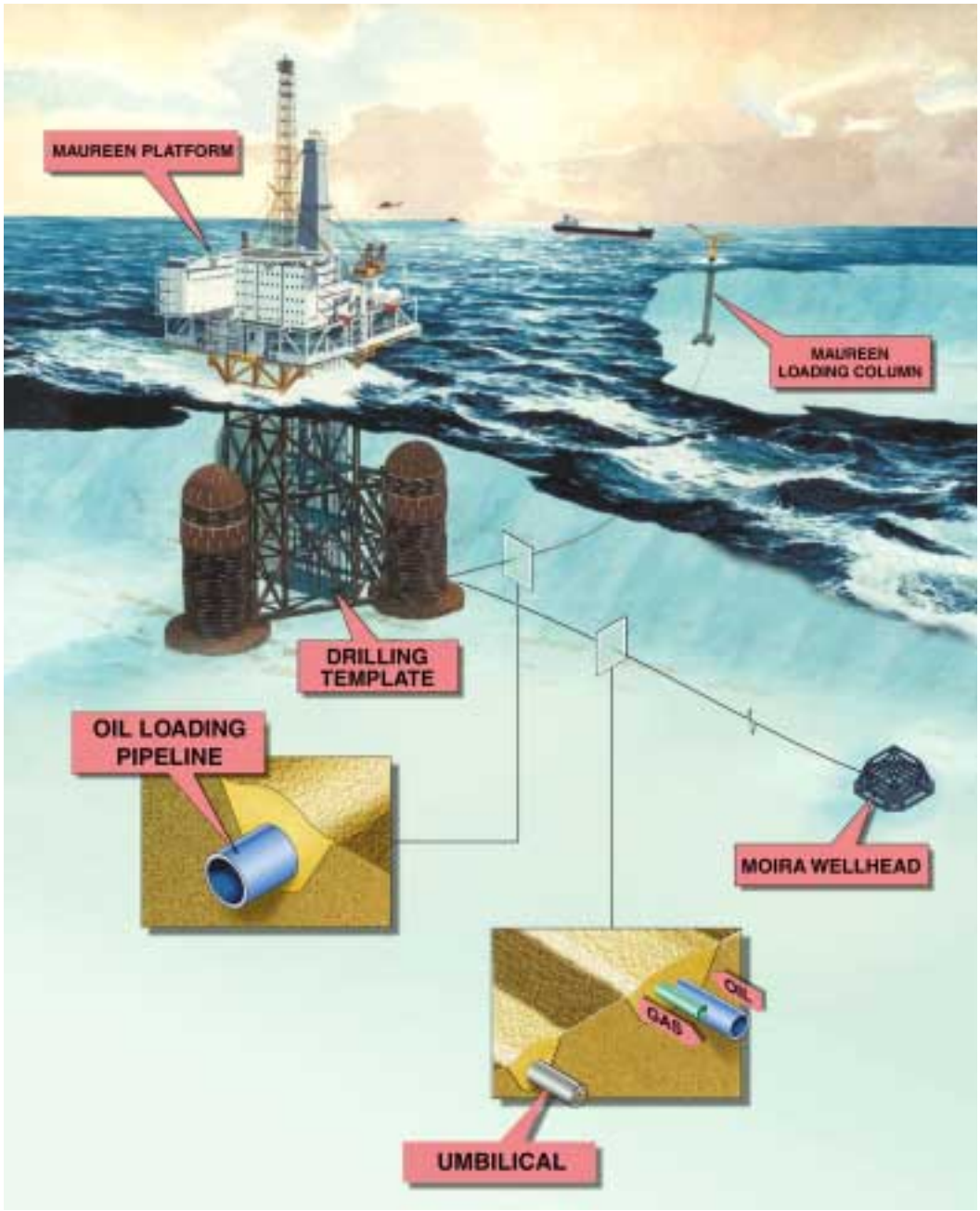
Oil production from the Maureen Facilities became uneconomic in June 1999 following a rapid decline in production levels. There were no remaining opportunities to increase production levels economically and the Cessation of Production consent was granted by the DTI on 7 October 1999. By that time the Maureen Owners were well underway with planning the decommissioning of the Maureen Facilities as described in the following subsections.

An Abandonment Safety Case has already been produced in accordance with the Offshore Installations (Safety Case) Regulations 1992. It was submitted to the Health and Safety Executive (HSE) in October 1999, assessed and then accepted by the HSE in April 2000[1].

2.4 Overview of the Facilities to be Decommissioned

The now redundant Maureen Facilities consist of the Maureen Platform and Drilling Template, the Maureen Loading Column, the Maureen Oil Loading Pipeline and the Moira Subsea Facilities. These Facilities are depicted in Figure 2-1 below.

Figure 2-1 The Maureen Facilities (Artist's Impression)



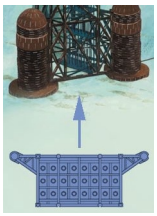
Brief descriptions of the Maureen Facilities are given below:

The Maureen Platform and Drilling Template

The Maureen Platform

The Maureen Platform, ("Platform") standing in 95.6 m of water, was the main production platform for the Maureen and Moira Fields and consists of drilling, production, crude oil storage, and accommodation facilities. The Platform is an unique large steel gravity based platform, designed and constructed to be refloated and (assuming a suitable opportunity is identified) reused at another location.

The Maureen Drilling Template

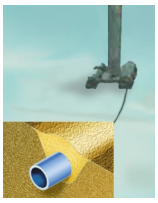


The Maureen Drilling Template ("Drilling Template") is located below the Platform and the Maureen wells were drilled through it.

The Maureen Loading Column

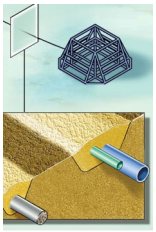
The Maureen Loading Column ("Loading Column") served as the oil export facility for crude oil production from the Maureen and Moira Fields. The Maureen Oil Loading Pipeline runs from the Maureen Platform to the Loading Column. The Loading Column has no crude oil storage facilities. Like the Platform, the Loading Column was designed to be refloated intact and therefore also has full reuse potential.

The Maureen Oil Loading Pipeline



The Maureen Oil Loading Pipeline ("Oil Loading Pipeline") is a 24" pipeline running from the Platform to the Loading Column 2.3 km away.

The Moira Subsea Facilities



The Moira Subsea Facilities consist of the Moira Wellhead and Production Tree, the Wellhead Protection Structure, and two small diameter infield pipelines and a control umbilical, 10 km in length. One of the pipelines provided gas to lift oil from the Moira well and the other transported the produced oil to the Platform for processing and export via the Loading Column.

2.5 Maureen Decommissioning: Planning and Selection Process

In the early 1990s, production forecasts indicated that the economic life of the Maureen and Moira Fields would end by the late 1990s. As a consequence, in 1993 the Maureen Owners initiated decommissioning studies to plan for the responsible and orderly decommissioning of the Maureen Facilities. The goal of the Maureen Owners is to plan and execute the decommissioning of the Maureen Facilities in a safe, environmentally sound, professional and responsible manner with a result acceptable to the United Kingdom Authorities, the public at large, and the Maureen Owners.

Since 1993, numerous engineering and environmental studies have been carried out to prepare for the decommissioning of the Maureen Facilities. The study results have been used to shortlist the viable decommissioning options, to make a final selection of the Selected Decommissioning Option for each facility, to plan the decommissioning operations, and to provide independent third-party verification of the technical decommissioning solutions. Selection of the best solution for each facility was based on thorough and comprehensive evaluations of the relevant decommissioning options, with particular consideration given to the following selection criteria:

- Technical Feasibility, Complexity and Technical Risks
- Safety
- Environmental impacts
- Effects on other users of the sea (Shipping and Fishing)
- Costs.

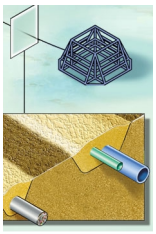
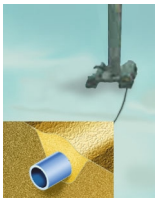
These evaluations were conducted against the background of the general presumption of complete removal except in special circumstances, as reflected in OSPAR Decision 98/3 and the unique designs of the Maureen Platform and Loading Column that allow these facilities to be refloated.

The Maureen Decommissioning Programme is a result of these studies and evaluations and is summarised in the following subsections.

2.6 Summary of the Maureen Decommissioning Programme

The Maureen Decommissioning Programme is comprised of Selected Decommissioning Options for each of the four main elements of the Maureen Facilities. Table 2-1 below provides a summary of each of these and a reference to the Section of this document where the Selected Option is described in more detail:

Table 2-1 Overview of the Maureen Decommissioning Programme

Facility		Selected Decommissioning Option	Description of the Option
Maureen Platform and Drilling Template		Refloat the Platform and tow to deep water mooring, followed by either reuse (full or partial) or recycling onshore if suitable reuse opportunities cannot be secured. Remove the Drilling Template to shore for recycling.	Section 7
Maureen Loading Column		Refloat and tow to deep water mooring, followed by reuse (full or partial) or recycling onshore if suitable reuse opportunities cannot be secured.	Section 8
Moira Subsea Facilities		Remove all facilities to shore for recycling/reuse.	Section 9
Maureen Oil Loading Pipeline		Clean and leave buried *in situ*.	Section 10

Upon completion of the decommissioning operations debris will be cleared from the seabed in the vicinity of the Maureen Facilities. The Maureen Owners will also monitor the drill cuttings layer found around the Maureen site according to an agreed post-decommissioning monitoring programme. A range of options for dealing with the residual drill cuttings layer (which is comparatively small at Maureen) has been studied. There are, currently, no proven means of removing drill cuttings from the seabed in an environmentally acceptable manner. Studies have also shown that the adverse environmental effects of continuing to leave the cuttings layer in place are minimal. The Maureen Owners have concluded that to continue to leave the cuttings in place is currently the best solution from an environmental and other perspectives. The Maureen Owners will continue to participate in ongoing industry wide studies on the treatment of drill cuttings generally in the North Sea, and will take these studies into consideration as they affect the Maureen cuttings layer.

More information on each of the Selected Decommissioning Options is summarised in the following subsections.

2.7 Decommissioning the Maureen Platform and Drilling Template and the Maureen Loading Column

2.7.1 Shortlisted Decommissioning Options

The table below summarises the shortlisted Decommissioning Options considered for the Maureen Platform and Drilling Template, with the Selected Option highlighted.

SHORTLISTED DECOMMISSIONING OPTIONS FOR THE PLATFORM, DRILLING TEMPLATE AND LOADING COLUMN

The proposed method for removal of the Maureen Drilling Template has been revised owing to changed circumstances arising during the execution of the Maureen Decommissioning Project. The new methodology is presented in Addendum 1 of this Maureen Decommissioning Programme.

PLATFORM Refloat and tow from field for reuse, partial reuse or onshore recycling		
DRILLING TEMPLATE Retrieve intact, cut into sections on the transport barge, and transport sections to shore for recycling	**DRILLING TEMPLATE** Retrieve and transport to shore intact for reuse or recycling	**DRILLING TEMPLATE** Cut in sections on seabed, retrieve sections and transport sections to shore for recycling

LOADING COLUMN Refloat and tow from field intact for reuse, partial reuse or onshore recycling

2.7.2 Option Selection

Platform and Loading Column Removal and Disposal

The Maureen Platform and Maureen Loading Column were designed and constructed to be refloated and reused elsewhere. The Maureen decommissioning studies confirm that refloating the structures is a technically sound solution and does not pose unacceptable safety or technical risks. Refloating and removing them will comply with the general rule of removal in OSPAR Decision 98/3, and will preserve the opportunity for reuse, thereby meeting the principles of the waste hierarchy. For these reasons refloating was the only shortlisted removal alternative, and hence the Selected Decommissioning Option, for these facilities.

Full reuse is the preferred disposal option for the Maureen Platform and the Loading Column and the Maureen Owners will continue to pursue reuse opportunities. If, despite these efforts, no suitable reuse for the facilities is found, partial reuse of significant parts of the structures will be considered. The alternative option for any of the facilities that are not reused is full deconstruction and recycling onshore. The decision between the various end-use options will be based on an overall environmental, technical and commercial process.

Drilling Template Removal and Disposal

Removal of the Platform enables access to remove the Drilling Template. Three alternative removal methods were investigated. The selected removal option was chosen on the basis of an overall evaluation of the relevant selection criteria. Final disposal will consist of recycling, as the Drilling Template was purpose-built for the specific requirements of the Maureen Field thus making reuse at another location unlikely.

2.7.3 The Selected Decommissioning Options

Removal of the Platform, Loading Column and Drilling Template

Refloat of the Maureen Platform will be achieved by ballasting and deballasting its three storage tanks and other water-filled compartments in a controlled manner. Pressurised nitrogen, an inert gas, will replace ballast water within the oil storage tanks to reduce the on bottom weight of the structure and to prevent implosion of the tanks. Buoyancy alone, however, will not be sufficient for the initial release (called "breakout") of the Platform's tank bases from the seabed. This will be achieved by injecting water under the bases to effectively jack them off the seabed, overcoming the adhesion to the seabed soils. By using a combination of both buoyancy and jacking forces the jacking pressure required is reduced and the whole activity can be finely controlled. The Maureen Loading Column will also be refloated by controlled ballasting and deballasting of its column and base floats.

To achieve a successful Platform refloat it is essential that hydraulic pressure be maintained under the tank bases until they break out of the seabed soils. However, there is a possibility that during the hydraulic jacking operation the soils around the tank bases will fail (i.e. will not contain the pressure), through soil upheaval and/or development of cavities ("piping"), resulting in a decrease in the underbase pressure and an inability to refloat the platform successfully.

Several measures to reduce this risk to an acceptable level were evaluated. Extensive testing and studies showed that the only effective remedial measure was to place a ring of gravel and iron ore (called a "soil surcharge") on the seabed around each of the three Platform tank bases prior to the refloat operation. Placement of the soil surcharge, totalling approximately 6000 te of non-toxic, naturally occurring material, will consolidate the seabed soils around the bases and prevent soil failure during the jacking operation. The necessity and effectiveness of the soil surcharge have been verified by two independent geotechnical experts. The soil surcharge will cause only local and short-lived environmental impacts, and it will be designed to be overtrawlable, thus posing no obstacles to fishing activities.

After being refloated, the Platform and Loading Column will be towed to a deep water mooring location. There is a limited number of locations suitable for receiving such structures. Bids have been solicited and received for the provision of deep water mooring facilities at suitable locations from a number of competent contractors. At or near these locations there will be facilities to modify the structures for reuse or partial reuse or, if necessary, to deconstruct and recycle the structures onshore. An early decision on the deep water mooring location will be made in order for moorings to be established well before refloating operations commence.

The Drilling Template and Maureen Wellheads will be completely removed to shore for recycling following refloat of the Platform.

Disposal of the Platform, Loading Column and Drilling Template

While in the deep water mooring, the Platform ballast/storage tanks will be opened and inspected, and any residue removed and properly disposed of, prior to any modification required for a reuse or for deconstruction and recycling. The Maureen Owners are actively seeking full reuse options, and are also exploring ideas and proposals for partial reuse which would utilise the facilities in other ways. In the event no reuse option can be secured the installations will be deconstructed in the deep water mooring and most of the materials recycled onshore. The Drilling Template and Maureen Wellheads will also be recycled to the maximum reasonable extent.

Management of the Maureen Drill Cuttings

Drilling of the Maureen Wells resulted in an accumulation of drill cuttings on the seabed beneath the Maureen Platform and Drilling Template. Based on recently collected data, it is estimated that of the 21,000 te of drill cuttings originally discharged, approximately 6000 te remain beneath the Maureen Platform today. The cuttings accumulation has an average height in the Platform footprint of 60 cm and a single peak of 1.3 m, with a shallower layer outside the Platform footprint. Studies show that the cuttings accumulation has diminished through time partially owing to flattening and dispersion during installation of the Platform, and additionally owing to a natural weathering process (physical and chemical degradation). If left undisturbed, the cuttings layer will continue to naturally erode over time and any hydrocarbons present will continue to biodegrade, although the speed and extent of these processes is inherently difficult to assess.

The strategy adopted by the Maureen Owners to deal with the Maureen drill cuttings is twofold. First, procedures will be developed and implemented to ensure minimal disturbance when the removal operations are carried out. The removal operations will cause only localised and short-lived disturbance of the drill cuttings, and the small volume affected is expected to quickly resettle nearby on the existing cuttings layer. Second, the Maureen Owners will implement an agreed post-decommissioning programme to monitor the drill cuttings and the seabed in the vicinity of the Maureen Field and will review the situation as more data and study results become available. The Maureen Owners will also continue to participate in an industry-wide research and development programme, the UKOOA Drill Cuttings Joint Industry Project. The purpose of this project (which is managed by Det Norske Veritas (DnV) and is subject to scientific review by an independent scientific work-group), is to gather information, conduct research and development studies, and ultimately to identify the best environmental practice and the best techniques available for dealing with these accumulations.

2.8 Decommissioning the Moira Subsea Facilities

2.8.1 Shortlisted Decommissioning Options

The Moira Subsea Facilities consist of the Production Tree, Wellhead, and Wellhead Protection Structure (collectively known as the "Moira Wellhead Facilities") together with two small diameter pipelines (6" and 2") and an umbilical which connect the Moira well to the Maureen Platform.

The shortlisted Decommissioning Options for the Moira Subsea Facilities are shown in the table below, with the Selected Option highlighted:

SHORTLISTED DECOMMISSIONING OPTIONS FOR MOIRA SUBSEA FACILITIES

MOIRA WELLHEAD FACILITIES Remove to shore for recycling		
PIPELINES/ UMBILICAL Cover with gravel and leave *in situ*	**PIPELINES/ UMBILICAL** Rebury and leave *in situ*	**PIPELINES/ UMBILICAL** Remove to shore for reuse/recycling

2.8.2 Option Selection

Total removal of the Moira Wellhead Facilities is a fairly routine operation, and a clear seabed will eliminate the risk of fishing vessels snagging their nets on the equipment and will accord with the intent of OSPAR Decision 98/3. For these reasons an early decision was made to completely remove the Wellhead Facilities.

Two of the three options considered by the Maureen Owners would have involved leaving the two small diameter pipelines and the umbilical *in situ* under the seabed. However, none of the lines have weight coatings, and both removal options would require remediation efforts to ensure burial to a sufficient depth followed by an ongoing monitoring programme. In contrast, reverse laying of small diameter pipelines and umbilicals is an established and efficient technique which results in a clear seabed. Hence on the basis of costs, safety and environmental impact, the Selected Option is to remove these pipelines and the umbilical from the seabed by reverse laying.

2.8.3 The Selected Decommissioning Option

After the Wellhead Facilities have been recovered, the pipelines and umbilical will be removed by a reverse laying operation. All the recovered equipment will be removed for reuse or recycling and disposal onshore.

2.9 Decommissioning the Maureen Oil Loading Pipeline

2.9.1 Shortlisted Decommissioning Options

The following table shows the shortlisted alternatives for decommissioning the Oil Loading Pipeline, with the Selected Option highlighted:

SHORTLISTED DECOMMISSIONING OPTIONS FOR THE OIL LOADING PIPELINE

Float and tow to shore intact for disposal	Recover to sea surface intact, cut in sections and bring sections to shore for disposal	Cut in sections on seabed, retrieve sections and bring to shore for disposal	Clean and leave buried.

2.9.2 Option Selection

Weight-coated pipelines of the diameter and wall thickness of the Oil Loading Pipeline cannot be removed by relatively unobtrusive reverse laying techniques. Evaluation of potential removal alternatives has shown that removal of the Oil Loading Pipeline would result in a higher safety risk to decommissioning personnel, increased atmospheric emissions and disturbance of the seabed, increased costs, and negligible or zero environmental gains. The major part of the pipeline is stable and adequately buried, and it is expected to remain so. The exposed pipeline ends will be removed and recovered. For these reasons the Maureen Owners concluded to that leaving the Oil Loading Pipeline buried *in situ* is the best decommissioning option.

2.9.3 The Selected Decommissioning Option

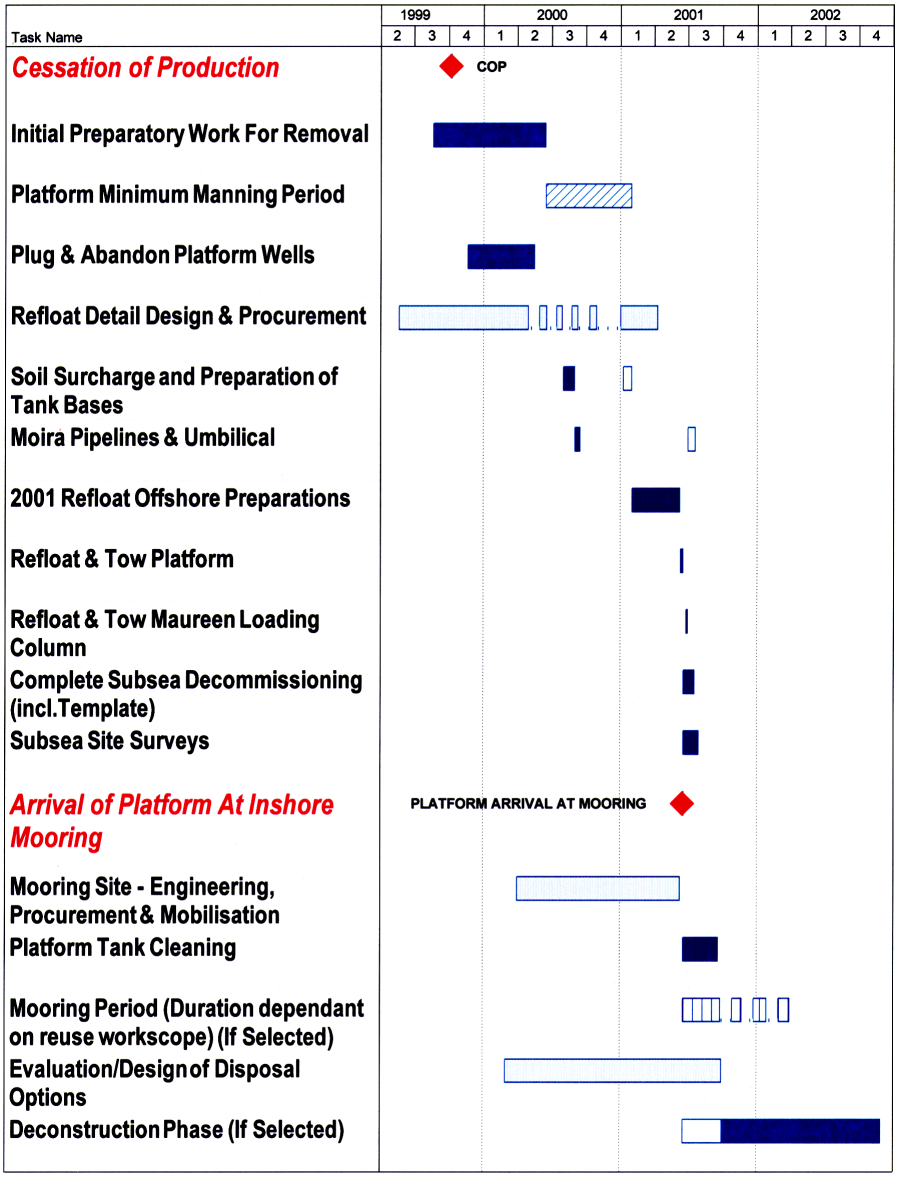
The Oil Loading Pipeline will be thoroughly cleaned prior to being left buried. The pipeline has already been flushed with warm oil to remove any waxy build-up and with sea water to flush out free hydrocarbons, with the residue being loaded onto a tanker via the Loading Column for onshore disposal. Final cleaning will be performed using an industry standard pigging process. The pipeline will then be disconnected from the Platform and the Loading Column, and the pipeline ends will be cut and removed at points below the seabed to avoid risk of snagging by fishing vessels. Any other sections of exposed pipeline identified during a final survey will be subject to reburial or covering with gravel for the same purpose.

2.10 Decommissioning Timetable

The main operations involved in the removal of Maureen Facilities are seasonal and weather sensitive, but it is expected that these activities will be completed in no more than two summer seasons. The soil surcharge will be placed on the seabed in summer 2000 or early in 2001, and the refloat of the Maureen Platform and Loading Column will take place in summer 2001. The Drilling Template will also be removed in summer 2001, soon after Platform refloat. A reuse opportunity for the Moira pipelines and umbilical might require this equipment to be removed during the 3rd or 4th quarter of 2000, otherwise these will be removed after Platform refloat. The reuse and/or deconstruction activities will take longer and insufficient information is available currently to quantify them.

The overall target schedule for the implementation of the Maureen Decommissioning Programme is given below:

Figure 2-2 Maureen Decommissioning Schedule



2.11 Costs

The cost of the contracts awarded under the Maureen Decommissioning Programme is £150 million. This cost covers the complete demolition of all the facilities and does not account for any variation brought about through reuse of any of the facilities in whole or in part.

2.12 Consultations

The Maureen Owners are actively consulting all interested parties on the proposed Maureen Decommissioning Programme. This approach is expected to result in a wider spectrum of consultees than that anticipated for statutory consultation as described in the DTI Guidelines.

To facilitate the consultation process, a copy of the Second Draft of this document has been posted on the Maureen web site[2] for review or downloading by interested parties. As each stage of the decommissioning process is carried out, information will be updated on the site. In addition, hard copies of this document can be made available by request at the Phillips Petroleum Company United Kingdom Limited offices in Woking and Aberdeen[3].

Comments and pertinent points raised, and the responses from and to statutory consultees, have been published on the Maureen web site and are included in this Third Draft document.

2.13 Status of the Decommissioning Programme

A Decommissioning Programme as defined in the DTI Guidelines on Decommissioning has six stages:

Stage 1	Preliminary discussions with government departments
Stage 2	Detailed discussions, submission and consideration of a draft Programme
Stage 3	Consultation with interested parties
Stage 4	Formal submission of a final Programme and approval under the Petroleum Act
Stage 5	Commence main works and undertake site surveys
Stage 6	Monitor the site

This Maureen Decommissioning Programme is submitted in Stage 4 of the above process with the intention of moving to Approval.

2.14 Notes and References

[1] Maureen Alpha Abandonment Safety Case
Document Number DP/AB/SC-022 – October 1999.

[2] Maureen web site
www.phillips66.com/Maureen

[3] Requests should be made by calling the Public Affairs Department of Phillips Petroleum Company United Kingdom Limited on
+44 (0)1483-756666

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