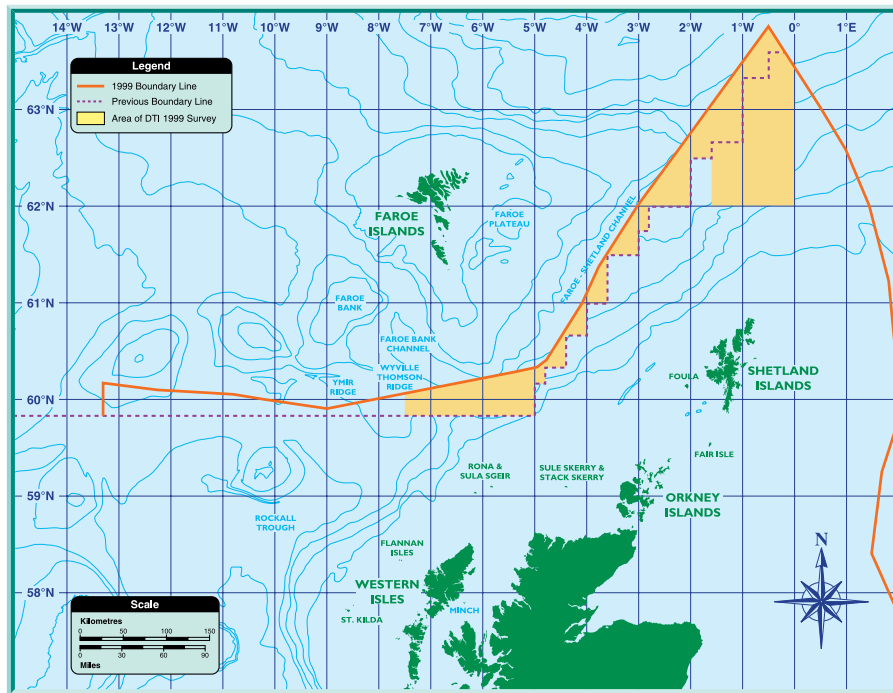


Report to the Department of Trade and Industry

Strategic Environmental Assessment of the Former White Zone

Volume 1 – An Overview of SEA Process, Key Issues and Findings



Consultation Document

AUGUST 2000

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1 SUMMARY

The UK Department of Trade and Industry (DTI) is conducting a Strategic Environmental Assessment (SEA) of the implications of licensing for oil and gas exploration and production, parts of a previously disputed area (the former White Zone) north-west of Scotland, between Shetland and the Faroe Islands (see Figure 1 on page 8). The SEA contributes to the consideration of environmental protection and sustainable development objectives in decisions regarding government plans and programmes.

A key part of SEA involves consultation with the public, environmental authorities and other bodies, together with such neighbouring states as may be potentially affected. The SEA is documented in three volumes for use in consultation:

- **Volume 1** - a stand alone summary of the process, key issues and findings
- **Volume 2** - a synthesis of environmental information for the relevant area (145 pages)
- **Volume 3** - a more detailed discussion of the nature of oil and gas exploration and production, potential impacts and prevention and mitigation measures (99 pages)

The proposed action considered by the SEA is the offer of Production Licences covering blocks in part(s) of the UK sector of the former White Zone through a 19th Round of offshore licensing. This follows the maritime boundary agreement between the UK and Faroe Islands of May 1999, which enabled licensing in the area for hydrocarbon exploration in both UK and Faroese waters. Blocks within the UK sector adjacent to the former White Zone have been licensed in previous rounds. The alternatives to the proposed licensing are not to offer any blocks, to license a restricted area, or to stagger the timing of activity in the area.

There is general agreement on the high level objectives and approach to SEA, but as yet no agreed methodology at an academic, European or international level. The SEA process followed here draws on studies commissioned by the UK government, European Commission and other organisations together with previous assessments of potential oil and gas licensing elsewhere.

At this stage, there is uncertainty in predicting the scale of potential hydrocarbon related activity which could follow the proposed licensing. In order to conduct the SEA, possible development and activity scenarios have been developed for consultation purposes by the DTI. These involve up to 15 exploration wells and the development of up to five producing fields comparable in size to the existing Foinaven and Schiehallion fields west of Shetland. Taken together, this activity would represent a small proportion of total oil and gas exploration and production in the UK, which for the west of Britain may involve some 15 exploration wells and up to 40 development wells over the next 5 years. As further context, in August 2000, seven oil exploration and production licences were awarded in Faroese waters (including part of the White Zone) with commitments to drill eight wells.

Physical, chemical and biological characteristics of the former White Zone, existing activities, and adjacent coastal environments are described in Volume 2 of the SEA. The main physical features of the area are the Faroe Shetland Channel and adjacent continental slopes and shelves, the Faroe Bank Channel and the Wyville Thomson Ridge. Water depths in the possible licence area range from 900 to 2400m.

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The area has a complex hydrographic regime, with distinct water masses resulting in a pronounced temperature gradient between shallow and deeper waters. The main surface and slope currents flow northwards across the Wyville Thomson Ridge in water depths to around 500m, with a deeper southward flowing cold current deflected westwards along the Faroe Bank Channel.

Seabird populations within the possible licence area are mainly breeding birds (fulmars, storm petrels, gannets, kittiwakes and various auks) from major colonies in the Faroe, Shetland, and Orkney Islands and more northerly breeding areas such as Norway and Iceland. In addition, a number of species migrate through the area in late summer and autumn (skuas and shearwaters), or are winter visitors (gulls and little auk). The Atlantic Frontier region – west and north of Scotland – contains substantial proportions of the north-east Atlantic breeding populations of some species, in particular great skua, gannet, puffin and black guillemot.

The Atlantic Frontier is considered important for marine mammals. Hooded seals utilise deep water in the Faroe Shetland Channel and north of the Faroes, throughout the year. Cetaceans in the possible licence area and adjacent waters can be broadly distinguished into several groups, on the basis of distribution and feeding:

- baleen whales (blue, fin, sei and humpback) are mainly recorded in deep water
- minke whales are summer visitors to shelf areas
- sperm and beaked whales are concentrated on the eastern flank of Rockall Trough, the southern flank of Wyville Thomson Ridge and along the eastern side of the Faroe Shetland Channel
- Atlantic white-sided and common dolphins are widely distributed in deep water
- white-beaked and Risso's dolphins are concentrated in shelf waters
- killer whale, bottlenose dolphin and harbour porpoise are all widely distributed over deep and shelf waters.

Seabed sediments and features in the area are diverse, with sediments in the deeper areas usually consisting of mud or muddy sand, and the proportion of mud decreasing upslope to the continental shelf break where the sediments are clean sands and gravel. The distribution of seabed sediments and features have been mapped by wide area surveys carried out in 1996 and 1998 on behalf of the Atlantic Frontier Environmental Network (AFEN), and in 1999 on behalf of DTI. Contaminant concentrations in sediments and sea water in the area are low and generally at, or close to, background levels.

Phytoplankton productivity in the area varies seasonally. In the North Atlantic, the spring diatom bloom generally peaks in May with a sharp decline in June. Zooplankton is dominated by the copepod *Calanus finmarchicus* which represents an important food source for the young of many fish species and is important in the recruitment of fish stocks of the area. The Faroe Shetland Channel an important over-wintering area for *Calanus finmarchicus* which are transported into the North Sea in spring.

Seabed communities in the area are characteristic of the interface of several biogeographic zones although they are widely distributed across the region. Water temperature and bathymetry have been identified as the primary environmental influences on distribution patterns in both community and species composition.

The Darwin Mounds on the southern flank of the Wyville Thomson Ridge were first discovered in 1998 and appear to be unique geological and biological features. The mound tails appear to have no physical expression, but are inhabited by dense populations of xenophyophores (single celled animals of up to 10cm diameter). The central mound

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appears to consist of blocky rubble with the cold water coral *Lophelia pertusa* usually present. The ecological significance of the mounds is unclear, although both *Lophelia* and xenophyophores are widely distributed elsewhere in the region.

The cold Norwegian Sea water of the deep Faroe Shetland and Faroe Bank Channels supports a sparse and distinct fish fauna, of little commercial value, with very few of the Atlantic deep water species which are found on the upper slopes of the Faroe Shetland Channel being present. The main commercial pelagic species found in the area are mackerel, Norway pout and blue whiting. Herring may also occur in the area and greater silver smelt is also present. Other than the greater silver smelt, commercial pelagic species are generally concentrated over the continental shelf and shelf break to the east.

Deep-water vessels from Scotland, France, Spain and Norway dominate fishing in the area, with fishing vessels from England, Faroe, Germany, Netherlands, Denmark and Ireland also present. The main demersal gears employed are otter trawls and long-lines, with some gill netting also being used. Demersal fishing effort in the area is relatively low compared to other UK waters with greatest effort being seen around the Wyville Thomson Ridge. Pelagic effort over the upper slope is at similar levels to that seen in other areas around the UK.

The waters of the former White Zone area are of minor importance for shipping. Coastal industry and activities in adjacent areas to the former White Zone (the Faroe, Shetland, Orkney and Western Isles and northwest Scotland) include fishing, aquaculture, tourism and recreation. All are of considerable importance to local economies.

The surrounding islands and coasts all have important conservation sites on international, European and national scales. Designated conservation sites include World Heritage Sites (St Kilda and parts of Orkney), Biosphere Reserves, Special Protection Areas (SPAs), candidate Special Areas of Conservation (cSACs), and Ramsar sites. These have variously been designated for importance in relation to breeding seabirds, wildfowl and moorland birds, seals, otters, vegetated sea cliffs, submerged caves, reefs, lagoons and archaeology.

The possible implications of oil and gas activity are considered in detail in Volume 3 of the SEA. While all sources of emissions, discharges and disturbance could potentially contribute to local, regional and global effects, five key sources were identified in terms of potential for cumulative impact.

1. Seismic survey uses high intensity noise sources, and could result in behavioural disturbance of whales and dolphins (cetaceans), including baleen and toothed whales and several species of dolphin which use or move through the area. In contrast to some previous licence rounds, most of the proposed area (and adjacent areas in UK and Faroese waters) has already been surveyed and limited additional seismic is likely to be required. However, even a scenario of up to three simultaneous surveys following licensing, would affect a relatively low proportion of the Faroe Shetland Channel, within which cetaceans are widely distributed at low density.
2. Drilling and production activities produce continuous or semi-continuous underwater noise and vibration, and recent studies have found sound levels near the Foinaven field to be relatively high. The cumulative effect of several developments would be related to specific locations, but could potentially represent a barrier to cetacean movements. However, available information does not suggest that cetaceans migrate along tightly defined routes in the possible licence area, and a significant effect is considered unlikely.
3. Drilling discharges would involve water based fluids, as the previous discharge of rock cuttings drilled with oil based fluids is no longer permitted in the UK. The accumulation of substantial “cuttings piles”, which has occurred under production platforms in the

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North Sea, is not predicted in the proposed licence area. The cold water coral *Lophelia pertusa* occurs on the Darwin Mounds and potentially elsewhere in the former White Zone, and may be susceptible to sedimentation resulting from drilling discharges. However, evidence of active sediment transport (e.g. rippled sand) in the area of the Darwin Mounds suggests that the corals present are normally subject to sediment deposition and to scour from particle laden bottom waters. It is also noteworthy that *Lophelia* has recently been found growing on various oil installations in the northern North Sea, suggesting greater tolerance to oilfield drilling solids and other discharges than has been hitherto recognised.

4. Reservoir (“fossil”) and injected water is produced along with hydrocarbons, and is generally the largest single wastewater stream in oil production. Produced water may be discharged overboard, or re-injected to a suitable geological formation. There is no evidence from intensively developed areas of the North Sea or elsewhere of cumulative acute or chronic toxicity effects from produced water discharges. However, increased hydrocarbon concentrations in sea water and sediments have been detected in the northern North Sea, which may be related to cumulative produced water discharges. The anticipated number of fields, highly dispersive environment and likelihood of reinjection make cumulative effects in the possible licence area unlikely.
5. Accidental oil spillage is a key concern regarding exploration and production activities in the proposed licence area, particularly in relation to subsea releases in deep water and to the risks presented by tanker export in comparison to pipelines. It was concluded in Volume 3, that the difficulty of deriving reliable predictions of potential spill frequency for future exploration and production operations, together with uncertainty over activity levels following the proposed licensing, would make it misleading to attempt a quantitative assessment of cumulative oil spill risk. However, using hypothetical exploration and production scenarios, illustrative cumulative spill frequencies have been derived. These suggest that, overall, cumulative spill risk associated with exploration scenarios is relatively low, with higher risks associated with production scenarios. At this stage, there are still a number of unknown factors, including the involvement and onward distribution routes of crude oil from terminals on Orkney and Shetland, which could contribute to overall risks in adjacent coastal waters. Further consideration of cumulative oil spill risks will therefore be necessary prior to approval of field developments.

With the possible exception of the combined physical effects on seabed communities of drilling discharges with those of commercial trawling, synergistic effects of exploration and production activities with those of other activities in the area are not predicted. A number of potential sources of effects could conceivably be detectable across national boundaries with the Faroe Islands and Norway; however, only oil spills are regarded as having the potential to result in significant environmental effects.

The DTI as licensing authority and offshore environmental regulator has at its disposal or is introducing a range of powerful legislation and other environmental control mechanisms, which provide a sound basis for the regulation of potential oil and gas activities in the former White Zone. In view of the sensitivities identified above, specific controls of seismic survey and production noise, and activities in the vicinity of the Darwin Mounds, are recommended under existing mechanisms. A number of gaps in information and understanding relevant to potential environmental sensitivities have also been identified, and may be addressed most efficiently through continuation of ongoing co-operative industry and government programmes including broad scale environmental monitoring.

The overall conclusion of the SEA is that, given adequate control and information gathering, there are no overriding reasons not to consider the UK sector of the former White Zone for oil and gas licensing.

2 STRATEGIC ENVIRONMENTAL ASSESSMENT

2.1 Introduction

Strategic Environmental Assessment is a process of appraisal through which environmental protection and sustainable development may be considered, and factored into national and local decisions regarding government (and other) plans and programmes.

The practice of Strategic Environmental Assessment, or Appraisal as it is sometimes termed in the UK, is varied and developing. This is exemplified in a quote from the report of the international seminar on Strategic Environmental Appraisal (DETR 1998a), "SEA processes vary in both scope and form far more than those used in EIA of projects. This is due to the wide range of strategic decisions to which SEA is applied. These include both broad policies and specific plans; they may relate to geographical regions, industrial sectors or social issues; and the time scales for their implementation may be immediate or very long term. In all of these cases, at least some of the environmental effects are likely to be diffuse, indirect and difficult to identify and predict." Largely this is because SEAs need to be conducted at an early stage, when there is uncertainty about the location, timing and scale of development, future economic and social circumstances and the availability of new technologies. Nonetheless, SEA is a valuable tool and the uncertainties identified are able to be taken forward for study and consideration certainly by the project specific assessment stage.

The Department of Trade and Industry (DTI) is conducting a Strategic Environmental Assessment (SEA) of the implications of licensing for oil and gas exploration and production, parts of a previously unlicensed area of the UK Continental Shelf (UKCS) to the north-west of Scotland.

A key part of SEA involves consultation with the public, environmental authorities and other bodies, together with such neighbouring states as may be potentially affected. The SEA is documented in three volumes for use in consultation. This volume may be read as a stand alone summary of the process, key issues and findings, the second volume is a compilation and synthesis of environmental information for the relevant area and the third volume presents a more detailed discussion of the nature of oil and gas exploration and production, potential impacts, and prevention and mitigation measures.

2.2 Context

In 1996, the European Commission proposed a Council Directive on the assessment of the effects of certain plans and programmes on the environment (Com (96)511), to provide a *strategic* complement to the Council Directives which require Environmental Impact Assessments of *specific* developments and activities (85/337/EEC and 97/11/EC). The Strategic Environmental Assessment Directive, as the proposed Directive is colloquially known, was amended in 1999 (Com (99)73) following discussion within the Commission and is currently awaiting adoption.

In advance of the adoption of the Directive, UK government departments, as part of the "Greening Government" initiative, are implementing the intent of the Strategic Environmental Assessment Directive and conducting Environmental Appraisals of their major plan and programme proposals.

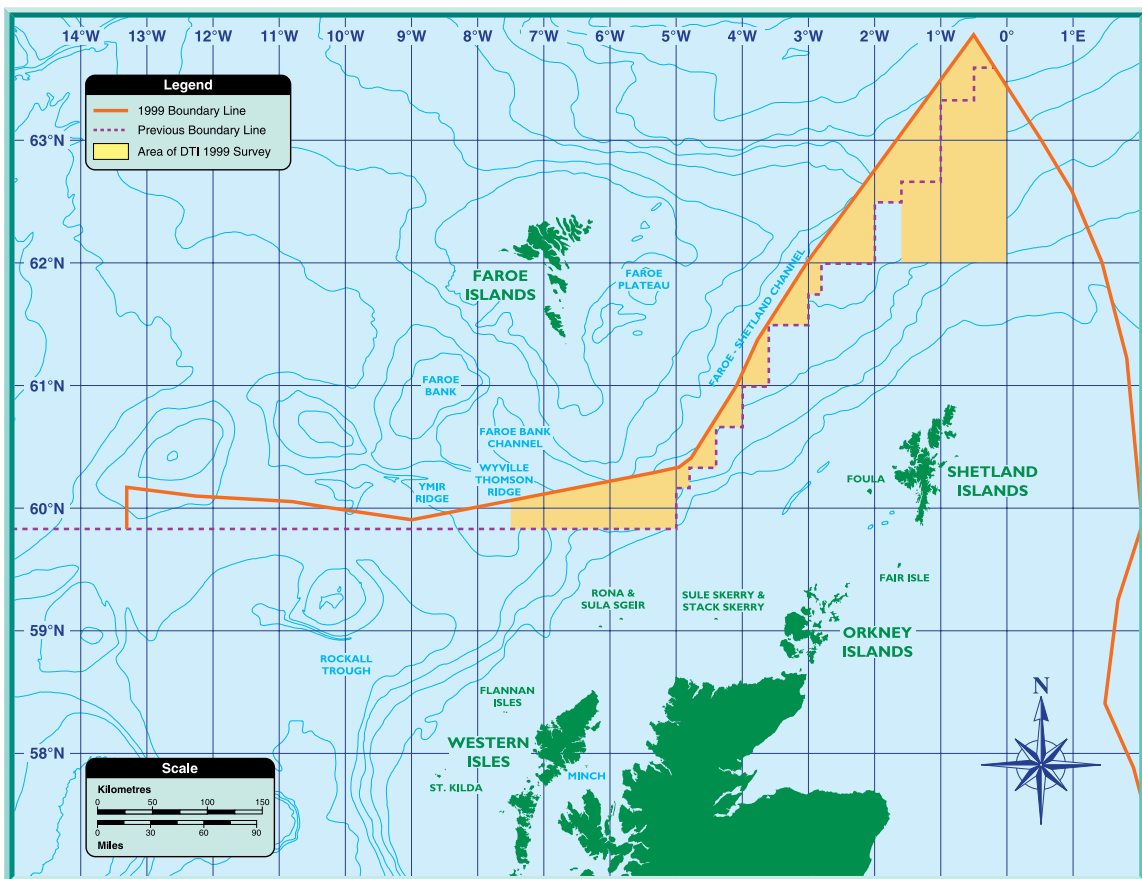
2.3 Function of this SEA

2.3.1 Background

The dividing line between UK and Faroese waters to the north-west of Scotland was formerly in dispute, with the disputed area being known as the “White Zone”. In May 1999, the UK-Faroe boundary was formally agreed, and consideration on both sides turned to licensing for hydrocarbon exploration. The maritime boundary agreement between the UK and Faroes was signed in May 1999 (see Figure 1 for the former and present boundaries). Subsequently, the UK sector of the former White Zone was designated a part of the United Kingdom Continental Shelf by means of a Statutory Instrument No. 2031 (under the Continental Shelf Act, 1964) which entered force in August 1999.

In line with the “Greening Government” initiative, the DTI set in train various actions to allow the intent of the SEA Directive to be met. These actions included the commissioning of a seabed survey and of a Strategic Environmental Assessment (SEA) of the implications of licensing. The seabed survey aimed to map, photograph and sample the seabed in parts of the UK sector of the former White Zone, to identify potentially sensitive features and areas which could qualify as Special Areas of Conservation under the Council Directive 92/43/EEC (the “Habitats and Species Directive”).

Figure 1 – Location of the UK sector of the former White Zone



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Scientific study of the area being considered for licensing commenced in earnest in 1868-70, with the cruises of *HMS Porcupine* and *Lightning*. In recent years the area has received renewed attention with major surveys conducted of seabed features and fauna, seabirds, cetaceans and hydrography. These studies are summarised in Volume 2 and emphasise the hydrographic complexity of the area and its importance for seabirds and cetaceans. Although no massive cold water coral reefs have been found in the area, two discrete areas with small coral colonies (the Darwin Mounds) were discovered by surveys conducted in 1998 and 1999 for the Atlantic Frontier Environmental Network and the DTI respectively.

A second DTI sponsored survey of the seabed, of parts of the former White Zone is taking place in Summer 2000, and the information from this survey will be used in licensing decisions and assessment of proposed hydrocarbon related activities.

2.3.2 Purpose and scope

Licensing of the UKCS for oil and gas exploration and production commenced in 1964 and has progressed through a series of rounds, the proposed licensing round would be the 19th.

The Petroleum Act, 1998 which consolidated among other issues, the Petroleum (Production) Act, 1934 and the Petroleum and Submarine Pipe-lines Act, 1975, became effective in February 1999. The Act provides the basis for granting onshore (Landward) and offshore (Seaward) Licences. There are two types of Seaward Licence:

- Exploration Licences - are non-exclusive and permit the holder to conduct non-intrusive surveys (e.g. seismic) on any area of the UKCS not covered by a Production Licence
- Production Licences - grant exclusive rights to the holders to “search and bore for, and get, petroleum” in specific blocks.

The proposed action is to offer Production Licences covering part of the UK sector of the former White Zone through a 19th Round of offshore licensing. The purpose of this SEA is to consider the environmental implications of this action and the potential exploration, development and production activities which could result.

The licence round process normally involves the following steps:

- Consideration of nominated blocks for shipping, fisheries, conservation and other sensitivities
- Offer of selected blocks by government
- Application for blocks of interest by companies, detailing proposed work programme, environmental management controls etc
- Interview of prospective licence holders by the DTI
- Offer of licence to successful applicant company, subject to its acceptance of a number of conditions

The SEA aimed to consider the following:

- The environmental protection objectives, standards etc established for the area relevant to the approval and subsequent implementation of the proposed action
- Any existing environmental problems in the area which may be affected by the proposed action
- Potential activities in the area
- The main mitigatory measures and alternatives investigated
- An assessment of the likely significant environmental consequences of the proposed action and its alternatives including the potential for cumulative, synergistic and transboundary effects

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- Proposed arrangements for monitoring the environmental effects of the proposed action and post decision analysis of its environmental consequences
- Difficulties encountered in compiling the information and a discussion of uncertainty of impact predictions

The assessment considers the potential environmental effects of opening the area to oil and gas exploration and production activity in terms of continued or future non-oil and gas uses, environmental contamination, biodiversity and conservation of the area. The wider policy issues of continued oil and gas production from the UKCS and sustainable development of the overall national hydrocarbon reserves are not considered since these are subjects for a different appraisal forum.

2.3.3 Alternatives

The alternatives to the proposed action are few, namely:

1. not to offer any blocks for Production Licence award
2. to restrict the area licensed by offering only a proportion of the blocks nominated
3. or to stagger the timing of activity in the area

2.4 The SEA process

2.4.1 Methodology

There is general agreement on the high level objectives and approach to SEA. However, in the absence of the final Council Directive on SEA, and with no agreed methodology for the conduct of a Strategic Environmental Assessment at an academic, European or international level, the approach taken here draws on studies commissioned by the UK government, European Commission and other organisations together with other strategic assessments conducted of potential oil and gas licensing, in particular:

Department of Environment Transport and the Regions 1998. Strategic Environmental Appraisal. Report of the International Seminar, Lincoln, 27-29 May 1998

European Commission 1998. Strategic Environmental Assessment Legislation and Procedures in the Community Volumes 1 & 2

European Commission 1998. Case Studies on Strategic Environmental Assessment Volumes 1 & 2

European Commission 1998. Strategic Environmental Assessment - Existing Methodology Volumes 1 & 2

WWF-UK 1997. The application of Strategic Environmental Assessment in relation to offshore oil and gas resources exploration

Thomassen *et al.* 1993. Åpning av Trøndelag I Øst, Nordland IV, V, VI og VII, Mørebasenget, Vøringbasenget I og II for letevirksomhet

Minerals Management Service 1998. Gulf of Mexico OCS oil and gas lease sales 171, 174, 177 and 180. Western planning area. Final environmental impact statement

Published and other available information on the natural environment and human uses of the area were sourced, reviewed and compiled in the preparation of the Synthesis of Environmental Information (Volume 2). In addition, Environmental Authorities and other

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potential sources of unpublished information were consulted. A comprehensive reference listing is given in Volume 2. Key information sources for the former White Zone include the preliminary report of the DTI commissioned seabed survey of the area, the draft Joint Nature Conservation Committee (JNCC) reports of seabird and cetacean occurrence, reports of surveys and studies conducted on behalf of the Atlantic Frontier Environmental Network (AFEN) and the Faroes Geophysical Environmental and Metocean group (GEM) and the draft report to JNCC of investigations of the deep sea fisheries to the west of Britain.

A literature search (and consultation) was undertaken to identify potential hazards and the nature and scale of potential environmental effects of the consequences of licensing all or part of the UK sector of the former White Zone. The environmental effects of oil and gas exploration and production have been extensively researched and reviewed over the last 30 years. Reviews of effects usually attempt to be comprehensive or address a specific topic, such as drilling wastes, the effects of oil on marine mammals etc. The general reviews and position papers considered in conducting the SEA are listed below:

Title	Reference
Environmental effects of offshore oil production. The Buccaneer gas and oil field study	Middleditch (1981)
Long-term environmental effects of oil and gas development	Boesch and Rabelais (1987)
North Sea oil and the environment: developing oil and gas resources, environmental impacts and responses	Cairns (1992)
North Sea quality status report 1993	NSTF (1993)
Åpning av Trøndelag I Øst, Nordland IV, V, VI og VII, Mørebasenget, Vøringbasenget I og II for letevirksomhet	Thomassen <i>et al.</i> (1993)
Environmental implications of offshore oil and gas developments in Australia	Swan <i>et al.</i> (1994)
Likely impacts of oil and gas activities on the marine environment and integration of environmental considerations in licensing policy	Hailey (1995)
Polluting the offshore environment	Joint Links (1995)
Environmental trends in the Gulf of Mexico in the twentieth century: The role of offshore oil and gas industry.	Gallaway <i>et al.</i> (1997)
Gulf of Mexico OCS oil and gas lease sales 171, 174, 177 and 180. Western planning area. Final environmental impact statement	MMS (1998)
The Atlantic Frontier Britain's last wilderness	Murray and Simmonds (1998)
Oil and gas in the environment	Environment Agency (1998)

In addition, a wide range of papers, topic specific reviews, reports and environmental statements have been consulted and are considered in the assessment of effects. These are referenced as appropriate in each volume and listed in the respective bibliographies.

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2.4.2 Activity scenarios

As noted above, at this stage there has to be uncertainty in predicting the scale of potential hydrocarbon related activity in the UK sector of the former White Zone. In order to conduct an assessment of the implications of licensing, possible development and activity scenarios have been developed for consultation purposes by the DTI. Early indications are that up to 15 exploration wells could be drilled over the next five years. It should be noted that only a small proportion of exploration wells lead to commercial discoveries. The DTI estimated recoverable reserves on a P50 basis (i.e. probability of 50%) of up to 1.7 billion barrels of oil equivalent. Such reserves could result in the development of five producing fields, similar in size to the existing Foinaven and Schiehallion developments west of Shetland.

Seismic surveys have already been conducted over much of the area being considered for licensing. For the purposes of assessment two seismic activity scenarios have been developed.

Cumulative and other effects have been assessed based on the following exploration and development scenarios. These scenarios include seismic, exploration drilling and production phases (i.e. are not mutually exclusive) and must only be considered as indicative. Both exploration and development activity levels and timing would depend on a range of factors including the number of blocks licensed, work programme commitments made by licensees, exploration success, economic and commercial factors and Government approval of project development plans.

Scenario (1) Exploration seismic survey – available data are considered sufficient, with little requirement for further survey

Scenario (2) Exploration seismic survey – comparable effort to summer 1997 (post-17th Round), with ten surveys in possible licence area during May-September 2001. Up to three simultaneous surveys at any time.

Scenario (3) 15 exploration wells drilled over five years, 2002-2007

Scenario (4) Recoverable reserves of 1.7 billion barrels of oil equivalent discovered, exploited through development of 3 fields similar in size to Foinaven and 2 fields similar to Schiehallion with all export by shuttle tanker to Sullom Voe and/or Flotta

Scenario (5) As Scenario (4), but with export by pipeline to Sullom Voe or Flotta.

The potential effects of UK former White Zone licensing cannot be considered in isolation and need to be placed in the context of likely seismic survey, drilling and development activities on the already licensed UKCS Atlantic Frontier acreage, together with that in the recently licensed Faroese areas.

The DTI estimate that UKCS Atlantic Frontier exploration activity over the next five years will be in the order of 5 seismic surveys, up to 10 wells to the west of Shetland and up to 5 wells west of the Hebrides. In addition, up to 40 wells may be drilled over the next five years to develop existing hydrocarbon discoveries or expand currently producing fields.

Following the UK Faroes boundary agreement, the Faroese government launched a Licensing Round on the 17 February 2000 with Licences awarded on the 17 August 2000 (see www.oms.fo). A total of seven licences for hydrocarbon exploration and production were granted to five consortia of oil companies. Four were six year licences, covering a total of 1,234 km² in the extreme south-east of the area offered, with work programmes committing to the drilling of a total of eight exploration wells over the term of the licences.

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The remaining three licences, were for a nine year period, covering a total of 2,980 km². The nine year licences cover preparatory activities only, with no commitment to drill, and are issued on condition that prior to the end of the first three years, a work programme for the remaining period and/or a relinquishment plan is agreed with the Faroese Government. Note that, seismic surveys have previously been conducted covering all of the newly licensed areas. The four licences in the south-east of the area have been surveyed using 2-D and 3-D seismic and the remaining licences have been investigated primarily by 2-D seismic survey. The possibility of further seismic survey in the area cannot be discounted.

2.4.3 Consultation

Linked to the DTI's SEA process for the former White Zone, has been consideration of potential offshore Special Areas of Conservation (SAC). As part of this process, the government's nature conservation advisors, the JNCC, consulted with a wide range of individuals and academic, government and non-governmental organisations requesting information on potential areas that might be considered as SACs. In addition, as part of its continuing dialogue on policies and plans with non-governmental organisations through the Joint Links network, the DTI requested to have relevant information on the former White Zone area drawn to its attention. Information from both these sources has been made available for the preparation of this SEA.

Consultation with those responsible for, interested or potentially affected by the outcome of decisions is a key element of SEA. The DTI intends for a wide consultation, both within the UK and adjacent states, on the proposed 19th Round of licensing, using the SEA consultation document as a basis. To facilitate this consultation, in addition to hard copies the SEA will be available on the DTI web site at www.og.dti.gov.uk together with the routes for consultee feedback. The results of the consultation will be documented as part of the SEA and considered in the decision on former White Zone licensing.

3 POSSIBLE IMPLICATIONS OF OIL & GAS ACTIVITY

3.1 Introduction

The sources and mechanisms of direct, indirect and other effects are considered in Volume 3, Sections 4.2 – 4.16. While all sources of emission, discharge and disturbance contribute to local, regional and global concentrations, levels or loads, only the following are considered to have the potential to result in significant individual or cumulative effects:

- Underwater noise from
 - Seismic surveys
 - Drilling, production facilities and support vessels
- Drilling discharges
- Produced water discharges
- Accidental oil spills

3.2 Cumulative Effects

3.2.1 Underwater noise

The importance of the deeper waters to the west of Scotland for large and small cetaceans is clear from past whaling records, recent sightings surveys and hydrophone studies. These studies are building a general picture of the occurrence of the different species in the area. What is much less clear is the extent to which the area is used as a migration route, exemplified by recent hydrophone records throughout the year of vocalisations of fin whales, previously thought to migrate seasonally through the area. However, some species do appear to be migratory in the area e.g. humpback whales. Also unclear are many aspects of the ecology of most of the cetacean species in the area including feeding grounds, food resources and fidelity, and how the resources are partitioned between species.

3.2.1.1 Seismic survey

In general, seismic survey is an intermittent activity, with a trend towards co-operative surveys of newly-licensed areas funded by several companies covering larger areas. However, in the summers following the 16th and 17th UK offshore licensing round block awards there were numerous seismic surveys on the Atlantic Margin. This raised the concern that the areal extent, intensity and duration of insonification might result in significant disturbance of cetaceans using or moving through the area (Gordon *et al.* 1998). An area of uncertainty is whether exposure to sufficiently intense noise from seismic survey, either once or repeatedly, will result in behavioural effects or physiological responses in terms of reduced hearing sensitivity in cetaceans through temporary or permanent threshold shifts (see Volume 3, Section 4.10).

Scenario (1) represents minimal source of seismic noise and is unlikely to result in significant effect. Scenario (2) represents a “worst case” for seismic noise disturbance, with potential for sequential effects on individual animals moving between affected areas and for simultaneous effects over a relatively large area (9,400km², assuming a threshold level causing effect of 160 dB re 1µPa and spherical spreading from three surveys with no overlap, giving an affected radius of 31.6km, Gordon *et al.* 1998). Additional cumulative effects may also be associated with simultaneous or sequential seismic survey over the next 3 years in the recently issued Faroese Licenses 005, 006 and 007. In relation to regional habitat availability, sperm and beaked whales utilise the shelf edge along the 1000m contour. The maximum cumulative area affected in this case is low, since the possible licence area includes only a small proportion of the total shelf edge north of the Wyville Thomson Ridge (i.e. both sides of the Faroe Shetland and Faroe Bank Channels). Baleen whales and deep water dolphin species are more widely distributed, the maximum simultaneous cumulative affected area associated with Scenario (2) comprises a limited proportion, ca. 15% of the Faroe Shetland Channel area.

Monitoring of the effects of previous seismic activity is of insufficient duration and spatial resolution to conclusively assess the likelihood of significant cumulative effects on cetaceans (see Volume 3, Section 4.10).

3.2.1.2 Drilling and production

Power generation and other activities on exploration rigs, production facilities and their support vessels represent continuous or semi-continuous sources of underwater noise and vibration in an area. Studies on such noise and its effects, particularly on cetaceans, are few although the results of the pop-up hydrophones deployed around the Foinaven field are relevant to consideration of the issue in the context of the former White Zone (see Volume 3,

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Section 4.10). Cetacean vocalisations are used for prey location and communication, and while there is no evidence for oilfield operational noise interfering with either of these functions in cetaceans, the possibility of a cumulative masking effect exists. The cumulative noise from a series of production installations along the Faroes Shetland Channel and adjacent areas could be conjectured to introduce a level of chronic disturbance such that it interfered with cetacean communication or feeding. In contrast, it could also be conjectured that the ocean is a noisy environment (through e.g. wind, wave and geological seismic noise) and cetacean noise discrimination must be acute, allowing extraneous noise to be ignored.

In the event that behavioural avoidance does occur as a result of exploration and/or production noise, it is conceivable that developments could represent a barrier to cetacean migrations. However, although the disturbance effect would be continuous, available source level measurements suggest that the radius of effect of individual developments is unlikely to exceed that associated with seismic (ca. 30km, see above) and no cetacean species in the area are known to migrate along a route as laterally defined as this. It is possible although unlikely that developments could be located sequentially across or along a migration route so as to present a cumulative barrier.

The noise source levels, number and duration of exploration wells considered in Scenario (3) do not suggest that cumulative noise effects are likely, even in combination with the wells anticipated in immediately adjacent UK and Faroese waters. However, production noise associated with Scenarios (4) and (5) does represent a potential cumulative effect, with preliminary data suggesting that the source intensity of FPSO developments is higher than previously appreciated. In the absence of control and mitigation measures, chronic cumulative noise disturbance could affect a proportion of the available deep water baleen whale and dolphin habitat of the Faroe Shetland Channel. Consequently, while cumulative effects from operational noise are not predicted on the basis of past evidence, as a precautionary measure, noise and vibration abatement should be included in new installation design.

3.2.2 Drilling discharges

The effects of drilling discharges are considered in Volume 3, Sections 4.3 and 4.8, with the chief area of concern being the Darwin Mounds, a discrete group of features often with coral colonies on the southern flank of the Wyville Thomson Ridge (see Figure 4, Volume 2). The spatial extent of acute and chronic effects from discharges of drill cuttings and mud have been the subject of considerable debate (contrast Davies *et al.* 1989 and Reiersen *et al.* 1989). This debate has centred on effects from oil based mud drilling, and since the routine discharge of such material is no longer permitted in the UKCS, it is not considered further. Drilling discharges involving water based drill muds are normally permitted in the OSPAR area, Gulf of Mexico and elsewhere, with the effects of such discharges generally held to be minor and insignificant.

It has been conjectured (see Volume 3, Section 4.8) that the cold water coral *Lophelia pertusa*, which occurs on the Darwin Mounds and elsewhere in the area, may be susceptible to sedimentation resulting from drilling discharges on the assumption that sediment loads in deep-water habitats are generally low. The strong currents found in the general area and favoured by *Lophelia* may both cause sediment suspension and transport and alleviate the effects of increased sediment load. There is evidence of active sediment transport (rippled sand) in the area of the Darwin Mounds suggesting that the corals present are normally subject to particulate deposition and to sediment scour from particle laden bottom waters. It is noteworthy that *Lophelia* has recently been found growing on various oil installations in the

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northern North Sea, suggesting greater larval dispersive ability and adult tolerance to oilfield drilling solids and other discharges than has been hitherto recognised.

The possibility of sublethal and eventually lethal effects from water based drill muds on some filter feeding shellfish benthic species has been raised by Canadian laboratory studies (see Volume 3, Section 4.8). It is unclear if these effects will occur in field conditions or if the test species exhibits extreme sensitivity to suspended particulates. However, studies of multiple well development drilling off California found possible field effects on some filter feeding epifauna. If further study indicates that certain suspension feeders are sensitive to the size fractions and specific gravities of water based mud drilling materials, then drilling discharges from a series of wells in the former White Zone area could result in cumulative effects. Drilling discharges from adjacent UKCS areas and potentially from the Faroes area may also contribute to the possibility of cumulative effects in the area. However, in view of the uncertainty about the occurrence of field effects, the substantial water depths over the area (promoting wide dispersion) and the progressive trend towards reinjection of drill muds and cuttings during field development, it is concluded that significant cumulative effects are unlikely.

Around 200 exploration, appraisal and development wells have been drilled on the existing licensed areas to the north west of Scotland. If the drilling wastes from the wells were transported and accumulated in seabed “sinks” a potential for cumulative effects could be seen. No evidence of areas of elevated concentrations barium in sediment (a useful tracer of drilling discharges) was found during the AFEN 1996 and 1998 or the DTI 1999 surveys (although slight elevations have been noted around field development sites west of Shetland, see Volume 3, Section 4.3). This suggests that past drilling discharges in the area have been very widely dispersed by the energetic and directionally diverse currents rather than accumulating in discrete sinks in the area.

In this context, the potential cumulative effects associated with 15 exploration wells (Scenario 3) and ca. 75 development wells (Scenarios 4 and 5) together with projected exploration and development drilling activity levels in adjacent UK and Faroese waters, are not considered likely to be significant.

3.2.3 Produced water discharges

There is no evidence from the North Sea or elsewhere of cumulative acute or chronic toxicity effects resulting from produced water discharges (see Volume 3, Section 4.2). A progressive raising of “background” levels of sediment hydrocarbon concentrations in some areas of the North Sea has been recorded although it is unclear if this is a result of oil based mud drilling discharges, oil spills, shipping, atmospheric fallout or produced water discharges. For the former White Zone, cumulative effects of produced water discharges associated with Scenarios (4) and (5), either in the water column or at the seabed, are unlikely in view of a progressive shift towards reinjection of produced water (including at the existing Schiehallion/Loyal fields development west of Shetland). In addition, where produced water discharges are made, the performance of treatment equipment has been improved resulting in a progressive reduction in the average oil in water concentration of UK produced water discharges (DTI 2000).

3.2.4 Accidental oil spills

It was concluded in Volume 3, Section 4.5 that the difficulty of deriving reliable predictions of potential spill frequency for future exploration and production operations, together with uncertainty over activity levels following the proposed licensing, would make it misleading to

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attempt a quantitative assessment of cumulative oil spill risk associated with licensing in the former White Zone.

The incremental frequency of a major oil spill (>1,000 tonnes) is low and is dominated by tanker offloading incidents. Credible scenarios for hydrocarbon releases on this scale (e.g. blowouts, major process failures, shuttle tanker casualties) involve multiple failures of management and control systems. Minor spills, <5 tonnes, were considered more likely, and could result from a wide variety of sources including subsea flowline and flange failures.

For illustrative purposes, semi-quantitative estimates (orders of magnitude) for cumulative spill frequencies associated with Scenarios (3), (4) and (5) are given below. These have been derived from historic spill frequencies and stochastic spill trajectory analyses cited by a range of project Environmental Statements (see Volume 3 Section 4.5). For Scenario (4), it is assumed that one shuttle tanker would be utilised per development.

Scenario (3) – cumulative oil blowout frequency 10^{-3} – 10^{-2} /year, giving cumulative frequency of coastal oiling 10^{-4} – 10^{-3} /year.

Scenario (4) - cumulative minor (<1 tonne) process spill 10^1 /year, minor (10 tonnes) loading spill frequency 10^{-1} /year, major (10,000 tonnes) blowout, process and loading spill frequency 10^{-4} /year giving cumulative frequency of coastal oiling 10^{-5} /year. Additional, unquantified frequency associated with tanker movements in coastal waters and offloading.

Scenario (5) – cumulative minor process spill 10^1 – 10^2 /year, minor pipeline spill frequency 10^{-1} /year, major blowout, process and loading spill frequency 10^{-4} /year, major pipeline spill frequency not quantified.

The frequency ranges listed above suggest that, overall, cumulative spill risk associated with exploration scenarios for the possible licence area is relatively low, with higher risks associated with development scenarios, in particular for tanker export (Scenario 5). In addition, there are a number of unknown factors, including the likelihood of tanker spills associated with distribution of crude hydrocarbons from terminals, which could contribute to overall risks in Orkney and Shetland coastal waters as a result of development of the possible licence area. Further consideration of cumulative oil spill risks is therefore likely to be necessary prior to approval of field developments. On a UKCS scale, the country has been a net exporter of oil since 1979. Tanker traffic movements (with associated risks) are influenced by relative rates of domestic consumption, import and export and are not simply related to production rates. It is therefore not possible to quantify risk directly associated with downstream consequences of licensing the former White Zone.

3.3 Synergistic effects

Cumulative and synergistic effects from exploration and production activities with those of other activities in the area are not predicted. One possible exception would be the physical effects of drilling discharges and commercial demersal trawling on benthic biotopes (specifically, the Darwin Mounds) although this would be mitigated through the assessment and consenting processes for wells (see Section 4). The individual sources of potential significant effect identified in Volume 3 affect only one sensitivity and conversely major receptors are predicted to be significantly affected by only one major source of impact. Therefore, significant negative synergistic effects in relation to existing uses of the area, in particular fishing and potential future oil and gas activities in the area are not expected.

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3.4 Transboundary effects

One of the objectives of the proposed EU Council Directive on the assessment of the effects of certain plans and programmes on the environment is to promote adequate consideration of, and consultation between the relevant governments, on transboundary effects where a plan or programme in one Member State may have significant effects on the environment of another.

The Convention on Environmental Impact Assessment in a Transboundary Context was signed in 1991, and is known as the Espoo Convention. This applies to various major activities with the potential to cause transboundary effects and includes offshore hydrocarbon production and large diameter oil & gas pipelines. Projects need to be screened for the potential transboundary effects and an Environmental Impact Assessment and international consultation by government conducted if necessary.

The area under consideration for licensing under the UK 19th offshore licensing round abuts the international boundaries with the Faroe Islands and Norway. Norway is a member of the European Free Trade Association but not a member of the EU and the Faroes is a self governing territory of Denmark, but not a full member of the EU.

The activities likely to occur following a decision to licence some or all of the UK sector of the former White Zone are summarised in Section 3 with their potential environmental effects discussed in Volume 3, Sections 4.2 – 4.16. Of the potential sources of effect from oil and gas exploration and production, the following have the potential to be detected in the national waters of adjacent countries:

- Seismic noise
- Light
- Drilling discharges
- Combustion emissions
- Underwater noise from vessels and operations
- Produced water discharges
- Oil spills
- Chemical spills

Many of the above aspects may be able to be detected physically or chemically in adjacent States, particularly from activities on the international boundary. However, only oil spills (see Section 3.5 above) are regarded as having the potential to result in significant environmental effects.

4 CONTROL, MANAGEMENT AND MONITORING

4.1 Existing controls

The DTI as licensing authority and offshore environmental regulator has at its disposal or is introducing a range of powerful legislation and other environmental control mechanisms. The first is the choice of which blocks to offer and on what basis to award them. Other principal controls are as follows:

- Through the licensing mechanism and Model Clauses under the Petroleum Act, 1998, the DTI can introduce additional environmental controls without primary legislation

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including temporal and exploration/ development activity constraints and requirements to gather more information pre or post activity. These controls can be UKCS wide or Block specific. In addition, Petroleum Operations Notices (PONs) outline further requirements of Licensees in relation to certain activities under their licences.

- With the exception of seismic survey, all major activities which could result from the issue of Production Licences are subject to a staged consenting process and the requirements of The Offshore Petroleum Production and Pipe-lines (Assessment of Environmental Effects) Regulations 1999.
- Under the Merchant Shipping (Oil Pollution Preparedness, Response and Co-operation) Regulations 1998, drilling from a mobile rig, oil pipelines and producing facilities are required to have in place an approved oil spill contingency plan, underpinned by oil spill risk assessment and demonstration of adequate response capability.
- The discharge to sea of oil is an offence under the Prevention of Oil Pollution Act, 1971 unless an exemption has been obtained, for example those issued by the DTI permitting and controlling the discharge of produced water
- The implementation of the European Directive (96/61/EC) on integrated pollution prevention and control (IPPC) is being staged for offshore facilities and will in the near future result in rigorous control of operational emissions and discharges through assessment and permitting. The new regime will replace most of those existing mandatory and voluntary controls administered by the DTI for offshore emissions and discharges.

In addition, major or important reefs, selected other species/groups or seabed features may be designated as Special Areas of Conservation under the European Directive on the conservation of natural habitats and of wild fauna and flora and if so, under the terms of the Directive, an Appropriate Assessment would be required if a plan or project would be likely to have a significant effect on the SAC (unless directly connected with the management of the site for nature conservation purposes).

Several aspects of offshore oil and gas operations in Scottish waters are regulated by other bodies, notably:

- Radioactive sources and wastes (including naturally occurring radioactive materials) by the Scottish Environment Protection Agency under the Radioactive Substances Act, 1993
- Oil drainage water by the Marine and Coastguard Agency under the Merchant Shipping (Prevention of Oil Pollution) Regulations, 1996
- Wastes returned to land for treatment, recycle or disposal, by the Scottish Environment Protection Agency under the Environmental Protection Act, 1990 and the Special Waste Regulations, 1996
- Non operational discharges to sea (such as rock dumping) by the Scottish Executive Rural Affairs Department under the Food and Environment Protection Act, 1985

The above controls, together with those implementing the International Convention for the Prevention of Pollution from Ships, 1983 as modified by the Protocol of 1978 (Marpol 73/78), provide a sound basis for the regulation of potential oil and gas activities in the former White Zone. Activity and area specific considerations are noted in the Sections below.

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4.2 Further controls

Seismic surveys may be conducted under Exploration or Production Licences. As a licence condition, the licence holder conducting the survey must comply with the terms of Petroleum Operations Notice No 14 Notification of Geophysical Surveys, with respect to consultation, prior notification and application of the DETR guidelines for minimising acoustic disturbance to marine mammals from seismic surveys (DETR 1998b). More detailed assessment of the implications of individual surveys and the possibility of cumulative effects should be considered for seismic surveys in and around the former White Zone area, in recognition of the importance of the area for cetaceans, the difficulties of visual observation in the vicinity of seismic vessels and uncertainties about the potential for disturbance effects.

4.3 Potential site specific controls

The Darwin Mounds are regarded as vulnerable to physical damage and potentially to smothering by particulates. However, there are alternatives to exclusion from licensing which could involve activity exclusion zones, the extent of which would require further understanding of the occurrence and ecology of these features.

4.4 Information gaps

Gaps in information and understanding relevant to potential operational activities are:

- The spatial and temporal distribution of seabirds (particularly the winter months) and their use of the area, required for oil spill risk assessment and response planning
- Further information on cetacean distribution and use of the area
- Information on cephalopod distribution and abundance (as a major component of the pelagic fauna and food resource for some cetaceans)
- High resolution topographic and biotope surveys of specific areas selected for drilling or development
- The ecological importance and susceptibility to disturbance of large sponges
- Propagation of seismic noise in the area
- Background noise levels in the area
- Operational noise levels from the range of potential activities and identification of low noise technologies
- The geology and ecology of the Darwin Mound features

It is noted that a number of the above gaps can be filled most efficiently through co-operative action including broad scale environmental monitoring.

4.5 Monitoring

The routine monitoring and reporting of the major sources of emissions and discharges from exploration and production activities is a legal requirement and the resulting information would be publicly available. In addition, performance monitoring is a prerequisite of a company's EMAS or ISO 14001 environmental management system.

Depending on the nature of the activity and the potential sources of significant effect, a selective programme of monitoring and review should be required to assess the accuracy of model outputs and other predictions made in Environmental Statements. In particular, the

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predictions made regarding noise levels from drilling and production operations should be tested and coupled with observation of cetacean behavioural responses. Similarly, visual observation (and where appropriate, acoustic monitoring) of cetaceans should be conducted during all seismic surveys.

Programmes for the monitoring of contamination and sediment recovery from physical disturbance resulting from licensed activities should be linked to the scale of activities and nature of discharges. It is recognised that some installation designs will incorporate reinjection technologies and so result in limited marine discharges.

4.6 Conclusion

The overall conclusion of this assessment is that, given adequate subsequent control and information gathering, there are no overriding reasons not to consider the former White Zone for oil and gas licensing. The area of seabed features known as the Darwin Mounds contain the coral *Lophelia* and should be subject to stringent control measures to prevent direct and indirect effects. The potential for cumulative effects on cetaceans of seismic and operational noise should also be considered prior to project-specific approvals. While the area as a whole is recognised as important for seabirds and cetaceans, on the basis of available information, no individual areas of the UK sector of the former White Zone were identified as being so important that they should not be considered for licensing with proper controls.

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5 GLOSSARY

Term	Definition
Acute	Of relatively short duration
Appraisal well	Well drilled to determine the physical extent, reserves and likely production rate of a field
Baleen whale	Filter feeding whale
Benthic	Relating to organisms living in or on the seabed
Biodiversity	Diversity of species
Biotope	A physical habitat and its associated biological community
Blow-out	The uncontrolled release of oil, gas or water from a well
Cephalopods	Marine molluscs including cuttlefish and octopus
Cetaceans	Aquatic mammals including whales, dolphins and porpoises
Chronic	Of relatively long duration
Darwin Mounds	Seabed features found on the southern flank of the Wyville Thomson Ridge
Development well	Well drilled in order to produce hydrocarbons from a proven field
Drill cuttings	Rock chips produced as a result of drilling
Drilling mud	Mixture of clays, water and chemicals used to cool and lubricate the drill bit, return rock cuttings to the surface and to maintain hydrostatic pressure to maintain well control
Environmental Impact Assessment	Systematic assessment of the environmental effects a proposed project may have on its surrounding environment
Environmental Management System	System established to manage an organisation's processes and resultant environmental impacts
Environmental Statement	Formal document presenting the findings of an EIA process for a proposed project. Issued for public consultation in accordance with The Offshore Petroleum Production and Pipe-lines (Assessment of Environmental Effects) Regulations, 1999
Epifauna	Organisms living on the surface of the seabed
Exploration well	Well drilled to determine whether hydrocarbons are present in a particular area

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Term	Definition
Hydrocarbon	Compounds containing only the elements carbon and hydrogen, the main components of oil and natural gas
Hydrography	In this context, the study of sea water masses, currents and tides
ISO 14001	International standard for environmental management systems
Licence block	Area of the sea which has been sub-divided and licensed to a company or group of companies for exploration and production of hydrocarbons
Licensing round	An allocation of licences made to oil companies
Produced water	Water removed from the reservoir along with oil and natural gas
Seismic	Survey technique used to determine the structure of underlying rocks by passing acoustic shock waves into the strata and detecting and measuring the reflected signals. Depending on the spacing of survey lines, the seismic is referred to as either 2 or 3-D.
Special Area of Conservation	Areas designated as European Sites under the Habitats and Species Directive
Strategic Environmental Assessment (or Appraisal)	An appraisal process through which environmental protection and sustainable development is considered in decisions on plans and programmes
White Zone	The formerly disputed area of sea between the UK and the Faroes

6 ACRONYMS, SYMBOLS AND ABBREVIATIONS

μPa	Micropascal
AFEN	Atlantic Frontier Environmental Network
dB	Decibel
DETR	Department of Environment, Transport and the Regions
DTI	Department of Trade and Industry
EC	European Community
EEC	European Economic Community
EIA	Environmental Impact Assessment
EMAS	Eco Management and Audit Scheme
ES	Environmental Statement
EU	European Union
FPSO	Floating, Production, Storage and Offloading Facility
IPPC	Integrated Pollution Prevention and Control
JNCC	Joint Nature Conservation Committee
MARPOL	International Marine Pollution Convention
OSPAR	Oslo and Paris Commission
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment or Appraisal
UK	United Kingdom
UKCS	United Kingdom Continental Shelf

7 REFERENCES

Boesch DF and Rabelais NN (1987). Long-term environmental effects of oil and gas development. Elsevier Applied Science, London.

Cairns WJ (1992). North Sea oil and the environment: developing oil and gas resources, environmental impacts and responses. Elsevier, Cambridge.

Davies JM, Bedborough D, Blackman RAA, Addy JM, Appelbee JF, Grogan WC, Parker JG and Whitehead A (1989). The environmental effect of oil-based mud drilling in the North Sea. In *Drilling Wastes* (FR Engelhardt, JP Ray and AH Gillam eds), pp. 59-89. Elsevier Applied Science, London.

DETR (1998a). Strategic Environmental Appraisal. Report of the international seminar, Lincoln 27-29 May 1998. Department of Environment, Transport and the Regions, London, 35pp.

DETR (1998b). Guidelines for minimising acoustic disturbance to marine mammals from seismic surveys. Department of Environment, Transport and the Regions, London. Available at www.jncc.gov.uk

DTI (2000). Development of the oil and gas resources of the United Kingdom 2000. The Stationery Office. Available at www.og.dti.gov.uk

Environment Agency (1998). Oil and gas in the environment. Environmental Issues Series, The Stationery Office, 104pp.

Gallaway BJ, Senner RGB, Fechhelm RB and Hubbard GF (1997). Environmental trends in the Gulf of Mexico in the twentieth century: The role of offshore oil and gas industry. Report to the American Petroleum Institute, 110pp. Available at www.api.com

Gordon JCD, Gillespie D, Potter J, Frantzis A, Simmonds M and Swift R (1998). The effects of seismic surveys on marine mammals. In, Seismic and Marine Mammals Workshop, 23-25 June 1998 (sponsored by AMJIG and IAGC).

Hailey N (1995). Likely impacts of oil and gas activities on the marine environment and integration of environmental considerations in licensing policy. English Nature Research Reports No 145, 29pp.

Joint Links (1995). Polluting the offshore environment. The practices and environmental effects of Britain's offshore oil and gas industry. Report to the Joint Links' Oil and Gas Consortium, 15pp.

Middleditch BS (ed) (1981). Environmental effects of offshore oil production, the Buccaneer gas and oil field study. Plenum Press. 446pp.

MMS (1998). Gulf of Mexico OCS Oil and Gas Lease Sales 171, 174, 177 and 180. Western Planning Area. Final Environmental Impact Statement. US Department of the Interior Minerals Management Service, Gulf of Mexico OCS Region. New Orleans.

Murray L and Simmonds M (1998). The Atlantic Frontier; Britain's last ocean wilderness. Greenpeace and the Whale and Dolphin Conservation Society Report.

NSTF (1993). North Sea Quality Status Report 1993. North Sea Task Force. Oslo and Paris Commissions. International Council for the Exploration of the Sea. Olsen & Olsen, Fredensborg, 132 pp.

Strategic Environmental Assessment of the Former White Zone

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Reiersen L-O, Gray JS, Palmork KH and Lange R (1989). Monitoring in the vicinity of oil and gas platforms; results from the Norwegian sector of the North Sea and recommended methods for forthcoming surveillance. In *Drilling Wastes* (FR Engelhardt, JP Ray and AH Gillam eds), pp. 91-117. Elsevier Applied Science, London.

Swan JM, Neff JM and Young PC (1994). Environmental implications of offshore oil and gas development in Australia -the findings of an independent scientific review. Australian Petroleum Exploration Association, Sydney, 695 pp.

Thomassen J, Bamstedt U, Munro Jensen B, Mariussen, A Moe KA and Reiersen JE (1993). Åpning av Trøndelag I Øst, Nordland IV, V, VI og VII, Mørebasenget, Vøringbasenget I og II for lettevirksomhet. Konsekvensutredning for miljø, naturressurser og samfunn. Nærings- og energidepartementet, Oslo, 132 pp.