dti

SEA 7

Environmental Report

MARCH 2007

25TH OFFSHORE OIL & GAS LICENSING ROUND

STRATEGIC ENVIRONMENTAL ASSESSMENT

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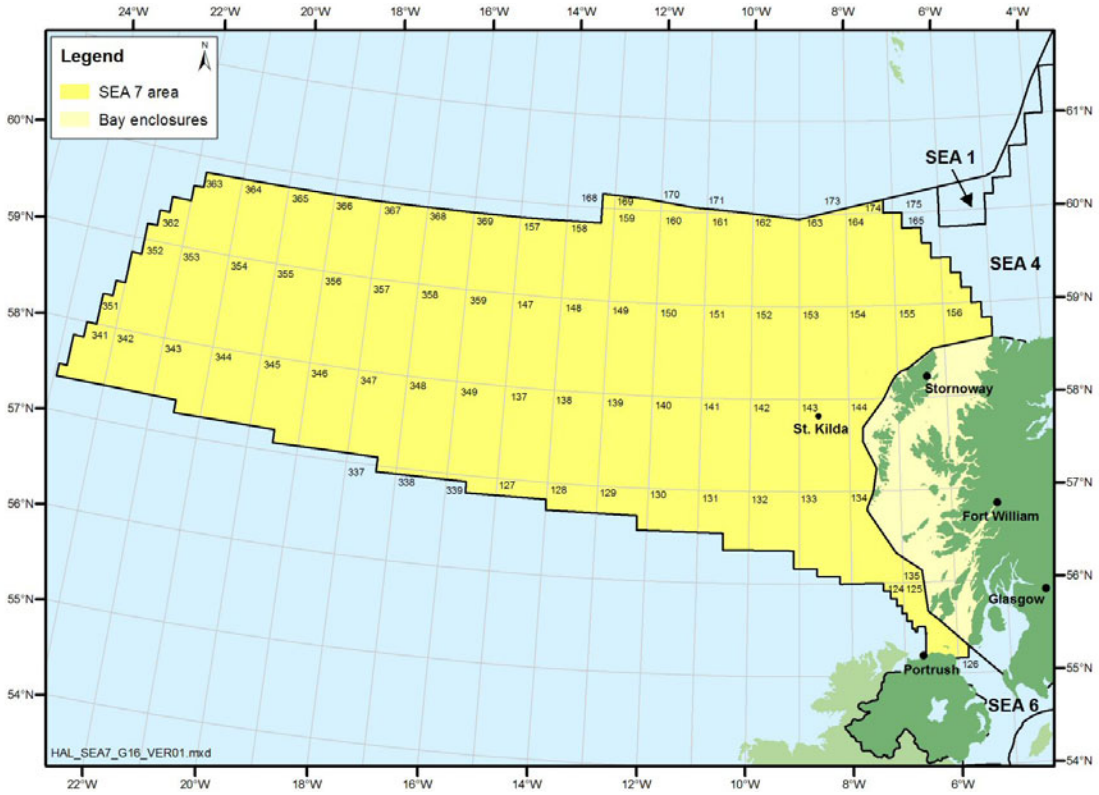
NON-TECHNICAL SUMMARY

This non-technical summary provides a synopsis of the Strategic Environmental Assessment (SEA) of the Department of Trade and Industry's (DTI) draft plan to hold a 25th round of offshore oil and gas licensing. As context, the recently published Marine Bill White Paper notes that activities in the marine area contribute substantially to the UK economy and quality of life, with an annual economic contribution in the order of £67 billion. Important contributors are oil and gas (£22.3 billion), tourism and recreation (£16 billion), naval defence (£6.5 billion), and ship and boat building and repairs (£3 billion), with significant contributions being made by ports (£1.6 billion), fisheries (£0.5 billion) and a range of other activities.

The draft plan and areas covered

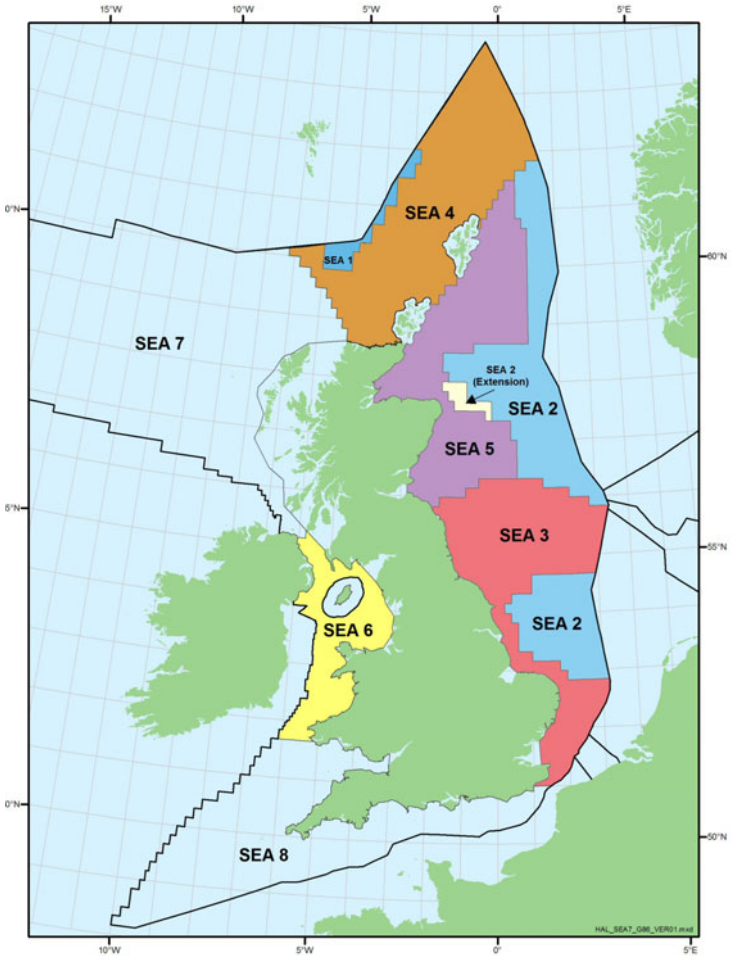
The draft plan is to invite applications for licences for blocks in the SEA 7 area to the north and west of Scotland (highlighted in bright yellow in the figure below) and to grant licences to successful applicants. These licences merely grant exclusivity to any hydrocarbon resources within a block to a company or consortium and do not by themselves permit any field activities, which are subject to a range of regulatory controls and consenting requirements.

The SEA 7 area



In addition, the draft plan includes the proposed re-offer during the same licensing round, of currently unlicensed blocks in the areas covered by earlier offshore oil and gas SEAs 1 to 6 (see figure overleaf).

DTI SEA sequence



For oil and gas licensing purposes the United Kingdom Continental Shelf (UKCS) is divided into quadrants of 1° of latitude by 1° of longitude with each quadrant further partitioned into 30 blocks, each of about 250km^2. Blocks within the SEA 7 area were first offered for licensing in 1971. The whole area comprises over 1600 blocks although the great majority have not previously been licensed, with only 8 blocks now wholly or partly under licence, and 93 that have been previously licensed but are now wholly relinquished. It is unlikely that blocks west of about longitude 14 degrees west will be offered for licensing or taken up as the far west boundary of the UKCS is not yet internationally agreed, they are beyond normal search and rescue helicopter range, and there are major gaps in environmental information for the area.

Most coastal blocks in the SEA 7 area are not part of this draft plan as they lie within bay closure lines (shaded in pale yellow on the figure below) which are subject to a different licensing regime. However, to allow full consideration of the draft plan for a 25th round of offshore licensing, SEA 7 also addresses the potential for effects on these blocks.

The overall DTI SEA programme covers offshore energy (oil & gas and renewables), but in the SEA 7 area (and other waters adjacent to Scotland) renewable energy is a devolved matter and would not be the subject of a DTI SEA. For other UK waters there is currently no draft plan for a leasing round for renewable energy and so SEA 7 addresses only the proposed oil and gas licensing round.

Strategic Environmental Assessment

The SEA process aims to help inform DTI licensing decisions through consideration of the environmental implications of the proposed plan and the potential exploration, development and production activities which could result from its implementation. The DTI began a sequence of sectoral SEAs in 1999 to consider the implications of further licensing of the UKCS for oil and gas exploration and production. To date six offshore oil and gas licensing SEAs have been completed (see figure above). SEA 1, in preparation for the 19th Seaward Licensing Round in 2001, addressed the deep water area along the boundary between UK and Faroese waters. SEA 2 covered the central spine of the North Sea with the majority of

existing UK oil and gas fields and following an assessment, a minor extension was made to the SEA 2 area. SEA 3 assessed the remainder of the southern North Sea. SEA 4 addressed the UKCS area to the north and west of Orkney and Shetland, SEA 5 covered the areas to the east of the Scottish coast, and SEA 6 was of the Irish Sea. During 2003, in preparation for a second round of offshore wind leasing, the DTI also conducted an SEA covering three strategic regions off the coasts of England and Wales.

Strategic Environmental Assessment (SEA) is now also required under the *Environmental Assessment of Plans and Programmes Regulations 2004*, which implement a European Directive on the subject, and this SEA has been prepared in accordance with its requirements.

SEA 7 process

The DTI offshore energy SEA process has developed over time, drawing in concepts and approaches from a variety of individuals, organisations and other SEAs as well as addressing the requirements of legislation and guidance. The process followed for SEA 7 and temporal sequence of events is summarised below although it is noted that certain activities such as information gathering continue throughout the process:

Initial scoping for SEA 7 with the SEA Steering Group, environmental authorities and a range of academic and conservation organisations commenced early in 2005 and focussed on ascertaining seabed and other survey needs. This was because of the timescale needed to organise, collect and analyse offshore information and samples. The conclusion of scoping was that further seabed survey work was necessary to investigate seabed habitats and biota, particularly of the seamounts, banks and pinnacles in deeper water well offshore. Survey field work was conducted during the summers of 2005 and 2006 using a variety of vessels and in collaboration with others interested in furthering understanding of the area including the British Geological Survey and Joint Nature Conservation Committee.

In addition, a range of other technical studies and syntheses of data were commissioned to underpin the SEA 7 assessment. These technical and data reports are summarised in Appendix 3 of the Environmental Report and are available for download at www.offshore-sea.org.uk where documents for previous SEAs are also available.

The DTI have developed a regional overview of the likelihood of hydrocarbons being present in commercial quantities in the SEA 7 area, together with likely scenarios in terms of block uptake and number of seismic surveys, wells and developments (see below and Section 2).

An Assessment Workshop involving the SEA Steering Group, Technical Authors and SEA Team was held in October 2006 and summarised in Appendix 11. The output of this workshop included the list of SEA objectives and indicators (see Section 3), the draft plan alternatives (see below) and a list of topics to be considered in more detail in the Environmental Report.

A formal scoping consultation was conducted with the Consultation Bodies/Authorities in November 2006 and feedback received is summarised in Appendix 1.

A stakeholder meeting was held in Glasgow on 26th March 2007 which was attended by stakeholders from a wide variety of organisations, sectors and areas. The stakeholder input on the SEA 7 information base, draft recommendations and other issues is given in Appendix 11.

The SEA assessment has considered the above information as well as the:

- Environmental receptors in the area and likely evolution of the existing baseline conditions (Section 4 and Appendices 3-9)
- Nature of likely operations, their potential environmental effects and existing regulatory or other controls in place to mitigate effects (Appendix 10)
- Implications of other plans and programmes (Appendix 2)
- Gaps in knowledge and understanding

The assessment of the draft plan and recommendations to the DTI are given in the SEA 7 Environmental Report which forms the basis for public consultation. The next steps following public consultation are described at the end of this non-technical summary.

Alternatives

SEA 7 addresses all the blocks within the area in terms of the implications of licensing for oil and gas exploration and development. Depending on the outcome of the SEA process and other Government considerations, all or a proportion of the unlicensed blocks within the SEA 1 to 7 areas may be offered for licensing in the 25th round.

Alternatives to the draft plan to hold a 25th oil and gas Licensing Round have been agreed as:

1. Not to offer any blocks for Production Licence award
2. To proceed with the licensing programme as proposed
3. To restrict the area licensed temporally or spatially

Prospectivity

There has been very little oil and gas exploration activity in the SEA 7 area to date. A number of exploration wells have been drilled but there are no producing fields or associated infrastructure.

For commercial hydrocarbon resources to occur, a number of factors and features have to coincide, including:

- The presence of source rocks, with an appreciable organic matter content
- Adequate depth of burial to allow the conversion of the organic matter to oil or gas through the action of temperature and pressure
- The presence of rocks with sufficient porosity to allow the accumulation of oil or gas
- Cap or seal rocks to prevent the oil or gas from escaping from the reservoir rocks
- Migration pathways to permit oil and gas formed in the source rocks to move to reservoir formations

Aside from a few blocks surveyed with 3D seismic and several blocks with sparse 2D seismic data, the bulk of SEA 7 is devoid of data to appropriately evaluate the real potential for hydrocarbons. Only 11 exploration wells have been drilled to west of the Hebrides of which one (the 154/1-1 well) found the “Benbecula” gas accumulation. Based on this there is a strong likelihood there could be more scope for ‘hydrocarbon traps’ on a trend stretching

south from the "Benbecula" well to the "Dooish" well in the Irish sector along a 260 by 30kms wide corridor along the continental slope in water depths of between 700m and 2,000m.

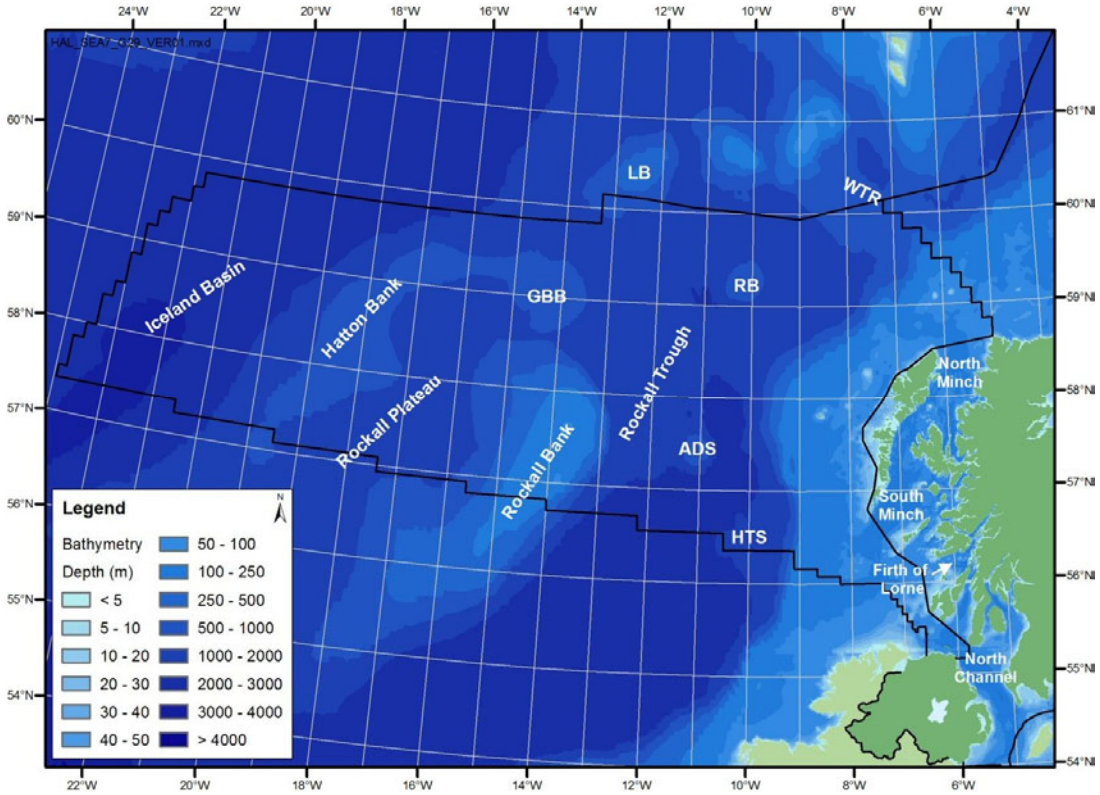
The geology of the area around the Hebrides and St. Kilda is not viewed as having prospectivity for hydrocarbons whilst the large area to the far west in deeper water is too poorly known to be definitive.

For the blocks in the SEA 7 area the DTI estimate that less than 10 x 2D seismic surveys, 2 to 8 x 3D seismic surveys and up to 10 drill or drop/contingent wells may be bid as part of 25th Round applications, with only half the wells actually being drilled. The anticipated timing of these wells over the first 5 years after licensing is: 1 in 2009, 2 in 2010 and 2 in 2011. Further activity levels will depend on the results of these initial exploration activities.

Overview of the SEA 7 environment

SEA 7 is the largest of the SEA areas. Topographically it includes sheltered coastal sea lochs, the exposed Hebrides continental shelf, the continental slope beyond the shelf to extensive areas of deep water muds of the Rockall Trough. The deep water area contains a number of major banks such as the Rockall and Hatton Banks as well as several seamounts. The area is bounded to the north east by the Wyville Thomson Ridge, a major ecological divide between warm and cold water areas.

Topographic features of the SEA 7 area



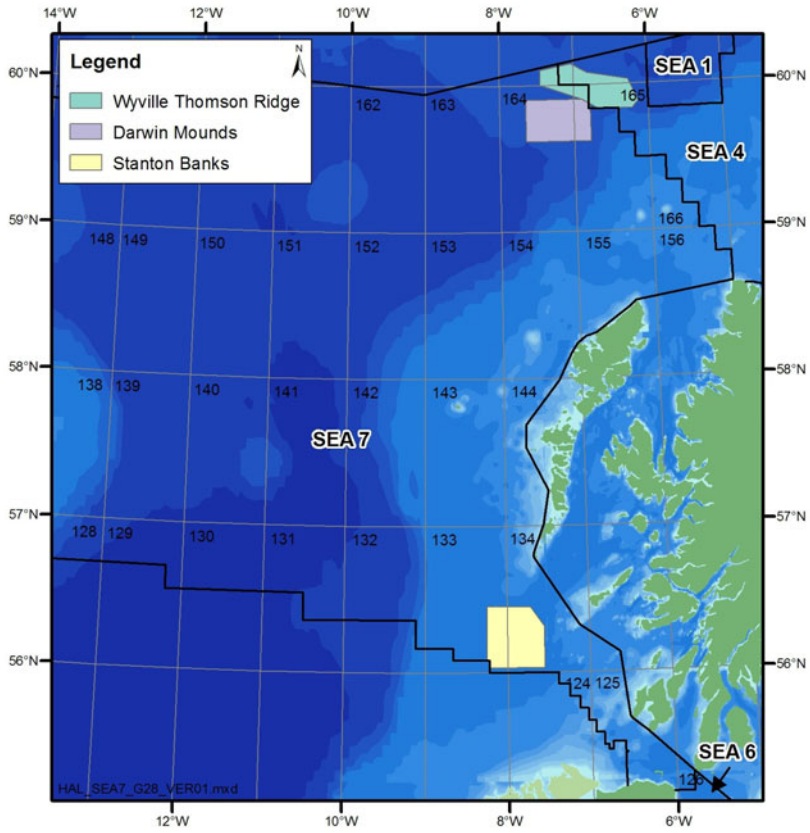
Notes: ADS - Anton Dohrn Seamount; LB - Lousy Bank; GBB - George Bligh Bank; HTS - Hebrides Terrace Seamount; RB - Rosemary Bank; WTR – Wyville Thomson Ridge.

The region is fully exposed to North Atlantic winds and waves. Water movement is largely from south west to north east with the prevailing current system dominated by an along shelf slope current of warm Atlantic water, the European Shelf Current. This is subject to some

seasonality and variability in speed according to the influence of depth contours. In the north of the region the current passes over the Wyville Thomson Ridge and a proportion of the water enters the North Sea by the Fair Isle current between Orkney and Shetland, and also from the north to the east of Shetland. Deeper waters to the west of the shelf edge are a mixture of water masses of different origin including periodic overspill of Arctic water from the north. Strong bottom currents around many of the seamounts and banks play an important role in determining the distribution of sediments and seabed biological communities.

The wide range in bathymetry, water currents and other factors results in a diverse array of seabed habitats and biological community types. Whilst shelf habitats have been fairly well described, those in deeper waters have remained largely unknown. The DTI SEA-funded seabed surveys of 2005 and 2006, which were largely directed at the major banks and seamounts of the area, have provided valuable information on these offshore areas and documented several cold water coral reefs and features of potential conservation importance. It is likely that based on this information a number of potential new offshore Special Areas of Conservation (SAC) will be selected in the SEA 7 area in the future. Currently three offshore areas in SEA 7 have been put forward as SACs for coral, stony and reef habitats on the Darwin Mounds, Wyville Thomson Ridge and Stanton Banks – see figure below.

Offshore conservation sites in the SEA 7 area



Within shelf and coastal waters, there are a large number of conservation sites of international and national importance, many of which cover extensive marine areas. The region is of great importance for seabirds (including puffin, guillemot, gannets, fulmar, shearwaters and other petrels) and waterbirds (e.g. seaduck, divers and geese), both during and outwith the breeding season. This importance is reflected in the number of Special Protection Areas (SPA) designated. One of the most important conservation sites is St. Kilda which is an SAC, SPA, World Heritage Site and National Nature Reserve which has 89% and 24% of the north east Atlantic population of Leach's petrel and gannet respectively. The most abundant breeding bird on St. Kilda is the puffin with over 135,000 nests. Some of the birds breeding on St. Kilda and other offshore islands feed beyond the shelf edge (e.g. Leach's petrel).

The SEA 7 area is also very important for marine mammals, with ten species of whale and dolphin recorded regularly, and the shelf region is of particular importance for harbour porpoise and a variety of dolphin species. Although data is limited, the deeper waters off the shelf appear to be important for a number of medium sized and large whale species, including beaked whales, sperm whale and humpbacked whale. Some whales migrate through the SEA 7 area between their Arctic feeding grounds and their breeding grounds at lower latitudes, although it is uncertain if defined migration routes are used.

Shelf areas are also very important for grey and harbour seals. Many of the region's islands support important breeding and moulting haul out sites for both species, with the exposed shelf waters to the west of the Hebrides of particular importance to foraging grey seals. More sheltered areas of the Minch and around Islay appear to be important for foraging harbour seals.

The SEA 7 area is largely rural and undeveloped. Important coastal activities and industries include tourism and mariculture, with fishing important both in coastal and offshore waters (including the offshore banks and seamounts). Offshore waters also contain important shipping routes, military practice areas and past munitions and other disposal sites. A number of telecommunications cables traverse the region.

Overview of main sources of effect and controls in place

The main stages of oil and gas activity are:

1. Exploration, including seismic survey and exploration drilling
2. Development, including production facility installation, generally with construction of an export pipeline, and the drilling of producer or injector wells
3. Production, with routine supply, return of wastes to shore, power generation, chemical use and produced water reinjection
4. Maintenance
5. Decommissioning, including cleaning and removal of facilities

The main sources of potential environmental effects are:

- Noise (impulsive) from seismic survey and piling during installation
- Noise (continuous) from drilling rig, production facility or vessels
- Physical damage (acute) from anchoring, pipeline construction
- Physical damage (non-acute) from particulate smothering
- Physical presence (biological) colonisation of structures by organisms
- Physical presence (human uses) interference with other users of the sea
- Chemical contamination (routine) from drilling and production discharges
- Chemical contamination (accidental) from spills etc
- Atmospheric emissions (air quality) from fuel combustion, venting
- Atmospheric emissions (climate) from fuel combustion

All the major stages of oil industry operation offshore are now covered by environmental regulations (see Appendix 10). Consents (with applications supported by assessments of effects) are required for seismic survey, exploration drilling, field development, pipeline installation, development drilling, field operation (including atmospheric emissions, production of hydrocarbons, use of chemicals, produced water treatment), offshore facility modification, field decommissioning etc. The major consents also include a public

consultation stage which allows stakeholders to draw issues to the DTI and developers attention.

Environmental Report

The Environmental Report provides a basis of information for formal consultation with the statutory consultation bodies and authorities and with the public, regarding the implications of the draft plan and its alternatives.

In accordance with the SEA Regulations, the following potentially affected receptors were included within the scope of the assessment.

- Biodiversity, habitats, flora and fauna
- Geology and sediments
- Landscape/seascape
- Water environment
- Air quality
- Climatic factors
- Population and human health
- Material assets (infrastructure, other natural resources)
- Cultural heritage, including architectural and archaeological heritage
- Interrelationships of the above

Information on the SEA 7 environmental baseline and its likely evolution has been grouped into these subject areas and the SEA 7 assessment has used the same headlines to maintain line of sight.

The assessment is given in Appendix 11 and summarised in Section 5. The key points and conclusions are highlighted below.

Biodiversity, habitats, flora and fauna

Assessment summary

All areas of the UKCS contain potentially vulnerable habitats and species. In recognition of this and in response to developing societal expectations, regulatory control of oil industry activities, including assessments as part of permitting requirements, and increasingly stringent discharge and emissions standards have been introduced over the years. Risk assessment for specific activities are required which take particular note of seasonal variations in seabird vulnerability, marine mammal distributions and seal moulting/pupping periods. The majority of exploration drilling and all field developments would be subject to statutory Environmental Impact Assessment (EIA) which is documented in an Environmental Statement and subject to public consultation allowing stakeholder input to consent decisions. Pre-activity studies include documentation of the key components of the local environment, such as mapping of seabed habitats and filling gaps in understanding of seabird and marine mammal distribution and abundance as necessary. As a result of the above, significant effects on the marine environment as a result of routine operations are mitigated to acceptable levels. Consequently, for previous SEA areas there seems no reason not to re-offer blocks offered for licensing in previous rounds (unless assessment is continuing as for some blocks in Cardigan Bay and the Moray Firth). For the SEA 7 area the magnitude of the gaps in basic understanding are such that a precautionary approach is suggested to licensing to allow some of the gaps to be filled.

For accidental events, regulations are in place which require operators to develop effective oil spill plans and mitigation measures, covering the organisation of response and the provision of physical and human resources. For some potential locations, estimated times within which oil might beach, under worst case trajectory modelling conditions, are very short. Effective contingency planning and local resources will therefore be necessary to allow the deployment of response measures where appropriate. In some cases, there is strong seasonality in specific sensitivities – in particular in relation to bird populations. Existing regulatory controls emphasise the risk management and contingency planning aspects of environmental management, including the timing of operations.

Since the start of the DTI offshore energy SEA programme, a number of Natura 2000 conservation sites (SACs and SPAs) have been proposed in offshore waters. In respect of coastal, marine and offshore Natura 2000 conservation sites, an Appropriate Assessment (AA) screening or full assessment (as appropriate) of the plan would be undertaken by the DTI after the block applications have been received. The AA process considers the potential of likely resultant activities in the blocks to adversely affect the integrity of Natura 2000 sites. The AA provides a further opportunity for the DTI to draw operator attention to block or local environmental sensitivities and, if viewed as necessary, to place specific temporal, spatial or other conditions on block licences. Operators should be made aware of the possibility that subsequent project level AA for a proposed operation which might affect Natura 2000 sites may conclude that consent is withheld if there is a risk to site integrity which cannot be effectively mitigated. The geology near St. Kilda is not considered prospective for hydrocarbons and on this basis applications for licences in the vicinity of the islands are not expected.

For the SEA 7 area it is concluded that blocks west of 14 degrees west should be withheld from licensing for the present. This is in view of the paucity of information on many potentially vulnerable components of the marine environment and that the analysis of SEA collected seabed data on carbonate mounds and coral reefs in the area and hence potential designation of areas as Natura 2000 sites is not yet complete. In addition, the far west boundary of the UKCS is not yet internationally agreed and is beyond normal search and rescue helicopter range. The offer of licences east of 14 degrees west is supported since there is relatively more data available including that generated during past seismic and drilling activities in the area. The DTI should draw to the attention of applicants that for some activities in certain areas of SEA 7, baseline data on selected components of the marine environment will require to be collected in advance of operations to underpin risk and other assessments.

For the previous SEA areas, the blocks in or overlapping with the boundaries of the Moray Firth and Cardigan Bay SACs should be withheld from licensing for the present whilst the further assessments initiated following the 24th Licensing Round applications are concluded.

Geology and sediments

Assessment summary

All SEA areas include a wide range of geomorphological features resulting from the underlying solid geology, past glaciations and recent processes, with sediments including muds to boulders. Various oil industry activities would result in sediment disturbance or potentially, without mitigation, destruction of small scale features. The seabed mapping undertaken in advance of operations would allow the identification and hence avoidance of valued features. Contamination of sediments may occur from discharges of drilling wastes,

production wastes such as produced water, or spills. The composition of planned discharges is regulated, with increasingly stringent controls applied in recent years. Monitoring results indicate that sediment contamination is not a significant issue. The geological information derived from seismic survey and the drilling of wells is regarded as a positive contribution to the understanding of the UKCS.

Landscape/seascape

Assessment summary

Areas potentially prospective for hydrocarbons in the SEA 7 area are beyond the sight of land and landscape or seascape interactions are not envisaged. Certain blocks within the previous SEA areas abut or are close to the coast, and for these areas exploration drilling or field developments would be subject to statutory EIA which would include visual impact assessment. The Environmental Statements produced as part of the EIA process are subject to public consultation allowing stakeholder input to consent decisions.

Water environment

Assessment summary

Contamination of water may occur from discharges of drilling wastes, production wastes such as produced water (i.e. water produced along with oil and gas during the production phase), or spills. It is not expected that significant discharges of produced water will be made, since there is a strong presumption against marine discharge and regulatory preference for reinjection to a suitable subsurface formation.

Drilling discharges are comprehensively regulated, with the discharge of oil-based drilling fluids effectively banned, and strict controls implemented over chemical additives used in water-based fluids. In view of the water depths and current regimes prevalent in prospective parts of the SEA 7 area, significant contamination or ecological effects of drilling discharges are not expected.

Other operational discharges are subject to regulatory controls, and are not considered to have significant environmental risk.

Monitoring results indicate that water column contamination and associated biological effects are not significant issues. This would apply to blocks in all SEA areas under consideration in SEA 7.

Air quality

Assessment summary

Atmospheric emissions from the potential activities likely to follow implementation of the DTI's draft plan could affect local air quality. Gaseous emissions contribute to regional acid gas loads and local low level ozone and potentially smog formation. The principal routine operational emissions during oil industry exploration and production (E&P) operations are of combustion products (CO_2, CO, NO_X, SO_2, CH_4, and volatile organic compounds (VOCs)) from power generation and engines on rigs, production facilities, vessels and helicopters. Fugitive emissions such as from cement tanks, diesel storage and cooling/refrigeration systems could potentially occur, resulting in emissions of dust/particulates, VOCs,

hydrofluorocarbon refrigerants etc dependent on source. The scale and timing of projected activity in the SEA 7 area, the distance offshore and limited other such sources in the region indicate that significant effects on local and regional air quality will not occur. A similar assessment is made for the other SEA areas, although in some there are appreciable other oil industry, fishing and vessel traffic contributions. The implications of atmospheric emissions from all exploration wells and all field developments would be assessed through the statutory EIA process, which would serve to identify if further mitigation was required.

Climatic factors

Assessment summary

Atmospheric emissions from the potential activities following implementation of the DTI's draft plan will contribute to local, regional and global concentrations of CO_2 and other greenhouse gases. There are growing concerns about the effects of fossil fuel combustion in terms of climate change and ocean acidification. However, the contribution of atmospheric emissions from activities that may result from implementation of draft plan alternative 2 or 3, or the end use of any hydrocarbons produced, would represent a minor fraction of existing UK, European and global emissions. In response to climate change concerns, the UK government and European Union have and are introducing a variety of policy initiatives intended to stabilise and reduce greenhouse gas emissions. All recognise the long term nature of the venture and that there is no one solution, with a series of contributory steps being required. These steps include reduction in energy demand through increased energy efficiency, promotion of renewable fuels and electricity generation, fuel switching to lower carbon alternatives, carbon capture and sequestration etc. In the near term, UK energy demand not met from indigenous sources (whether fossil or renewable) will be supplied by imported fossil fuels – with little distinction in terms of resultant atmospheric emissions. Thus domestic hydrocarbon production would be neutral in the attainment of UK climate change response policy objectives, and potentially positive in respect of oil, since associated gas is put to beneficial use rather than mostly flared as in some other sources of potential supply. In addition, domestic hydrocarbon production has a positive contribution to the UK economy and security of supply.

In recognition of the national and international focus on climate change and curbing fossil fuel emissions, the DTI should seek and give consideration to CO_2 emission reduction proposals at both the licensing and development Environmental Statement and production consent application review project stages. Examples of such proposals are capture and storage of CO_2 from gas processing operations (rather than venting).

Population and human health

Assessment summary

In view of the nature of activities resulting from the proposed licensing; low risk (based on historic frequency and severity) of major accidental events; occupational health regulation of risks to workforce; controls on use and discharge of chemicals and other marine discharges and remoteness from coastlines and major centres of population, no adverse effects on population or human health are expected.

Licensing is likely to result in continued activity and investment in the UK offshore oil and gas industry and hence positive benefits in terms of employment, tax revenues and security of energy supply.

Material assets (infrastructure, other natural resources)

Assessment summary

There is no existing oil and gas infrastructure in the SEA 7 area and interactions with other users of the marine environment are not likely to result in significant detriment to other activities. Within the SEA 7 and previous SEA areas, it is not considered that oil and gas exploration and production would result in "sterilisation" of the area in respect of renewable energy development or for underground storage of captured carbon dioxide, although this should be reviewed during the consideration of licence applications. The continued use and maintenance of existing offshore oil and gas infrastructure provides the opportunity for its potential future use in carbon capture and storage projects.

Cultural heritage, architectural and archaelogical heritage

Assessment summary

Offshore cultural heritage in deeper waters consists chiefly of shipwrecks and crashed aircraft, with no significant interaction expected. A likely positive effect of activities in licensed areas is wreck discovery and potentially identification during oil industry rig site or pipeline route surveys. No interactions are foreseen between activities in blocks potentially licensed in a 25th Round and the abundant coastal archaeological heritage of the SEA 7 area. If commercial quantities of hydrocarbons are discovered and a pipeline to shore is considered, offshore aspects would be covered by a statutory EIA and onshore elements through the planning process. Similar considerations apply to the previous SEA areas.

The geology near St. Kilda is not considered prospective for hydrocarbons and on this basis interactions with the World Heritage Site are not anticipated.

Interrelationships - Cumulative effects

Assessment summary

Cumulative effects from activities resulting from the proposed 25th round licensing have the potential to act incrementally with those from other oil and gas activity, including both existing activities and new activities in existing licensed areas, or to act cumulatively with those of other human activities (e.g. fishing and shipping). Secondary effects comprise indirect effects which do not occur as a direct result of the proposed activities, while synergistic effects are considered to be potential effects of E&P activities where the joint result of two or more effects is greater than the sum of individual effects. Cumulative effects in the sense of overlapping "footprints" of detectable contamination or biological effect were considered to be either very limited (noise, physical presence, physical damage, emissions, discharges) given the past level of activity in the SEA 7 area, or unlikely (accidental events). A similar assessment is made for the areas covered by previous SEAs since monitoring data indicates that the more stringent emissions, discharge and activity controls introduced over recent years have been effective and there is no evidence for significant cumulative effects from current activities.

Atmospheric emissions from activities that may result from implementation of draft plan alternative 2 or 3, and the end use of any hydrocarbons produced will contribute to the overall global emissions of greenhouse gases. However, the scale of such emissions is relatively small, and they will be included in overall UK emissions inventories and the longer

term initiatives to shift the balance of energy demand and supply towards a low carbon economy.

Besides an indistinguishable contribution to climate change and ocean acidification, no secondary or synergistic effects were identified that were considered to be potentially significant, although the effects of multiple noise sources, including the interaction of seismic survey and military sonars, were identified as areas requiring better understanding.

Interrelationships - Wider policy objectives

Assessment summary

The SEA Directive requires that, in considering the likely significance of effects, the degree to which the plan or programme influences other plans and programmes should be addressed, together with the promotion of sustainable development. Activities which may follow licensing in a proposed 25th Licensing Round are subject to regulatory control and are not predicted to have a significant negative impact on UK Government or other wider policy and commitments. The contribution of atmospheric emissions from activities that may result from implementation of draft plan alternative 2 or 3, or the end use of any hydrocarbons produced, would represent a minor fraction of existing UK, European and global emissions. These emissions where they relate to combustion end use would be neutral in the attainment of UK climate change response policy objectives, and potentially positive in respect of oil since associated gas is husbanded rather than mostly flared as in some other sources of potential supply.

The outcome of the 25th Licensing Round has the potential to contribute positively to UK energy supply and policy, although the scale of this is uncertain, particularly in respect of the SEA 7 area. No major negative effects on other policies or programmes are foreseen.

Transboundary effects

Assessment summary

The SEA 7 area is contiguous with waters under the jurisdiction of the Republic of Ireland and the Faroes. Based on the likely area where blocks would be applied for, prevailing wind and major water mass movements will normally result in the transport of atmospheric emissions, marine discharges and spills towards the west coast of Scotland. However, SEA 7 activities may occur adjacent to the median lines and sources of potentially significant environmental effects, with the additional potential for transboundary effects, therefore include:

- Underwater noise
- Marine discharges
- Atmospheric emissions
- Accidental events – oil spills

All of the four aspects above may be able to be detected physically or chemically in Irish or Faroese waters. A similar consideration applies to the potential for transboundary effects from activities in SEA areas 1 to 6, variously in the waters of adjacent States.

The scale and consequences of environmental effects in adjacent state territories due to activities resulting from the proposed 25th Round licensing will be less than those in UK waters and are unlikely to be significant.

Conclusions

The SEA considered the alternatives to the draft plan and the potential implications of the resultant activities in the context of the objective of the draft plan, the SEA objectives, the existing regulatory and other control mechanisms, and the existing environmental problems and their likely evolution over time. A number of recommendations are made. The conclusion of the SEA is that alternative 3 to the draft plan, with the area licensed restricted spatially through the exclusion of certain blocks, is the preferred option for a 25th Licensing Round.

Next steps

The SEA 7 Environmental Report and supporting documents are available for review and public comment for a period of 12 weeks from date of publication in April 2007. The documents are being made available from the SEA website (www.offshore-sea.org.uk) or on CD or printed copy. Comments and feedback should be marked "SEA 7 Consultation" and may be made via the website or by letter or e-mail addressed to:

Megan Douglas
Department of Trade and Industry
Energy Development Unit
4th Floor Atholl House
86-88 Guild Street
Aberdeen AB11 6AR
Fax: 01224 254019
E-mail: megan.douglas@dti.gsi.gov.uk

The DTI will consider comments received from the public consultation in their decision making regarding the draft plan.

A Post Consultation Report will be prepared and placed on the website collating the comments and DTI responses to them.

In addition, if the licensing round is held and blocks applied for, prior to the award of any licences the DTI will undertake a plan level Appropriate Assessment to consider the potential implications of activities within a block for the integrity of Natura 2000 conservation sites.

1 INTRODUCTION

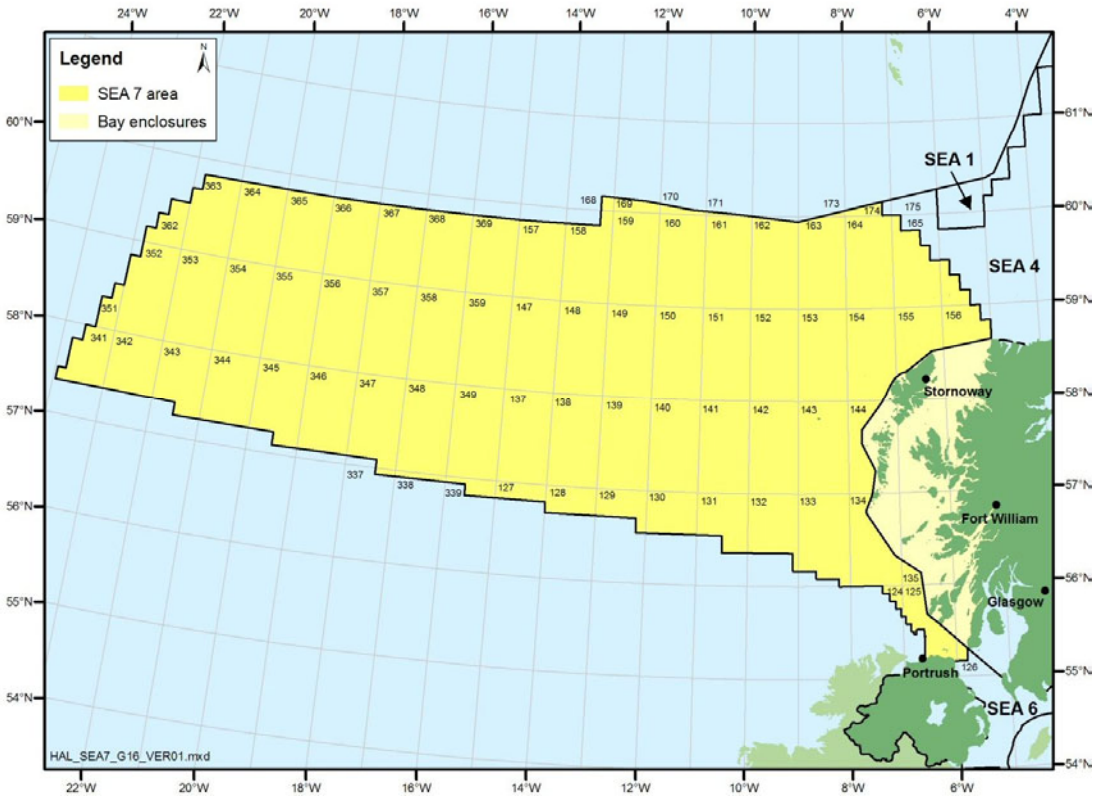
1.1 Background

The *Petroleum Act 1998* vests all rights to the nation's petroleum resources in the Crown. The DTI is responsible for licensing exploration and regulating development of the UK's oil and gas resources. The Secretary of State for Trade and Industry may grant licences to operators that confer exclusive rights to "search and bore for and get" petroleum. Each of these licences confers such rights over a limited area and for a limited period. Licensing of the United Kingdom Continental Shelf (UKCS) for offshore oil and gas exploration and production commenced in 1964 and has progressed through a series of seaward licensing rounds. Further information on offshore licensing can be found on the DTI's website at www.og.dti.gov.uk/upstream/licensing/index.htm.

It should be noted that such licences are not permits or consents for activity and that offshore oil and gas activities are subject to the consenting and permitting regimes summarised in Appendix 10.

The DTI is considering plans for a 25th round of offshore licensing and in preparation for this is conducting a Strategic Environmental Assessment. This document is the SEA Environmental Report. The draft plan for this round, which is described in Section 2, includes the offer for oil and gas licensing to the west (and north) of the Hebrides – see Figure 1.1.

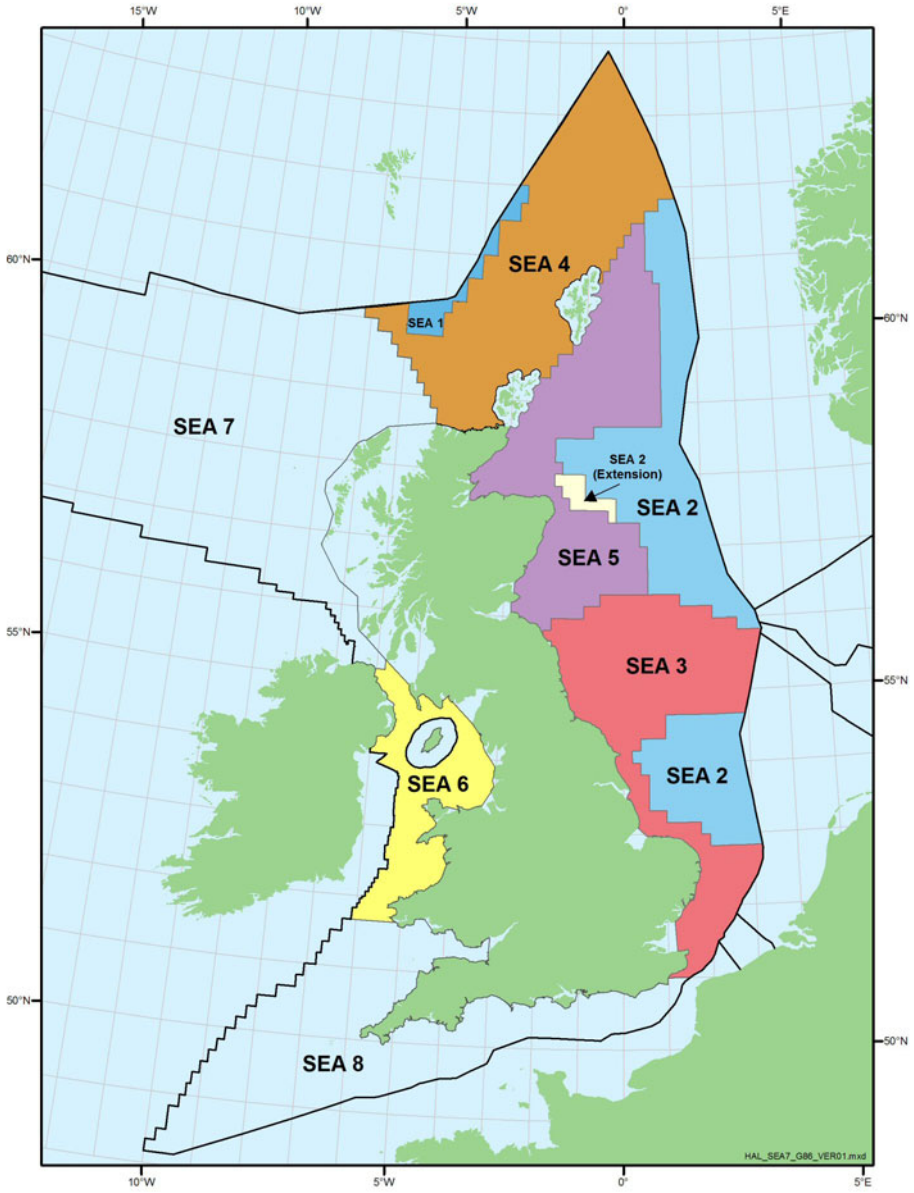
Figure 1 1 – DTI SEA 7 Area



Note - to allow full consideration, the SEA 7 area is shown extending to the shoreline within bay enclosure lines (shaded paler yellow) although these "bay" areas would not form part of an offshore oil and gas licensing round.

In addition, as part of SEA 7, an assessment will be made of the implications of re-offering during the same licensing round, currently unlicensed blocks within the areas covered by the earlier offshore oil and gas SEAs (SEAs 1 to 6 listed below and shown in Figure 1.2)

Figure 1.2 – DTI Offshore SEA sequence



In 1999, the DTI commenced an SEA process for offshore energy with a sequence of sectoral SEAs of the implications of further licensing for offshore oil and gas exploration and production. Completed SEAs and licensing rounds are listed below.

	Area Covered (see Figure 2)	**Licensing Round**
SEA 1	The deep water area along the UK and Faroese boundary	19th Round (2001)
SEA 2	The central spine of the North Sea which contains the majority of existing UK oil and gas fields	20th Round (2002)

	Area Covered (see Figure 2)	**Licensing Round**	
SEA 3	The remaining parts of the southern North Sea	21st Round	(2003)
SEA 4	The offshore areas to the North and West of Shetland and Orkney	22nd Round	(2004)
SEA 5	Parts of the northern and central North Sea to the east of the Scottish mainland, Orkney and Shetland	23rd Round	(2005)
SEA 6	Parts of the Irish Sea	24th Round	(2006/7)

In addition, during 2003, the DTI conducted an SEA covering three strategic regions off the coasts of England and Wales in relation to a second round of offshore wind leasing.

Strategic Environmental Assessment is a formalised, systematic process 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 SEA aims to integrate environmental considerations into the decisions about oil and gas licensing and to provide for public consultation and participation in decision making.

1.2 Strategic Environmental Assessment

1.2.1 The requirement for SEA

Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment (commonly called the SEA Directive) was adopted to provide a strategic complement to the Council Directives (85/337/EEC and 97/11/EC) which require Environmental Impact Assessments of specific developments and activities.

The Directive's stated objective is

> *"to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development, by ensuring that, in accordance with this Directive, an environmental assessment is carried out of certain plans and programmes which are likely to have significant effects on the environment."*

A series of regulations have been established across the United Kingdom to implement the requirements of the Directive.

The Environmental Assessment of Plans and Programmes Regulations 2004 apply to any plan or programme which relates either solely to the whole or any part of England[1] or to England and any other part of the UK. The Regulations apply to plans and programmes whose first formal preparatory act was on or after 21 July 2004, and also, with retroactive

[1] Including the territorial waters of the United Kingdom that are not part of Northern Ireland, Scotland or Wales, and waters in any area for the time being designated under Section 1(7) of the *Continental Shelf Act 1964*.

effect, to those which have not been either adopted or submitted to a legislative procedure leading to adoption by 21 July 2006.

In 2005, the United Kingdom ratified the "*UN/ECE Convention on access to information, public participation in decision-making and access to justice in environmental matters*" (hereafter called the Aarhus Convention)[2].

Article 1 of the Aarhus Convention states that,

> *"In order to contribute to the protection of the right of every person of present and future generations to live in an environment adequate to his or her health and well-being, each Party shall guarantee the rights of access to information, public participation in decision-making, and access to justice".*

A required part of SEA is consultation with the consultation bodies and public, together with such neighbouring states as may be potentially affected.

1.2.2 The Environmental Report and its purpose

The purpose of this Environmental Report is to document the assessment of the environmental implications of the proposed draft plan and its alternatives, together with the potential exploration, development and production activities which could result. The report provides a basis of information for formal consultation with the statutory consultation bodies and authorities, and with the public, regarding the environmental implications of the draft plan.

Schedule 2 of the Regulations sets out the information to be included in an Environmental Report of a Strategic Environmental Assessment - see Table 1.1. Regulation 12(3) specifies that….

"the report shall include such of the information referred to in Schedule 2 …. as may reasonably be required, taking account of:- (a) current knowledge and methods of assessment; (b) the contents and level of detail in the plan or programme; (c) the stage of the plan or programme in the decision-making process; and (d) the extent to which certain matters are more appropriately assessed at different levels in that process in order to avoid duplication of the assessment."

[2] The Community adopted Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information and repealing Council Directive 90/313/EEC and Directive 2003/35/EC of the European Parliament and of the Council of 26 May 2003 providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC as well as proposals for a Directive on access to justice in environmental matters.

Table 1.1 – Information to be included in Environmental Reports as required by S.2 of the Environmental Assessment of Plans and Programmes Regulations 2004

Requirement
1. An outline of the contents and main objectives of the plan or programme, and of its relationship with other relevant plans and programmes.
2. The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme.
3. The environmental characteristics of areas likely to be significantly affected.
4. Any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Council Directive 79/409/EEC on the conservation of wild birds and the Habitats Directive.
5. The environmental protection objectives, established at international, Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation.
6. The likely significant effects on the environment, including short, medium and long-term effects, permanent and temporary effects, positive and negative effects, and secondary, cumulative and synergistic effects, on issues such as - (a) biodiversity; (b) population; (c) human health; (d) fauna; (e) flora; (f) soil; (g) water; (h) air; (i) climatic factors; (j) material assets; (k) cultural heritage, including architectural and archaeological heritage; (l) landscape; and (m) the inter-relationship between the issues referred to in sub-paragraphs (a) to (l).
7. The measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme.
8. An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information.
9. A description of the measures envisaged concerning monitoring in accordance with regulation 17.
10. A non-technical summary of the information provided under paragraphs 1 to 9.

The criteria for determining the likely significance of effects are set out in Schedule 1 of the Regulations and are listed Table 1.2.

Table 1.2 – Criteria for determining the likely significance of effects on the environment as specified in S.1 of the Environmental Assessment of Plans and Programmes Regulations 2004

1. The characteristics of plans and programmes, having regard, in particular, to:-
   - (a.) the degree to which the plan or programme sets a framework for projects and other activities, either with regard to the location, nature, size and operating conditions or by allocating resources;
   - (b.) the degree to which the plan or programme influences other plans and programmes including those in a hierarchy;
   - (c.) the relevance of the plan or programme for the integration of environmental considerations in particular with a view to promoting sustainable development;
   - (d.) environmental problems relevant to the plan or programme; and
   - (e.) the relevance of the plan or programme for the implementation of Community legislation on the environment (for example, plans and programmes linked to waste management or water protection).

2. Characteristics of the effects and of the area likely to be affected, having regard, in particular, to:-
   - (a.) the probability, duration, frequency and reversibility of the effects;
   - (b.) the cumulative nature of the effects;
   - (c.) the transboundary nature of the effects;
   - (d.) the risks to human health or the environment (for example, due to accidents);
   - (e.) the magnitude and spatial extent of the effects (geographical area and size of the population likely to be affected);
   - (f.) the value and vulnerability of the area likely to be affected due to –
     - (i.) special natural characteristics or cultural heritage;
     - (ii.) exceeded environmental quality standards or limit values; or
     - (iii.) intensive land-use; and
   - (g.) the effects on areas or landscapes which have a recognised national, Community or international protection status.

1.2.3 Consultation bodies

The following are the consultation bodies/authorities as defined in the regulations for this SEA:

- Countryside Agency (now Natural England)
- English Nature (now Natural England)
- Historic Buildings and Monuments Commission for England (English Heritage)
- Environment Agency (for England and Wales)
- Historic Scotland
- Scottish Environment Protection Agency
- Scottish Natural Heritage
- Cadw
- Countryside Council for Wales
- Department of Environment, Environment & Heritage Service (NI)

In addition, the Joint Nature Conservation Committee will also be included in the formal consultation for this SEA.

1.2.4 The study team

This report was prepared by independent consultants, Hartley Anderson Limited, on behalf of the DTI. Contributions to the assessment and the public consultation document have been received from the SEA Steering Group, the DTI and Geotek Ltd, together with the authors of the underpinning studies commissioned for SEA 7 and the participants in the Expert Assessment Workshop and the Stakeholder Workshop.

1.3 Organisation of the Environmental Report

A large amount of information has been collated and reviewed as part of this SEA. To facilitate reader access and understanding, the following 'road-map' identifies where relevant information can be found. The body of the Environmental Report comprises 7 main sections plus a bibliography, glossary, appendices and a non-technical summary. Figures and tables are interspersed throughout the document.

Table – 1.3 – Structure of the Environmental Report

ER Section	Summary
Non-technical summary	A stand alone summary in non technical language of the SEA, its findings and conclusions.
Section 1 Introduction	Describes the background to the draft plan and the regulatory context and purpose of the SEA and the ER.
Section 2 Overview of the draft plan	Provides details of the background to the proposed plan, the plan itself, its objectives and relationships to other plans and programmes. Alternatives to the plan are also described.
Section 3 SEA approach	Describes the scope and methodology of the SEA.
Section 4 Environmental information	Describes the environmental characteristics of the relevant areas, identifies relevant existing environmental problems, the likely evolution of the environmental baseline and SEA objectives.
Section 5 Summary of Assessment	Provides details of the assessment method, a summary of the results of the assessment and a consideration of cumulative impacts. Identifies mitigation and enhancement measures to prevent, reduce or offset any significant adverse effects identified during the assessment process.
Section 6 Recommendations and Monitoring	Provides an overall conclusion regarding the likely implications of the proposed licensing and alternatives, together with recommendations for mitigation and monitoring and gaps in understanding relevant to the process.
Section 7 Next steps	Describes the consultation phase for the Environmental Report and proposed Plan, the process underpinning the adoption of the plan and the final SEA statement.
	Bibliography
	Glossary and abbreviations
Appendix 1 Scoping consultation	Describes issues identified during scoping consultation and signposts where they are addressed within the Environmental Report.
Appendix 2 Other plans and programmes	Includes a matrix describing other plans and programmes of relevance to the proposed plan, the implications of these for the proposed plan and the implications of the proposed plan on these other plans and programmes.
Appendix 3 Environmental baseline – SEA 7 area	Underpins Section 4 and contains a series of sub-appendices describing key environmental characteristics of the SEA 7 area including biodiversity, habitats, flora and fauna; geology and sediments; landscape/seascape; water resources; air quality; climatic factors; population and human health; material assets, and cultural heritage.

ER Section	Summary
Appendix 4 Changes to the environmental baseline since SEA – SEA 1	Underpins Section 4 and updates to the information base used for SEA 1
Appendix 5 Changes to the environmental baseline since SEA – SEA 2	Underpins Section 4 and updates to the information base used for SEA 2
Appendix 6 Changes to the environmental baseline since SEA – SEA 3	Underpins Section 4 and updates to the information base used for SEA 3
Appendix 7 Changes to the environmental baseline since SEA – SEA 4	Underpins Section 4 and updates to the information base used for SEA 4
Appendix 8 Changes to the environmental baseline since SEA – SEA 5	Underpins Section 4 and updates to the information base used for SEA 5
Appendix 9 Changes to the environmental baseline since SEA – SEA 6	Underpins Section 4 and updates to the information base used for SEA 6
Appendix 10 Offshore Oil and Gas environmental controls	Summarises the key environmental legislation and controls in relation to the offshore oil and gas industry
Appendix 11 Consideration of the Effects of Licensing	Underpins Section 5, Summarises the outputs of the Assessment and Stakeholder meetings and presents the main assessment
Appendix 12 Natura 2000 sites	Maps and tables showing blocks relative to Natura 2000 sites

2 OVERVIEW OF THE DRAFT PLAN

2.1 The draft plan

The Department of Trade and Industry's draft plan is to hold a 25th seaward licensing round to offer for oil and gas licensing the unlicensed blocks to the west of Hebrides – see the SEA 7 area in Figure 1.1. In addition, as part of SEA 7, an assessment is made of the implications of re-offering during the same licensing round, currently unlicensed blocks within the areas covered by the earlier offshore oil and gas SEAs – SEAs 1 to 6 in Figure 1.2

Depending on the outcome of the SEA process and other Government considerations, all or a proportion of the unlicensed Blocks within the SEA area may be offered for licensing in the 25th round.

Context to licensing

The Petroleum Act 1998 vests exclusive right of searching and boring for and getting petroleum[3] within Great Britain and the territorial sea adjacent to the United Kingdom in the Crown and allows the Secretary of State for Trade and Industry to grant licences on behalf of Her Majesty to explore for and exploit these resources and those on the UK Continental Shelf (UKCS). The main type of offshore Licence is the Seaward Production Licence. Offshore licensing for oil and gas exploration and production commenced in 1964 and has progressed through a series of Seaward Licensing Rounds. A Seaward Production Licence may cover the whole or part of a specified block or a group of blocks. A Licence grants exclusive rights to the holders "to search and bore for, and get, petroleum" in the area covered by the licence.

A Licence does not act as a permit for activity in the Block nor does it confer any exemption from other legal/regulatory requirements.

There are three main types of Seaward Production Licences:

- Traditional Production Licences which are the standard type of Seaward Production Licences and run for three successive periods or Terms. Each Licence expires automatically at the end of each Term, unless the Licensee has made enough progress to earn the chance to move into the next Term. The Initial Term lasts for four years and the Licence will only continue into a Second Term of four years if the agreed Work Programme has been completed and if 50% of the acreage has been relinquished. The Licence will only continue into a Third Term of 18 years if a development plan has been approved, and all the acreage outside that development has been relinquished.

- Frontier Production Licences which are a variation of the Traditional Production Licence with four Terms rather than three. A Frontier Production Licence has a longer exploration phase (six years as opposed to four) with the objective of allowing companies to screen larger areas, during a two year Initial Term so they can look for a wider range of prospects. At the end of the Initial Term, the Licensee must relinquish 75% of the licensed acreage. The Second Term lasts four years at the end of which (i.e. when the Licence is six years old), the exploration Work Programme must have been completed and the Licensee must relinquish 50% of what is left (i.e. leaving one eighth of the original licensed area). In this sense, the

[3] That is mineral oil or relative hydrocarbon and natural gas

end of a Frontier Licence's Second Term corresponds to the end of a Traditional Licence's Initial Term.

- In the 21st Round (2002) the DTI introduced Promote Licences. The general concept of the Promote Licence is that the Licensee is given two years after award to attract the technical, environmental and financial capacity to complete an agreed Work Programme. In effect, DTI will defer (not waive) its financial, technical and environmental checks until the preset Check Point. Promote Licensees are not allowed to carry out field operations until they have met the full competence criteria. The way this is implemented is that each Promote Licence carries a "Drill-or-Drop" Initial Term Work Programme. The Licence will therefore expire after two years if the Licensee has not made a firm commitment to DTI to complete a programme of work. By the same point, it must also have satisfied DTI of its technical, environmental and financial capacity to do so.

In recent years, another variation of the Traditional Production Licence has also been offered specially drafted to cover the redevelopment of a decommissioned field such as the Ardmore (formerly the Argyll) field.

The terms and conditions of the Licences are set out in the *Petroleum Licensing (Exploration and Production) (Seaward and Landward Areas) Regulations Order 2004 (2004/352),* as amended by the *Petroleum Licensing (Exploration and Production) (Seaward and Landward Areas) (Amendment) Regulations Order 2006 (2006/784).*

It should be noted that the environmental capacity of applicants is explicitly examined by the DTI, by way of written submissions and interviews, before licences are awarded.

Licence Round History

Blocks in the SEA 7 area were first offered for oil and gas licensing in 1971. Eight of the blocks are currently wholly or partly under licence, 93 have been licensed but are now wholly relinquished and 1,531 have never been licensed (Figure 2.1).

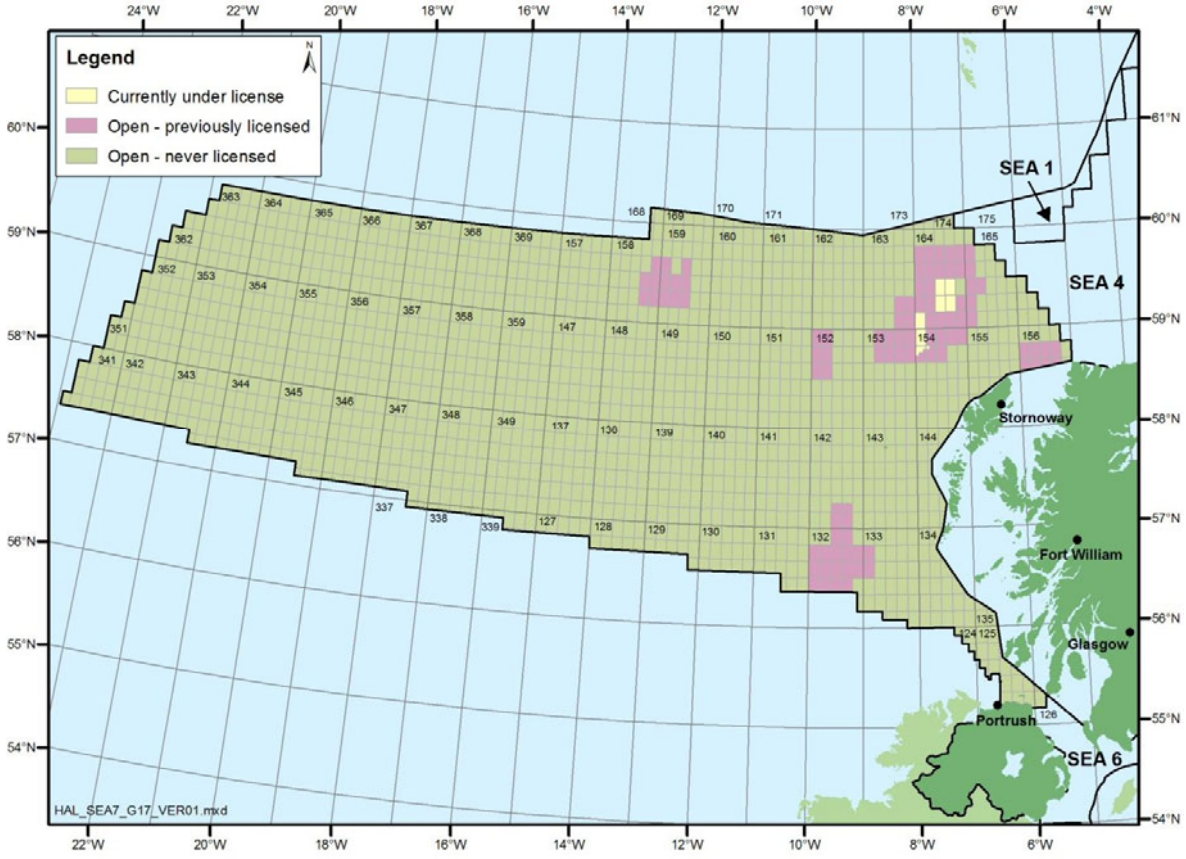
There has been very little oil and gas exploration activity in the area; a number of exploration wells have been drilled (Figure 2.2) but there are no producing fields or associated infrastructure.

Prospectivity

For commercial hydrocarbon resources to occur, a number of factors and features have to coincide. These include:

- The presence of source rocks, with an appreciable organic matter content
- Adequate depth of burial to allow the conversion of the organic matter to oil or gas through the action of temperature and pressure
- The presence of rocks with sufficient porosity to allow the accumulation of oil or gas
- Cap or seal rocks to prevent the oil or gas from escaping from the reservoir rocks
- Migration pathways to permit oil and gas formed in the source rocks to move to reservoir formations

Figure 2.1 – SEA 7 oil & gas licensing history and current status

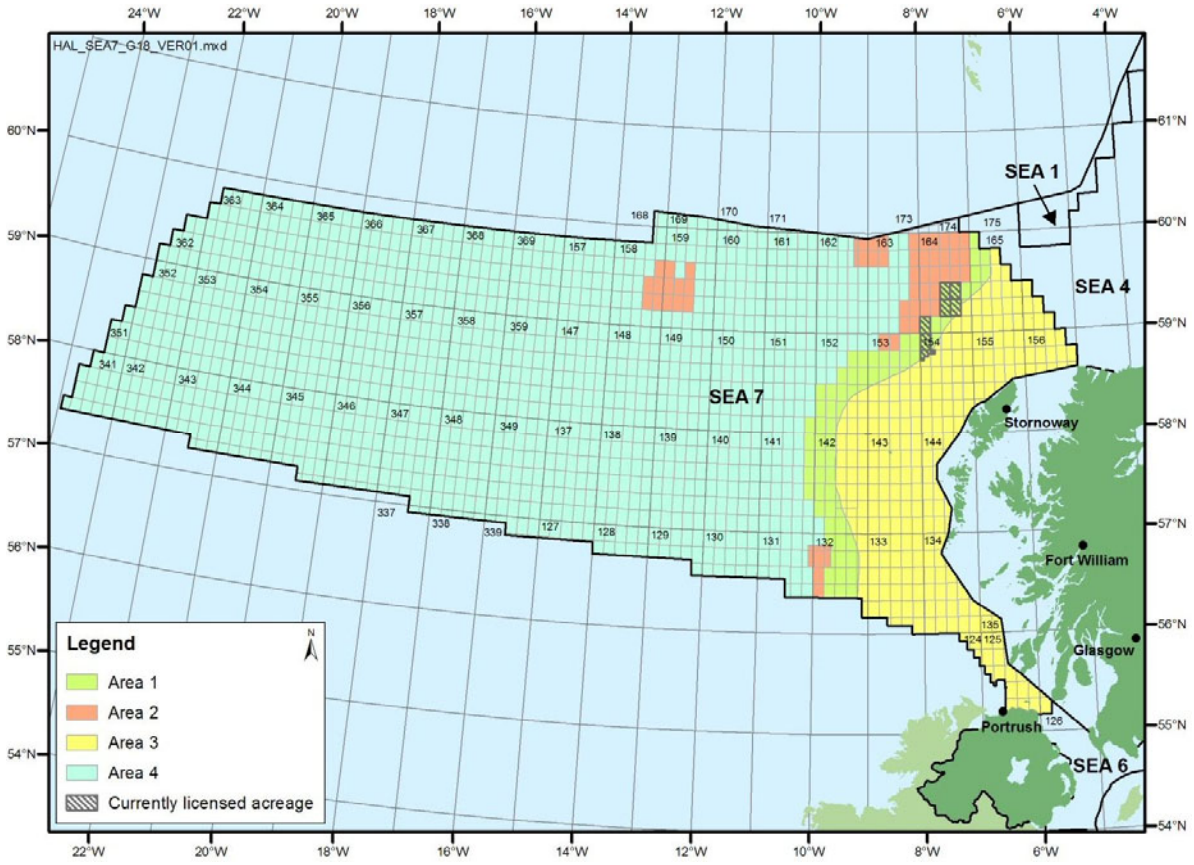


Aside from a few blocks with 3D seismic data coverage and several blocks with sparse 2D seismic data, the bulk of SEA 7 is devoid of data to appropriately evaluate the real potential for hydrocarbons. SEA 7 would require initial investments in acquiring state of the art, purpose designed seismic to realistically unravel any further hydrocarbon potential. New seismic techniques have been attempted over the last few years, some of which are thought to improve imaging in areas of moderate basalt coverage.

On the basis of prospectivity, the SEA 7 area has been broadly subdivided into 4 'geographic regions' (see Figure 2.2 overleaf):

- **Area 1** includes the Benbecula discovery (see below) and runs south to the most southerly previously licensed acreage in South Rockall.
- **Area 2** mainly represents previously explored licensed acreage in various locations.
- **Area 3** runs immediately west of the Hebrides and abuts Area 1, also including St. Kilda.
- **Area 4** represents the largest and least known area located predominantly in deep water.

Figure 2.2 – SEA 7 'geographic regions' of hydrocarbon prospectivity



Area 1

Area 1 can be considered to contain the potential for hydrocarbons. From 11 exploration wells drilled west of the Hebrides, the 154/1-1 well found hydrocarbons. The 154/1-1 well is associated with the Benbecula gas accumulation and there is a strong likelihood there could be more scope for 'hydrocarbon traps' on a trend stretching south from Benbecula to the Irish, Dooish, well along a 260 by 30kms wide corridor. Well 164/28-1 gave an indication of the potential for oil in a similar feature.

It is predicted that any hydrocarbon potential will most likely coincide with water depths beginning at about 700m and extending westwards to water depths of over 2,000m.

Area 2

Area 2 has been split into four parts where some blocks have been previously licensed. Prospectivity here is considered to be limited. The analysis of three key wells (163/6-1, 164/7-1 and 132/6-1) in conjunction with other data shows the areas adjacent the wells to be most likely unprospective.

Area 3

Covers an area that includes the Hebrides Shelf, the Hebrides Slope, and the Geikie Escarpment and is considered to contain limited hydrocarbon prospectivity. The area also contains St. Kilda. Four wells have been drilled along the shelf margin/slope. All failed to find any trace of hydrocarbons (wells 154/3-1, 164/25-1Z, 164/25-2 and 132/15-1) mainly

because there was no trapping mechanism to capture the hydrocarbons. This area could have potential if structures are identified.

Area 4

Area 4 covers an extensive area that has no history of hydrocarbon exploration. Most of the area in question underlies extensive areas of Tertiary, Palaeocene age basalts. Relatively little 2D seismic has been acquired and very limited imaging beneath the basalts. However, there are some interesting structures above the basalts which could contain hydrocarbons, although the sourcing of such structures with hydrocarbons is problematic.

The westerly extent of SEA 7 area blocks offered in a 25th licensing round will be influenced by a number of factors including international agreement on the extent of UK waters (currently disputed), and health and safety considerations since parts of the area are beyond the normal range of HMCG search and rescue helicopters. The closest HMCG base is Stornoway where the aircraft is fitted with overload fuel tanks and offers a radius of action of 240 miles and in excess of 5 hours endurance (MCA 2002).

2.2 Plan objectives

The draft plan objectives have been formulated within the policy framework supplied by the 2003 Energy White Paper *Our energy future - creating a low carbon economy*. The UK Government's energy policy has four long-term goals:

- To cut the UK's CO_2 emissions by some 60% by about 2050, with real progress by 2020
- To maintain the reliability of energy supplies
- To promote competitive markets in the UK and beyond, helping to raise the rate of sustainable economic growth and improve productivity
- To ensure that every home is adequately and affordably heated

In the nearer term the strategy aims are to:

- Reduce greenhouse gas emissions, in line with our Kyoto commitment, by 12.5% from 1990 levels in 2008-12; and move towards a 20% reduction in carbon dioxide emissions from 1990 levels by 2010.

- Increase the proportion of UK electricity produced from renewable energy sources to 10% in 2010, consistent with our wider goals for affordable and reliable energy supplies.

The draft plan subject to this SEA needs to be considered in the context of overall UK energy supply and greenhouse gas reduction efforts. The DTI Sustainable Development Action Plan 2005/6 (see http://www.sustainable-development.gov.uk/government/department/dti.htm) includes a number of strategy indicators, delivery actions and 2006 targets and work streams including reducing greenhouse gas emissions, sustainable energy, and secure energy electricity generation.

Security of supply is one of the key issues identified by the 2003 Energy White Paper and the recent Energy Review (DTI 2006) to achieve these goals. With production from UK oil and gas fields declining, the UK will become yet more reliant on imports. By 2010, imports could be meeting up to 40% of the UK's total gas demand, rising to 80–90% by 2020. The

UK is also expected to become a net importer of oil (on a sustained basis) by 2010 (DTI 2006).

The Energy Review recognised that whilst developments in low carbon technologies and improvements in energy efficiency will act to reduce demand for and thus decrease our reliance on imported fossil fuels, fossil fuels will constitute the majority of our energy mix for the foreseeable future, particularly oil and gas. Making efficient use of the UK's own energy reserves brings obvious benefits both in the contribution it can make to a diverse UK energy mix but also to the economy in terms of jobs, investment and national income generated by the sector (DTI 2006).

The following extract from the recent Marine Bill White Paper (Defra 2007) highlights the relative economic importance of the oil and gas industry. "*Activities in the marine area contribute substantially to the UK economy and quality of life. It is estimated that the economic contribution of these activities is in the order of 67 billion pounds Sterling annually in the UK. Important contributors are oil and gas (22.3 billion), tourism and recreation (16 billion), naval defence (6.5 billion), and ship and boat building and repairs (3 billion), with significant contributions being made by ports (1.6 billion), fisheries (0.5 billion) and a range of other activities."*

Taking account of current UK energy policy, the stated objective of the DTI with respect to oil and gas is *"To maximise the economic benefit to the UK of its hydrocarbon resources, taking into account the environmental impact of hydrocarbon development, and the need to ensure secure, diverse and sustainable supplies of energy for business and consumers at competitive prices"* (G Swann, presentation).

This was amplified by a recent HM Treasury discussion paper (HM Treasury 2007) which states:

"The UK Government remains committed to promoting a healthy and prosperous UK oil and gas industry and maximising the economic recovery of the UK's oil and gas reserves.

The UK's oil and gas reserves are significant, and up to 2006 have produced around 36 billion barrels of oil equivalent (boe). Estimates of the oil and gas remaining to be produced from the UK Continental Shelf (UKCS) range from 15 to 25 billion boe. Although the UK is already a net importer of oil and gas, indigenous supplies will continue to play a vital role in the UK's energy consumption for many years to come.

The underlying geology and future oil and gas prices are the dominant drivers of investment and hence ultimate recovery levels. However Government has a crucial role to play in ensuring that the regulatory and fiscal regimes help deliver the best possible future for the UKCS.

To achieve this, the Government has twin objectives for the fiscal regime to promote investment and production whilst striking the right balance between producers and consumers and ensuring a fair return for the UK taxpayer from our national resources."

Within this framework, the main objectives of the current draft plan are to enhance the UK economy and security of energy supply through the comprehensive exploration and appraisal of UK oil and gas resources and the economic development of discovered reserves without compromising the biodiversity, ecosystem functioning and the interests of nature and heritage conservation, and human health, material assets and users.

2.3 Potential activities following licensing

As indicated above, the draft plan does not itself permit any exploration or production activities, which will be subject to a range of permitting and other controls (see Appendix 10).

Predictions of potential activity which could follow licensing in the SEA 7 area have been estimated by the DTI and summarised below.

Likely take-up of blocks in the SEA 7 area

The number of blocks that might be taken up in the SEA 7 area could be high, in the region of 50 to 100's; however, these would mostly be Frontier type licences where large areas are taken up initially for seismic and scoping studies.

Estimated scale of new seismic data collection

Table 2.1 - Estimated scale of new seismic data collection for the first 5 years

Area	2D seismic		3D seismic	
	Number of surveys	Length (km)	Number of surveys	Coverage (km^2)
1	2	2,500-5,000	2-8	500-2,000
2	3	10-200	-	-
3	Limited or none	-	-	-
4	4	2,500-5,000	-	-

Estimated number of exploration wells

Estimated that between 2 and 5 exploration wells will be drilled up until 2011, and up to 5 appraisal wells.

It is expected that no firm well obligations will be received mainly because of the lack of existing seismic and other data. Part of the acreage has only sparse 2D seismic coverage, and almost certainly the majority of the blocks applied for will be on a Frontier Licence basis with new seismic acquisition as a firm commitment. All wells pledged will be either a drill or drop or contingent on regional/block specific evaluations.

For the 25th Round, an estimate of up to 10 drill or drop/contingent wells could be expected, with potentially half making it past the first hurdle. The anticipated timing of these wells over the first 5 years is: 1 in 2009, 2 in 2010 and 2 in 2011.

Estimates for exploration wells are specifically for the 25th/26th Rounds. Future activity will depend on success resulting from the 25th/26th Rounds and the outcome of the 2006 North Benbecula well.

Anticipated major infrastructure developments in the near–term

The North Benbecula exploration well (Area 1) was drilled in 2006 and if successful in proving a commercially viable gas accumulation, then a full appraisal programme of up to 5 wells would be likely before a development plan. The type of development would be a result of weighing up the pros and cons of subsea versus a new build Tension Leg Platform, and gas export route options.

If the current oil prices continued for the next 4-5 years an oil discovery of at least 100 million barrels of recoverable reserves would be the minimum case in water depths of less than 1,000m that could be developed using Floating Production Storage and Offloading (FPSO) vessels.

Other anticipated infrastructure:

- 1-2 FPSO
- 1 or 2 subsea tieback developments between 2010-2014
- Between 4 and 10 development wells to 2013.

2.4 Alternatives to the plan

The high level alternatives for the draft plan for a 25th Seaward Licensing Round have been discussed at the assessment workshop and stakeholder meeting and are considered to include sub-options (such as to import a greater proportion of UK oil and gas). The alternatives identified were:

1. Not to offer any blocks for licensing
2. To proceed with the licensing programme as proposed
3. To restrict the area licensed temporally or spatially

The alternatives were considered using the hierarchy of options below (modified from ODPM 2005).

need or demand: is it necessary?
Can the need or demand be met without implementing the plan or programme at all?

↓

mode or process: how should it be done?
Are there technologies or methods that can meet the need with less environmental damage than 'obvious' or traditional methods?

↓

location: where should it go?

↓

timing and detailed implementation:
When, in what form and in what sequence should the plan be carried out?
What are the important issues? Do existing controls and measures address them? What other controls and measures are required?

The results are summarised in Table 2.2.

Table 2.2 – Consideration of hierarchy of alternatives

Is there a need or demand	Security of supply is one of the key issues identified by the 2003 Energy White Paper and the recent Energy Review (DTI 2006). As production from UK oil and gas fields declines, the UK will become more reliant on imports. By 2010, imports could be meeting up to 40% of the UK's total gas demand, rising to 80–90% by 2020. The UK is also expected to become a net importer of oil by 2010 (DTI 2006). In the absence of the plan the UK would import additional fuel to make up the shortfall in domestic production.

	The Energy Review recognised that, in spite of developments in low carbon technologies and improvements in energy efficiency, fossil fuels, and particularly oil and gas, will constitute the majority of the UK energy mix for the foreseeable future. Exploiting the UK's energy reserves contributes to a diverse and secure UK energy mix as well as to the economy in terms of jobs, investment and national income generated by the sector.
Mode or process	Exploration, drilling and production technologies are not static and improvements are introduced to increase efficiency and reduce environmental footprint and impacts. New techniques and technologies, once proven, can be expected to rapidly become accepted practice.
Location	The presence of commercial hydrocarbon resources is a function of geological history which dictates the areas of potential interest.
Timing and detailed implementation	The plan is needed before exploration or production can occur in currently unlicensed blocks. In relation to the re-offer of blocks in previous SEA areas, the early implementation of the plan would allow potential synergies in terms of use of existing infrastructure (e.g. pipelines) to be taken advantage of. The extent of such synergies will decline if the plan is delayed as infrastructure is decommissioned and removed. There are a range of environmental sensitivities present in the blocks some of which may occupy a large proportion of the block area (e.g. conservation designations). However, the majority of blocks are large (*ca.* 250km^2) which allows potential room for manoeuvre in identifying suitable areas for exploration and production activities, subject to consenting and other existing controls. Existing environmental controls in terms of location, timing, supply routes, noise, emissions and wastes are comprehensive, with no important gaps identified. Demonstration of compliance with the environmental regulatory requirements is a precondition of DTI activity consent. It is important that operators and potential operators of blocks demonstrate awareness of environmental sensitivities and their implications for any subsequent activity at the block acquisition stage.

2.5 Relationship of the Draft Plan to other Plans and Programmes

The regulations require that consideration is given to the degree to which the *"plan or programme influences other plans and programmes including those in a hierarchy"*.

A list of the other plans and programmes which have been analysed in terms of their implications for the draft plan is given in Appendix 2.

3 SEA APPROACH

3.1 SEA process and stages completed to date

The DTI oil and gas licensing SEA process is underpinned by the requirements of the SEA Directive, UK implementing legislation and those of the Aarhus Convention – see Section 1.

A summary of the SEA process used for SEA 7 is given below and in Figure 3.1.

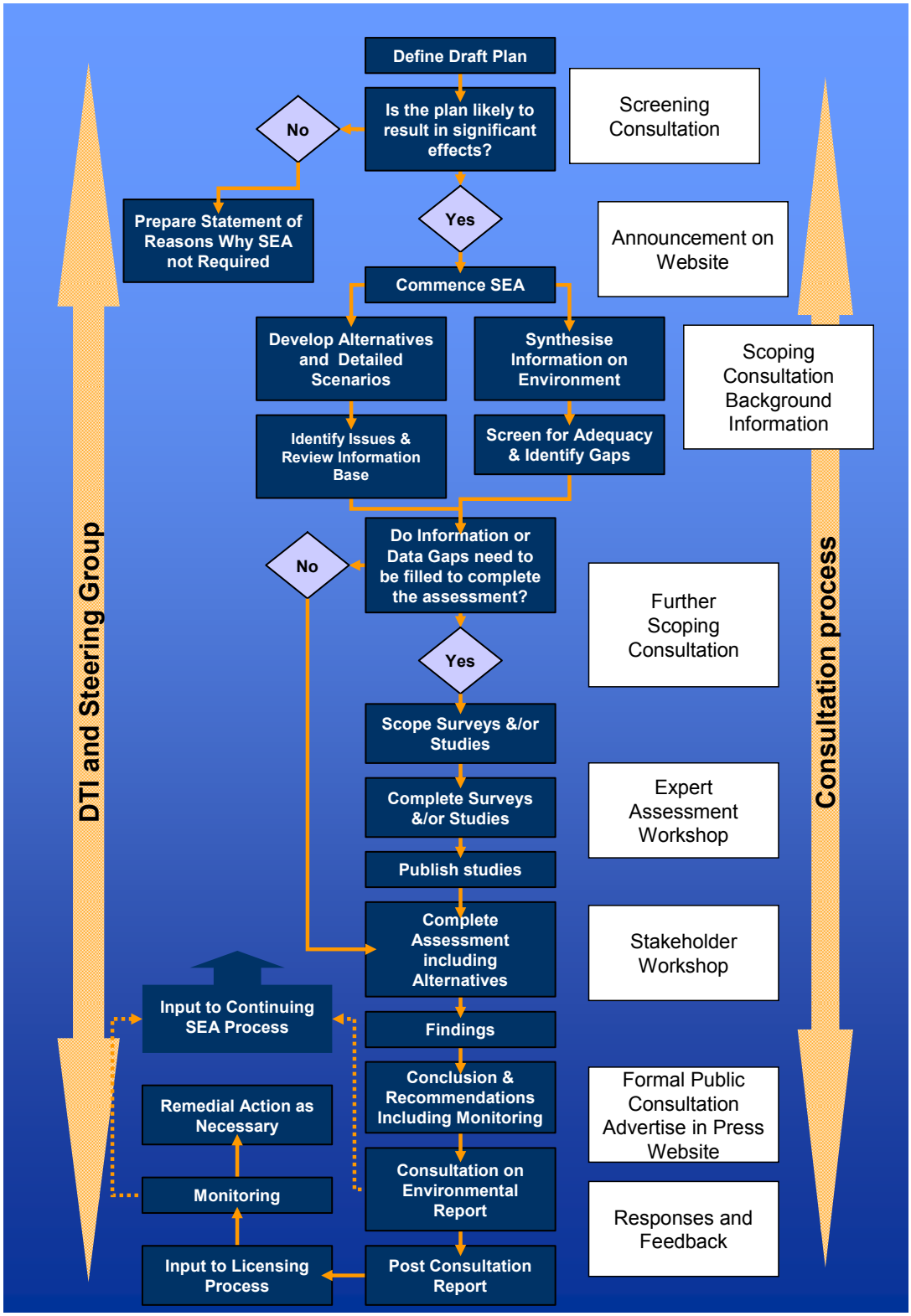
The SEA process aims to help inform DTI licensing decisions through consideration of the environmental implications of the proposed draft plan.

The key stages in the conduct of this SEA are:

1. Instigation of draft plan and identification of alternatives and draft objectives
2. Scoping for field work
3. Information gathering and collation on:
    a. Environmental baseline
    b. Offshore survey
    c. Existing environmental problems
    d. Potential effects of proposed plan
    e. Other relevant plans and programmes and their objectives
4. Assessment workshop
5. Consultation with the Consultation Bodies on the scope and level of detail of the Environmental Report
6. Assessment of effects including consideration of alternatives
7. Stakeholder meeting
8. Production of Environmental Report
9. Public Consultation
10. Post consultation evaluation of feedback and input to decision on the plan
11. Screening/conduct of Appropriate Assessment
12. Public Consultation
13. Monitoring plan implementation

The first eight stages of the SEA are now complete. The SEA Objectives are given in Section 3.2. Feedback to the scoping consultation (Stage 5) is summarised in Appendix 1 along with clear signposting to where issues raised by scoping are addressed within the Environmental Report. Preparatory work has been undertaken for subsequent stages.

Figure 3.1 – Overview of the SEA Process



Since SEA 1, the DTI oil and gas licensing SEA process has evolved and the following process improvements have been implemented:

- Establishment of a SEA Steering Group with wide representation from a range of stakeholders (established in early 2001)
- A formal scoping step with relevant consultation bodies and authorities
- Integrated management of survey, consultation and assessment processes
- Facilitation of public consultation through a dedicated website
- Widespread dissemination of data and information
- Development of modular documents applicable to more than one SEA
- Syntheses of data to facilitate access
- Commissioning of expert underpinning studies
- Publication of technical reports on website, CD as well as hard copy where requested
- Involvement of authors of expert underpinning studies and other users in an assessment workshop
- Stakeholder workshop meetings
- Environmental report available via website or as CD or hard copy
- Continuing development of the methods for the consideration of cumulative and synergistic effects

Responsibility for the publication of the Environmental Report rests with the DTI. Members of the Steering Group, as individuals and through their organisations, may comment on the proposed draft plan and the consultation materials (including this document) during the consultation phase, and encourage others to comment.

3.2 Scoping

A key purpose of scoping is to identify key issues of concern at an early stage so that they can be considered in appropriate detail in the SEA. Scoping also aids in the identification of information sources and data gaps that may require to be filled by studies or surveys to underpin the assessment.

For the SEA 7 process the principal purposes of scoping were to:

- Promote stakeholder awareness of the SEA initiative
- Ensure access to all relevant environmental information
- Identify opportunities for potential collaboration and the avoidance of duplication of effort
- Identify information gaps so these could be evaluated and filled if necessary
- Identify stakeholder issues and concerns which should be considered in the SEA

Initial scoping consultation with a range of academics and conservation organisations focussed on ascertaining seabed survey and other study needs. This part of scoping was conducted early because of the timescale needed to organise, collect and analyse offshore seabed information and samples. The conclusion of that consultation was that additional information on specific seabed habitats and fauna was needed and consequently surveys of targeted areas of SEA 7 were conducted in 2005 and 2006 – see Section 3.3.

A scoping document was produced and a scoping opinion formally requested in November 2006 from the environmental consultation authorities and bodies for Wales, Scotland,

England and Northern Ireland. Responses received are summarised in Appendix 1 and have been considered in the SEA.

3.3 Surveys and studies

Seabed surveys were carried out in the SEA 7 area during 2005 and 2006 (see Figure 3.2) variously from the *RV Pelagia, the MV Franklin* and the *RSS Charles Darwin.* A variety of features of potential conservation interest were surveyed, in particular areas of elevated topography including offshore banks, seamounts and pinnacles. The work comprised geophysical and biological sampling, video and still photographs collected using a drop camera system.

Figure 3.2 – Areas included in the 2005 and 2006 SEA 7 surveys

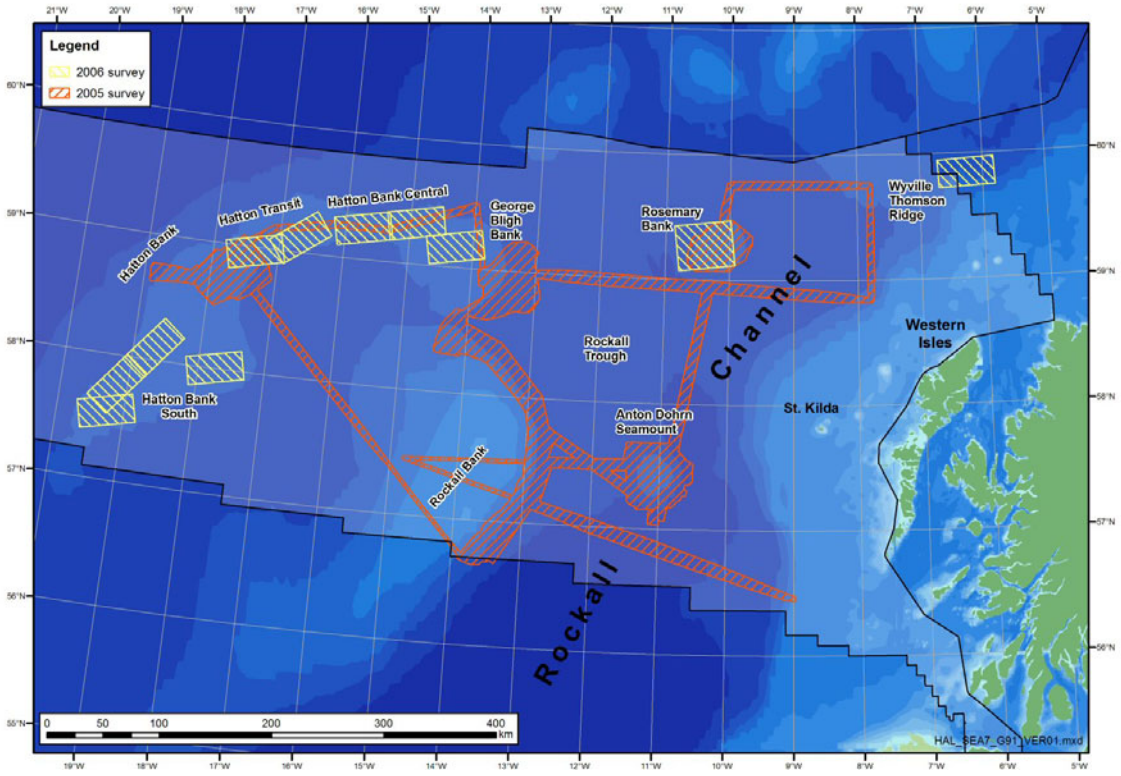


Figure 3.3 – Example seabed images from the SEA 7 surveys

Cold water coral on Hatton Bank

Rabbit fish at George Bligh Bank

A preliminary review, with input from the SEA Steering Group, of the availability of information to support preparation of the baseline environment description for this assessment (Appendix 3) concluded that a number of studies were required. These studies were commissioned either to provide expert reviews or data syntheses in areas for which synoptic overviews were not published or readily available. These reports underpin the assessment documented in this report and are available from the DTI's SEA website (www.offshore-sea.org.uk).

Technical Reports

- SEA7 Benthos
- SEA7 Cephalopods
- SEA7 Conservation
- SEA7 Economics Baseline Study
- SEA7 Fish & Fisheries
- SEA7 Geology
- SEA7 Hydrography
- SEA7 Marine Mammals
- SEA7 Noise
- SEA7 Other Users
- SEA7 Plankton
- SEA7 Archaeology
- SEA7 Prehistoric Archaeology
- SEA7 Seabirds
- SEA7 Surface Geology & Sedimentary Processes
- SEA7 Shellfish
- SEA7 Socio-economics
- Inshore Seabirds Review

Data Reports

- SEA7 Benthos.
- SEA7 Contamination.
- SEA7 Fish & Fisheries.
- SEA7 Geology.
- SEA7 Oceanography.
- SEA7 Plankton

3.4 SEA objectives

The development of SEA objectives is a recognised way in which environmental considerations can be described, analysed and compared. Objectives and indicators for SEA 7 were discussed at an Assessment Workshop held in Glasgow in October 2006 in which members of the SEA steering group and technical authors participated. The revised draft list was circulated to the Consultation Bodies/Authorities during scoping and was subsequently amended as a result of scoping feedback. The revised SEA Objectives are presented in Table 3.1 below.

Table 3.1 - SEA Objectives and Indicators

SEA topic	SEA Objective	Indicators
Biodiversity, habitats, flora and fauna	Avoids damage to conservation sites, and protected species	Site condition monitoring reveals no decline in conservation status
	Conserves the wildlife and wildlife habitats of the United Kingdom	For selected "valued ecosystem components" no loss of diversity or decline in population (measures as % of relevant biogeographic population) attributable to E&P activities

SEA topic	SEA Objective	Indicators
Geology and soils	Protects the quality of the seabed and sediments	No adverse change in quality of seabed sediments at a series of regional monitoring stations
	Avoids damage to geological conservation sites and protects important geological features	No physical damage to designated geological conservation sites
Landscape/seascape	Minimises adverse impact on seascape/landscape including designated and non-designated areas	No permanent impact on designated areas (inclusive of related shore developments)
Water resources	Protects surface water and aquifer resources	No adverse change in quality of surface water and aquifers UKCS E&P meets OSPAR hydrocarbon discharge reduction targets Number of spills and quantity of spilled oil
Air quality	Avoids degradation of regional air quality from oil and gas activities	Existing monitoring of local air quality shows no adverse impact
Climatic factors	Minimises greenhouse gas emissions	UKCS E&P greenhouse gas emissions 2003 Energy white paper "Low Carbon Indicator" (Greenhouse gas and carbon dioxide emissions)
Population and human health	Has no adverse impact on human health	Progress in achieving OSPAR targets for continued reduction in harmfulness of offshore discharges
	Avoids disruption, disturbance and nuisance to communities	None currently proposed
Material assets (infrastructure, other natural resources)	Protects other United Kingdom resources of economic and amenity value	Avoidance of spatial conflicts
	Promotes waste reduction	Progress in reducing volumes of waste to landfill

SEA topic	SEA Objective	Indicators
Cultural heritage including architectural and archaeological heritage	Protects the historic environment and cultural heritage of the United Kingdom	No impact on designated sites and features (including impact on their setting)

3.5 SEA scope

The area of study for the SEA 7 is shown in Figure 1.1 and for the re-offer of Blocks in areas 1 to 6 in Figure 1.2.

The main stages of oil and gas activity considered in the assessment are:

- Exploration, including seismic survey and exploration drilling
- Development, including production facility installation, generally with construction of an export pipeline, and the drilling of producer or injector wells
- Production, with routine supply, return of wastes to shore, power generation, chemical use and produced water reinjection
- Maintenance
- Decommissioning, including cleaning and removal of facilities

The main sources of potential environmental effects are:

- Noise (impulsive) from seismic survey and piling during installation
- Noise (continuous) from drilling rig, production facility or vessels
- Physical damage (acute) from anchoring, pipeline construction
- Physical damage (non-acute) from particulate smothering
- Physical presence (biological) colonisation of structures by organisms
- Physical presence (human uses) interference with other users of the sea
- Chemical contamination (routine) from drilling and production discharges
- Chemical contamination (accidental) from spills etc
- Atmospheric emissions (air quality) from fuel combustion, venting
- Atmospheric emissions (climate) from fuel combustion

The SEA assessment considered the likely significant effects of the implementation of the plan including short, medium and long-term effects, permanent and temporary effects, positive and negative effects, and secondary, cumulative and synergistic effects on:

- Biodiversity, habitats, flora and fauna
- Geology and sediments
- Landscape/seascape
- Water resources
- Air quality
- Climatic factors
- Population and human health
- Material assets (infrastructure, other natural resources)
- Cultural heritage, including architectural and archaeological heritage

and the interrelationship between the above.

3.6 Assessment methodology

The assessment is presented as an evidence based discussion (Appendix 11) citing peer reviewed and other literature as appropriate together with spatial GIS output maps and graphics. The assessment will consider the implications of the draft plan for relevant existing environmental problems including, especially, those relating to any areas of a particular environmental importance, such as areas designated under the Habitats & Species and Birds Directives. The assessment will draw on stakeholder perspectives on key issues relating to offshore oil and gas exploration and production obtained through consultation with regulators, local authorities, operators and others. The results of the assessment are summarised for each alternative in a receptor based matrix format (Appendix 11).

The assessment is summarised in Section 5 of the Environmental Report.

Assessment workshop

An Assessment Workshop involving the SEA steering Group, Technical Authors and SEA Team was held in October 2006. The workshop brought the expertise of the SEA Steering Group, the authors of the SEA 7 underpinning technical reports, and the SEA team to bear on the assessment process for SEA 7 (see Appendix 11).

The objectives of the assessment workshop were to:

- To discuss and agree the draft objectives for SEA 7
- To identify the main environmental issues that should be considered further in the SEA 7 Environmental Report
- Review areas, sites and features of the SEA 7 region to identify any requiring additional protection over and above that available through existing mechanisms
- Identify any gaps in information and understanding, and assess their influence on the confidence with which the SEA 7 assessment of likely effects and necessary mitigation can be made
- To consider the re-offer of blocks for oil and gas licensing within areas previously subject to SEA

Stakeholder meeting

The SEA 7 stakeholder meeting took place in March 2007 in Glasgow. A wide variety of potential stakeholders, drawn from UK regulators, government advisers, local authorities, other industry representatives, academics, NGOs and those who registered with the SEA website were invited to the session. The workshop was chaired by Professor William Ritchie. The workshop had two key objectives:

1. To update stakeholders on the SEA 7 progress and issues
2. To gather stakeholder input to and comments on the information and analysis on which SEA 7 is being based

A document providing background for stakeholders on the current DTI offshore energy SEA (SEA 7) was forwarded to delegates in advance of the workshop. During the workshop, delegates were also provided with a workshop feedback questionnaire (Appendix 11).

3.7 Public consultation

The Environmental Report and draft plan will be issued for formal consultation in line with the requirements of the SEA Regulations and the Cabinet Office Code of Practice – see below.

In November 2000, the Cabinet Office published a code of practice on written consultation which provides criteria for consultations involving documents in written or electronic form. The Code of Practice was reviewed, and a revised code was published on 20 January 2004 – see extract below.

CODE OF PRACTICE ON CONSULTATION

The six consultation criteria:

1. Consult widely throughout the process, allowing a minimum of 12 weeks for written consultation at least once during the development of the policy.
2. Be clear about what your proposals are, who may be affected, what questions are being asked and the timescale for responses.
3. Ensure that your consultation is clear, concise and widely accessible.
4. Give feedback regarding the responses received and how the consultation process influenced the policy.
5. Monitor your department's effectiveness at consultation, including through the use of a designated consultation co-ordinator.
6. Ensure your consultation follows better regulation best practice, including carrying out a Regulatory Impact Assessment if appropriate.

These criteria must be reproduced within all consultation documents.

Extract from Code of Practice on Written Consultation issued January 2004

4 ENVIRONMENTAL INFORMATION

4.1 Introduction

The following section and associated appendices provide environmental information as required under Schedule 2 of *The Environmental Assessment of Plans and Programmes Regulations 2004* (Regulation 12(3)).

The environmental baseline of the SEA 7 area (Section 4.2) is described under a series of headings which relate to issues identified by the SEA Regulations on which to judge the *"…likely significant effects on the environment, including short, medium and long-term effects, permanent and temporary effects, positive and negative effects, and secondary, cumulative and synergistic effects…"* These include:

- Biodiversity, habitats, flora and fauna
- Geology and sediments
- Landscape/Seascape
- Water environment
- Air quality
- Climatic factors
- Population and human health
- Material assets (infrastructure, other natural resources)
- Cultural heritage, including architectural and archaeological heritage

Within Section 4.2, summary details are provided under each heading with further information and figures available in a series of sub-appendices of Appendix 3. Links between Section 4.2 and the relevant sub-appendices are signposted clearly.

Section 4.3, relevant existing environmental problems in SEA 7 area, identifies *"Any existing problems which are relevant to the plan or programme including, in particular those relating to any areas of particular environmental importance, such as areas designated pursuant to Council Directive 79/409/EEC on the conservation of wild birds and the Habitats Directive."* Similarly, the location of further information within the relevant sub-appendices is signposted.

Finally, Section 4.4 Likely evolution of the baseline highlights *"…relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme."* Supporting information in the sub-appendices is again signposted clearly.

4.2 Environmental baseline of SEA 7 area

Biodiversity, habitats, flora and fauna

The SEA 7 area contains a wealth of different habitats which support a wide variety of biological species and communities. Whilst some species may be restricted to particular depths or temperatures; others including some fish and cetaceans may range between coastal and deeper offshore waters.

Coastal areas are characterised by a complex coastline with sheltered sea lochs, rocky shores, sandy beaches and extensive machair habitat. The sea lochs contain extensive areas of sheltered muddy habitats which are also present in deeper areas of the Minch. The

many islands and skerries present, both nearshore and further offshore, support internationally important populations of cliff-breeding seabirds and waterbirds (e.g. ducks, grebes and divers) which overwinter in sounds and inlets, and breeding seals. St. Kilda, in particular supports huge numbers of breeding seabirds, as well as internationally important marine habitats such as reefs and extensive sea caves. Between many of the islands, fast-flowing tidal straits support a rich benthic fauna. Fronts between well-mixed and stratified (thermally or salinity-induced) waters may be areas of increased biological production attracting marine predators such as fish, turtles, seabirds, seals and cetaceans. The extensive shallow shelf west of the Outer Hebrides is exposed to wave action with large areas of bedrock, cobbles and boulders present.

Between the shelf and the deeper offshore areas of the Rockall Trough, a persistent northward flowing shelf edge current transports warm water from the south along the Atlantic margin. This current plays a key role in the distribution of both benthic communities and pelagic organisms such as plankton, cephalopods and fish. Moving down slope, bottom currents which can often be quite strong shape both the sediment bedforms and the benthic communities present in the major basins of the region. Mixing processes around the large seamounts in the region may result in enhanced production. Given that offshore waters are less productive generally than those of the shelf, these areas of enhanced production may be important for a wide range of species including fish, seabirds and marine mammals.

In the deep water basins, epifaunal communities on boulders and rock add diversity to the predominantly deep water mud communities found over much of the area. Benthic organisms of particular importance and abundance include xenophyophores, sponges and corals. These organisms can provide habitat for a wide variety of different species, including fish and invertebrates. Coral reef mounds have been found on the south and west flanks of the Rockall Bank, Wyville Thomson Ridge, Lousy Bank and Hatton Bank, and in the Sea of the Hebrides. Of particular note are the Darwin Mounds which lie at a depth of 900-1,000m in the north east Rockall Trough. These coral-capped mounds are of international importance and have recently become the UK's first offshore pSAC. Other relevant offshore sites for reef habitat in the process of being designated as SACs include the Wyville Thomson Ridge and Stanton Banks.

The main ecological characteristics of the SEA 7 area are described in ***Appendix 3a.1*** under the following headings: plankton; benthos; cephalopods; fish and shellfish; marine reptiles; seabirds and coastal waterbirds, and marine mammals.

International nature conservation sites present within coastal and marine areas of SEA 7 include Special Areas of Conservation, Special Protection Areas, Ramsar sites, Important Bird Areas, Biosphere Reserves and World Heritage Sites (*see **Appendix 3a.2** and **Section 2** of the underpinning conservation report (AICSM & Hartley Anderson 2006) on the SEA website*). There are also a large number of sites of national and local importance (*see **Appendix 3a.2** and **Section 5** of AICSM & Hartley Anderson 2006*). The conservation importance of St. Kilda for example is highlighted by its designation as an SAC, SPA, IBA and World Heritage Site as well as a National Nature Reserve and Site of Special Scientific Interest (SSSI).

Relevant offshore SACs include the Darwin Mounds possible SAC, the Stanton Banks dSAC and the Wyville Thomson Ridge dSAC (*see **Appendix 3a.2** and **Section 3** of AICSM & Hartley Anderson 2006*).

Geology and sediments

Deep water basins dominate much of the SEA 7 region with the Rockall Trough, Hatton-Rockall Basin and Iceland Basin the major topographic lows. These basins are bordered by topographic highs including the Rockall and Hatton Banks with a number of large seamounts also present. The topography of the shelf and coastal areas are characterised largely by glacial relict features including the fjordic coastline of the mainland, drumlins, enclosed deeps, bedrock grooves, moraines and slide scars.

Earthquakes are fairly common in the region although those large enough to surpass structural design criteria are limited in number and restricted to nearshore areas.

The SEA 7 area has been under-explored for hydrocarbons and has no producing oil or gas fields. Difficulties in understanding the region's prospectivity are posed by the lack of detailed knowledge on source rocks and the impacts of thick sequences of Palaeogene volcanic rocks on exploration.

The morphology and distribution of surficial sediments in the region has resulted largely from the interplay of glacial processes (e.g. iceberg rafting, debris flows), and palaeo- and modern-day physical processes including bottom currents and gravity-driven slope processes *(see **Appendix 3b** and the underpinning BGS geology and surficial sediments report (Holmes et al. 2006))*.

The DTI funded a seabed survey in 2005 to map selected areas of the major offshore banks and shoals in the SEA 7 region with a view to investigating their geomorphology and sedimentary processes. Areas surveyed included the Anton Dohrn Seamount, Rosemary Bank, George Bligh Bank, Rockall Bank and Hatton Bank. Key features identified included coral reef mounds, polygonal faults, erosive scars resulting from strong benthic currents, rock outcrop and areas of potential slope instability *(see **Appendix 3b** and the underpinning seafloor surface architecture and sedimentary processes report (Jacobs 2006)).*

Given that much of the area is remote from industry/population centres and there are few offshore activities, levels of contamination of sediments, seawater and biota are expected to be close to background *(see **Appendix 3b**)*.

Geological Conservation Review (GCR) sites are of national and international importance and have been selected to show all the key scientific elements of the earth heritage of Britain. There are 156 coastal GCR sites in SEA 7, selected for 25 different categories (the GCR 'blocks'), which cover a range of geological and geomorphological features *(see **Section 5** of AICSM & Hartley Anderson 2006).*

Landscape/Seascape

The coastal region of SEA 7 has a varied and complex landscape and seascape which includes a highly indented coastline with a large number of islands of various sizes.

On the north west coast of the Scottish mainland, rocky headlands produce a series of broad bays and sealochs with many small islands and skerries. The east coast of the Outer Hebrides is for the most part heavily indented and fragmented with many inland water bodies. Much of the west coast has a horizontal form with views over open expanse of Atlantic. North Uist is slightly more complex due to dune systems and a more hilly hinterland.

The Inner Hebrides is a diverse series of small and large islands, all of which have distinctive characteristics with some having notable archaeological and historical landscape designations (AICSM & Hartley Anderson 2006). On Skye, the coastline is dominated by the headlands of the three peninsulas Trotternish, Waternish and Duirinish between large bays or sealochs. The other islands have a highly varied and complex landscape/seascape, often highly fragmented with rocky inlets, small islands and skerries, sandy beaches and machair. The sounds between the islands and the mainland are an important part of the landscape/seascape.

The Scottish mainland coast is characterised by deep-sea punctuations into an essentially highland landscape of ridges and mountains. Over-deepened by ice-movements, this interpenetration of the sea and the land epitomise the image of Highland Scotland (AICSM & Hartley Anderson 2006).

Key characteristics of the seascape of the west coast of Scotland and the islands and their sensitivity to development are described in ***Appendix 3c***.

In the Scottish part of SEA 7, sixteen large coastal areas have been designated as National Scenic Areas (NSAs), Scotland's only national landscape designation *(see **Appendix 3c** and **Section 5** of AICSM & Hartley Anderson 2006).*

The coast of Northern Ireland is a high coastline with relatively few bays and beaches most of which have traditional holiday-making facilities, including golf courses e.g. Portrush and Whiteport. Rathlin Island lies 7km offshore and contains good examples of the basaltic and other landscapes which are found elsewhere in the province. The basaltic columns of the Causeway Coast have been designated as an Area of Outstanding Natural Beauty (AONB) as well as a World Heritage Site. The Antrim Coast and Glens AONB is also of relevance *(see **Appendix 3c** and **Section 5** of AICSM 2006)*.

Water environment

SEA 7 is the largest and most extensive of the SEA regions and the range of marine environments is probably the most diverse of all the regions; from abyssal ocean depths and isolated seamounts, to narrow coastal sounds and fjords.

The physical structure of the shelf seas is largely determined by a balancing act between the stratifying influences of solar radiation and fresh water run-off from the land, and the mixing influences of the strong tidal and wind-driven flows, themselves shaped by the irregular bathymetry and coastline of the SEA 7 region. On the outer shelf and upper slope, the northward-flowing slope current is a key feature responsible for the transport of water, sediments and biological organisms through the region. Some or all of the slope current intermittently meanders onto the shelf north of Ireland where it mixes with waters flowing north from the Irish Sea and Clyde Sea. This mixture forms the Scottish Coastal Current (SCC), which continues northward through the Minch with another branch flowing up the west coast of the Outer Hebrides.

In deeper waters, strong bottom currents, particularly in the vicinity of the major banks and seamounts, are often responsible for distributing sediments and there is evidence of seabed scouring in such areas. Surface and bottom currents over much of the deep water area are complex with eddies and internal waves adding considerable variability. Winter mixing of the near-surface layers usually occurs to depths of 500–700m but there is evidence of deeper mixing, possibly to 1,000m. The region is therefore a major area for ventilation of the North Atlantic and facilitates ocean-atmosphere heat exchange.

The SEA 7 area experiences some of the harshest metocean conditions in the world. The region is exposed to the full force of storms generated in the Atlantic Ocean, particularly during winter months, which are associated with waves of considerable size developed over the long Atlantic fetch.

Ambient noise over much of the area is dominated by natural processes such as wind and precipitation rather than anthropogenic sources. During calm periods, noise from distant and local shipping may be more important *(see **Appendix 3d** and underpinning ambient noise report (Harland & Richards 2006)).*

Further details of the SEA 7 water environment are provided in ***Appendix 3d*** and the underpinning hydrography report (SAMS 2006).

Air quality

Whilst air quality is not monitored routinely at offshore sites, regular air quality monitoring is carried out by local authorities in coastal areas adjacent to SEA 7. The air quality of all local authorities within the SEA 7 area were within national standards set by the UK government's air quality strategy (DEFRA 2006), with no areas declared as Air Quality Management Areas. In 2004, emissions of atmospheric pollutants were very low over the vast majority of the coastal SEA 7 area with higher emissions from parts of Northern Ireland.

In general, the lack of industrial development and remoteness of the SEA 7 area means that air quality is likely to be good or excellent over nearshore and offshore waters. The atmospheric deposition of pollutants to the SEA 7 area is likely to be low.

Further details of air quality in the SEA 7 area are provided in ***Appendix 3e***.

Climatic factors

The North Atlantic Oscillation (NAO) is an important influence on the North Atlantic and European weather and climate. In recent decades the NAO has been found to explain over 30% of variation in monthly sea surface temperature and has also been linked with variations in wind strength and direction and rainfall (IACMST 2005).

In general, the coldest months in the SEA 7 area are January and February and the warmest are June, July and August. Gale force winds, over the open ocean, can be expected in all seasons with, in winter, 20% of all observations recording winds of Force 8 or more (>18.9ms^{-1}) in the west of the area and 17% in the east. In the spring the frequency is between 4 and 8% and, in the autumn, between 8 and 12% with the higher frequencies in the west. Severe gales (Force 10 or more) (>26.4ms^{-1}) have a percentage frequency, in winter, of about 6% in the west but only around 2 to 3% in more sheltered areas to the east (UKHO 2004). The most frequent direction for gales is from the south west to west, and although gales from the south to south east are not uncommon, they are usually short-lived.

Further details of climatic factors are provided in ***Appendix 3f*** which also summarises progress in understanding the human and natural drivers of climate change.

Population and human health

Population

The coastal region of SEA 7 is not heavily populated with the population estimated at about 135,000 people. Population density is very low (4-19 persons/km^2) in comparison to the

general figure for Scotland (65 persons/km^2) and extremely low in comparison to Northern Ireland's population density (119 persons/km^2) (Scottish Executive Social Research 2002).

The coastal region is generally rural in nature with a number of relatively small settlements. The largest settlements are the towns of Fort William, Stornoway on the Isle of Lewis, Oban and Ballycastle in Northern Ireland.

Despite the general decline in the fishing industry, fishing remains an important part of the coastal economy in Scotland. The significance of the industry varies by region, with the Outer Hebrides being one of the few regions found to be particularly dependent on sea fishing. The main sources of income in Northern Ireland are farming, tourism and a little light industry *(see **Appendix 3g** and the underpinning other users report (Stocks & Hobbs 2006)).*

Human health

The UK Government utilises a series of Community Health Profile Indicators to gain a general understanding of the health and well-being of the population.

SEA 7 is an offshore area and the following relates to the populations adjacent to the area.

One of these indicators, *Feeling "in poor health"*, uses the age standardised percentage of household residents who reported their health over the previous 12 months as having been "not good". Evidence suggests that this self-reported measure of health has good predictive validity of mortality and health care utilisation. Overall in Scotland, 10.2% of people described their health for the 12 months prior to Census day (29 April 2001) as "not good". This compared with 9% in England, 12.5% Wales and 10.5% for Northern Ireland (Healthscotland 2004).

Adjacent to SEA 7, there was little variation in the percentage of people describing their health as "not good", with figures ranging from 9.5% in Argyll & Bute to 8.4% in Ross, Skye & Inverness West and 8.8% in the Western Isles.

Life expectancy for both males and females adjacent to the SEA 7 are increased over the period 1993/95 to 2003/05, with the highest increase in Argyll & Bute, where male life expectancy increased by 3.5 years to 75.1 years and females increased by 2 years to 80.7 years (National Statistics 2006). Life expectancy in Northern Ireland increased on average for both sexes from 75.6 years to 79.5 years.

Material assets (infrastructure, other natural resources)

Fisheries

Demersal fishing effort for cod, haddock, anglerfish, whiting, *Nephrops* and saithe is fairly high over the shelf but particularly high south of Barra and to the north of the Outer Hebrides. Deep water bottom trawling extends from the shelf break down to about 1,700m and the target species vary with depth.

In 2004 the EC took action to protect the cold water corals of the Darwin Mounds (now a pSAC) and prohibited all fishing with gear that makes contact with the seabed in a defined area around the mounds.

The main pelagic fisheries of the west of Scotland are for herring, mackerel, horse mackerel and blue whiting. Other fisheries include longlining for ling, tusk, hake and Greenland halibut

as well as a range of coastal shellfisheries *(see **Appendix 3h** and the underpinning fisheries reports (Gordon 2006, Chapman 2006)).*

Important fishing ports in the SEA 7 area include Kinlochbervie, Ullapool, Mallaig and Lochinver.

Shipping

Overall shipping density throughout SEA 7 is low to moderate. Moderate shipping density occurs in coastal waters between the mainland and the Hebrides and from the southern tip of the Outer Hebrides running south east to the North Channel. The highest density occurs in the North Channel and there is a traffic separation scheme in place to control this traffic. West of the Outer Hebrides shipping density is low and there is a deep water route for large vessels.

Five Marine Environmental High Risk Areas (MEHRA's) have been established in the SEA 7 area including Gallan Head on the Isle of Lewis, two cells at West Islay, and two further cells at North St. Kilda and South St. Kilda.

Oil and gas activity

There has been little oil and gas activity in the SEA 7 area. A small number of blocks have previously been licensed and two areas to the north of the SEA 7 area (north of the Outer Hebrides) within quadrants 164 and 154 are currently under licence. There has been one significant gas discovery in block 154. However, there are no existing oil or gas fields in production or under development.

Renewable energy

At present there is little development of offshore renewables in the SEA 7 area but there is huge potential from wind, wave and tidal resources.

The Western Isles Council has recently recommended that the Scottish Executive approve the development of a major wind farm on the Isle of Lewis. The recommendation was subject to the removal of 5 turbines from the revised Lewis Wind Power proposal of 181 turbines generating about 650MW of electricity. The proposal has generated considerable public interest over its potential environmental and socio-economic impacts and will now be considered by the Scottish Executive.

There is considerable political will to develop renewable energy in the region. A Strategic Environmental Assessment for the development of marine wave and tidal renewables is currently underway and the world's first commercially operational wave-power station has been operational on Islay for a number of years. The arrival of large scale marine renewables in the SEA 7 area is likely to be a number of years away but the industry may compete with oil and gas for sea areas at some point in the future. The availability of interconnection infrastructure is a significant constraint on development of both onshore and offshore renewable energy in the area. A recent Scottish Hydro Electric Transmission Limited (SHETL) consultation on the preferred option for an interconnection between Lewis and the mainland described the potential for underground cabling between Lewis and Little Loch Broom (Scottish and Southern Energy website - http://www.scottish-southern.co.uk).

Cables

Cables in the SEA 7 area include four international telecom cables of which three are active and one is out of service.

Military activity

Almost the entire marine area to the west of Scotland is designated as military practice and exercise areas (PEXA). However, the presence of a PEXA does not preclude other activities and provided there is sufficient planning and consultation between the oil and gas industry and the MOD, conflict would be considered unlikely.

Marine waste disposal (including ordnance)

There are a number of small nearshore disposal sites, primarily for the disposal of material from port and navigation channel excavation and coastal engineering works.

There are 5 known munitions dump sites in the SEA 7 area. Conventional munitions were disposed of at two coastal sites and the three remaining offshore sites contain chemical weapons. The recovery of dumped munitions is not considered feasible at present and munitions have been shown to be present outside of the boundaries of known dump sites.

Mariculture

The west coast and islands are the focus of much of the mariculture industry in Scotland, particularly for salmon and shellfish. The industry makes an important contribution to the economy of rural and island communities. Mariculture is also important on the Irish Donegal coast which borders the SEA 7 area in Northern Ireland.

Tourism and recreation

The SEA 7 coast is characterised by unspoilt and spectacular coastal scenery with few large population centres. It appeals to people who want to 'get away from it all' and enjoy nature. Popular outdoor activities include nature watching, walking, sailing, diving and fishing. Tourism makes an important contribution to regional economies with around 10% of people employed in the tourism sector in some areas. The relative remoteness of the Northern Highlands and the islands means that they receive fewer tourists than south west Scotland and the coast of Northern Ireland. However, some local developments may be significant, for example the increase in diving and cultural visitor numbers at St. Kilda. Continued development of cruise liner tourism may also have a local effect in some parts of the area.

Further details of the material assets of the SEA 7 region are provided in ***Appendix 3h*** and the underpinning other users report (Stocks & Hobbs 2006).

Cultural heritage, including architectural and archaeological heritage

Ten thousand years ago, relative sea level was up to 45m lower along much of the SEA 7 coast and this corresponds with the period of early human settlement in the area.

Potential locations for the survival of prehistoric archaeological material on the seabed include the shelf to the west of the Hebrides; the Hawes Bank and seabed around Coll and Tiree; and between and around Islay, Jura, Colonsay and Oronsay. Smaller locations include parts of the Rum and Canna coastline, sheltered inlets and reaches to the east of the Hebrides, and sheltered inlets around Skye. Recent research at the University of Ulster,

Coleraine has highlighted the previous existence of a low energy strait with various islands between the Northern Irish coast and the south Hebrides in the early Holocene (Cooper *et al*. 2002), confirming this area as a potential archaeological hotspot.

The SEA 7 area has been used extensively by seafarers from at least the Mesolithic up to present times. A large number of ship wrecks have been located within the region although there are likely to be a considerable number which remain unidentified. There are five wrecks protected under the *Protection of Wrecks Act 1973* within the SEA 7 area, the *Swan*, the Kinlochbervie wreck, *HMS Dartmouth* and the Mingary castle wreck off the Scottish coast, and *La Girona* off Northern Ireland.

The maritime cultural heritage around St. Kilda is currently protected as a World Heritage Site. The World Heritage Site of the Giant's Causeway and Causeway coast does not protect the maritime cultural heritage as yet, but may do so if its designation is reconsidered in the future.

4.3 Relevant existing environmental problems in SEA 7 area

The SEA Directive sets out the information to be included in the Environmental Report of the Strategic Environmental Assessment, and includes:

- *Any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC and 92/43/EEC (the Birds and Habitats Directives).*

The environmental problems described in Table 4.1 were identified during preparation of the environmental baseline (Section 4.2 and Appendix 3). No judgement of importance should be inferred from the position of problems/issues in the table. The location of supporting data is signposted in Table 4.1.

Table 4.1 – Environmental problems relevant to offshore oil and gas licensing

Problem	Supporting data	Implications
Potential for nearshore earthquakes	Five earthquakes of sufficient magnitude to cause structural damage to developments tied to the seabed have been recorded in the nearshore since 1970. None recorded on the outer Hebrides Shelf or further to the west. **Further information:** Appendix 3b. Holmes *et al.* (2006).	Review potential blocks to be offered and ensure licensee awareness.
Instability of Rockall Bank slope	Eastern margin of Rockall Bank has a steep upper slope which is an area of heavily incised bedrock outcrop. Evidence of landsliding on mid-lower slope. **Further information:** Appendix 3b. Jacobs (2006)	Ensure licensee awareness. Detailed environmental, oceanographic, and geotechnical studies may be required.
Transport of pollutants	Potential for pollution from discharged fine-grained sediment particles to be carried along-slope and along-shelf to the wider seabed by the residual currents.	Ensure licensee awareness. Detailed studies may be required to determine risk of pollutant transport.

Problem	Supporting data	Implications
	Further information: Appendices 3d and 3g. Holmes *et al.* (2006).	
Potential effects of climate change	Potential effects still not fully known. Large scale climatic and oceanographic processes such as changes in the NAO index may affect wave heights and water temperatures. **Further information:** Appendix 3f. SAMS (2006).	Maintain awareness of research developments and encourage active participation in relevant research.
Contamination of water and sediments	Existing contamination of sediments and sea water by hazardous substances likely to be restricted to areas close to industrial and population centres such as the Firth of Clyde. There may also be contamination associated with munitions dumpsites although the scale of this potential problem is poorly defined. **Further information:** Appendix 3g.	Review potential blocks to be offered and ensure licensee awareness so that potential activities do not exacerbate problem.
Introduction of non-native species	Sediments and water in ballast tanks are important vectors for the spread and introduction of invasive planktonic and benthic species. **Further information:** Appendix 3a.1.1. Kennington & Johns (2006).	Ensure licensee awareness. Encourage good practice for vessel management of rigs/support vessels to minimise risk.
Potential climate induced changes to phyto- and zooplankton communities in NE Atlantic	Considerable increase in phytoplankton colour (production) over the last decade in certain areas of the north east Atlantic. Large-scale reorganisation in zooplankton communities detected. **Further information:** Appendix 3a.1.1. Kennington & Johns (2006).	Maintain awareness of research developments and encourage active participation in relevant research.
Damage to important benthic habitats such as cold water corals	Widespread damage to coral reefs caused by the trawls of commercial fishing vessels has been observed on the shelf edges of Ireland and Norway, and on the Darwin Mounds pSAC. **Further information:** Appendix 3a.1.2. Davies *et al.* (2006).	Review potential blocks to be offered and ensure licensee awareness so that potential activities do not exacerbate problem.
Declines in the numbers of salmon returning to rivers on the west coast	Reasons for declines in this Annex II species are complex but may include pollution, predation, by-catch, parasite infestation from aquaculture sites, genetic interactions with escaped farmed stock, and climate change. **Further information:** Appendix 3a.1.4.	Significant interaction not foreseen.
Over-fishing and changes to fish communities	Whilst the impact of fishing activities on the shelf fish communities is unclear, there are a number of severely depleted stocks e.g. cod, whiting, plaice and hake. Trawling in the deep waters may have caused substantial changes in the community structures of the deeper waters west of the shelf break. **Further information:** Appendix 3a.1.4. Gordon (2006).	Significant interaction not foreseen.

Problem	Supporting data	Implications
Vulnerability of seabirds and coastal waterbirds to pollution and disturbance from shipping and industry	The SEA 7 area is of great importance to both seabirds and coastal waterbirds throughout the year. Shelf and coastal waters around important seabird colonies many of which are designated as SPAs are very vulnerable to surface pollution and disturbance. **Further information:** Appendix 3a.1.6. Barton & Pollock (2005), Pollock & Barton (2006a).	Review potential blocks to be offered and ensure licensee awareness so that potential activities do not exacerbate problem.
Possible disturbance of marine mammal populations.	Given the remote nature of much of SEA 7, there are few sources of disturbance to marine mammals in the region. However, a number of activities within the region (e.g. military sonar/seismic and fishing activities) could disturb marine mammal populations. In general, existing populations of large whales have not recovered from the effects of past commercial whaling and are therefore particularly vulnerable to disturbance. **Further information:** Appendix 3a.1.7. Hammond *et al.* (2006), Harland & Richards (2006).	Maintain awareness of research developments. Review potential blocks to be offered and ensure licensee awareness so that potential activities do not exacerbate problem.
Unfavourable condition of conservation features and sites.	Over the period 1999-2005, the national conservation agencies carried out a programme of monitoring the designated features of A/SSSI, SACs, SPAs and Ramsar sites (http://www.jncc.gov.uk/page-3521). 57% of A/SSSi sites were reported as in favourable condition, with 37% of SACs, 86% of Ramsars and 73% of SPAs reported as favourable. 60.3% of UK marine and coastal habitats were reported as favourable. SEA 7 specific details are not available. However, the features which are least favourable are often being impacted by factors which operate outside the sites on which they are designated (e.g. drainage conditions for some isolated wetlands, pollution) which require concerted effort by many agencies (e.g. water quality affecting fish). Given that much of the SEA 7 is remote from human influence, it would be expected that this particular impact would be reduced compared to other areas. **Further information:** Appendix 3a.2. AICSM and Hartley Anderson (2006).	Review potential blocks to be offered and ensure licensee awareness so that potential activities do not exacerbate problem.

4.4 Likely evolution of the baseline

Given the extent of the SEA 7 area, the lack of detailed information about the region's environment and the difficulty in defining quantitative indicators of the likely evolution of the environmental baseline, a qualitative approach has been adopted.

Table 4.2 highlights how key aspects of the SEA 7 environment (as described in Section 4.2 and Appendix 3) may evolve in the absence of oil and gas licensing in the region. The location of relevant information in Appendix 3 is clearly signposted as are relevant reports.

Table 4.2 – Likely evolution of the SEA 7 baseline

Likely evolution of baseline
Biodiversity, habitats, flora and fauna
Plankton There has been a considerable increase in phytoplankton colour over the last decade in certain areas of the north east Atlantic. Particularly high increases were seen after the mid-1980s between 52-58°N (central oceanic area). However, an inverse pattern of change (decreasing trend) in phytoplankton colour was seen above 58°N (northern oceanic area). Over the same period of time there have been large scale changes in the spatiotemporal patterns of sea surface temperature (SST) in the north east Atlantic (Edwards *et al.* 2001). These different regional responses can be partly explained by trends in the North Atlantic Oscillation (NAO). The NAO has positive correlations with SST and phytoplankton colour in the central oceanic region, and negative correlations with SST and phytoplankton colour in the northern oceanic region. These different patterns are most likely a reflection of opposing responses to wind mixing, SST and other hydroclimatic parameters influenced by trends in the NAO although this is poorly understood (Edwards *et al.* 2001). Recently, a large-scale reorganisation in the calanoid copepod biodiversity has been detected in the north eastern North Atlantic and adjacent seas (Beaugrand *et al*. 2002). Strong biogeographical shifts in all copepod assemblages were found with a northward extension of more than 10° in latitude of warm-water species associated with a decrease in the number of colder-water species. These changes have been attributed to regional sea surface temperature warming (Beaugrand 2003). **Further information:** Appendix 3a.1.1. Kennington & Johns (2006).
Benthos Our present understanding of benthic communities within SEA 7, particularly in the deep water region is far from complete and will require further research and survey. However, the communities within the region are determined by a host of physical factors including sediment type, depth, disturbance and seasonality, and biological factors such as phytodetrital input and the presence of habitat modifying species. The relative lack of anthropogenic pollution in the region means that many benthic communities remain relatively undisturbed by pollution and are likely to remain so for the foreseeable future (with the possible exception of climate change effects). The destruction of cold water coral reefs by trawling gear is a potential problem with trawling now banned over the Darwin Mounds. Similar action is probably required for other locations known to support reef communities. **Further information:** Appendix 3a.1.2. Davies *et al.* (2006).
Cephalopods Whilst information on cephalopod distribution and abundance is limited, a wide range of cephalopod species appear to be present within the SEA 7 area, seasonally or throughout the year. Similarly, the identification of important spawning grounds within SEA 7 is highly speculative. Given that the vast majority of the SEA 7 area is remote from anthropogenic activities it is unlikely that cephalopods will be adversely affected by increased levels of environmental contamination. Potential changes to oceanic circulation patterns and temperature may however have a significant influence on cephalopod distribution and abundance. **Further information:** Appendix 3a.1.3. Hastie *et al.* (2006).
Fish and shellfish Whilst the impact of fishing activities on the shelf fish communities is unclear, there are a number of severely depleted stocks e.g. cod, whiting, plaice, hake and some elasmobranchs. Trawling in the

Likely evolution of baseline
deep waters may have caused substantial changes in the community structures of the deeper waters west of the shelf break. Initial studies of catch rates from surveys west of Scotland in the 1980s compared to the last 5-10 years suggest substantial reductions in large, slow-growing species and a switch to smaller, faster-growing fish (ICES 2005a). ICES (2005a) noted a number of major trends affecting the region's ecosystem including the steady warming of the area, particularly of the slope current. The Rockall Trough waters have been warming steadily for some years and are currently at an all time high. The general and continuing reduction of copepod abundance is also of concern given the major role of these organisms in the food web. Both these factors are likely to have an impact on the life histories of many species, but particularly on the migratory pelagic species; mackerel, horse mackerel and blue whiting. Both mackerel and horse mackerel migrations are closely associated with the slope current. Continued warming of the slope current is likely to affect the timing of this migration. The timing and location of spawning by all these species is also likely to be affected by this general warming. **Further information:** Appendix 3a.1.4. Gordon (2006).
Marine reptiles Marine reptiles will likely continue to be recorded from the SEA 7 area in low to moderate numbers compared to other parts of the UK and Ireland coast. The potential impact of the recorded warming of waters in the region on turtle distribution and abundance is as yet unknown. The ongoing Irish Sea leatherback project will likely provide valuable information of particular relevance for SEA 6 but also for neighbouring areas. **Further information:** Appendix 3a.1.5.
Seabirds and coastal waterbirds Changes to the baseline will likely be determined by any significant or long term changes to the breeding success of both seabirds and waterbirds in the region. Poor breeding success in 2005 was thought to be associated with low food availability (e.g. sandeels or sprats). The reasons for the apparent food shortage are not yet fully understood but may involve both natural (e.g. changes in fish recruitment, spawning areas etc) and anthropogenic influences (e.g. fishing). Given that many seabird species differ in their preferred prey species and there is often quite large variation in the numbers and success of breeding seabirds, it is very difficult to predict the likely evolution of the baseline. Similarly, there can be significant variation in the numbers of coastal waterbirds breeding, migrating through or overwintering in the SEA 7 area which may relate to a wide variety of factors including food availability, disturbance or weather patterns. Of particular concern would be any accidental pollution incidents involving shipping or other industries which could have potentially very serious impacts on both seabirds and waterbirds. **Further information:** Appendix 3a.1.6. Barton & Pollock (2005), Pollock & Barton (2006a).
Marine mammals Given the remote nature of much of the SEA 7 area, there are few sources of disturbance to marine mammals in the region. Military (particularly activities involving sonar/seismic) and fishing activities would likely be the only activities which could adversely affect marine mammal populations. For example, changes in the availability of principal forage fish could be expected to result in population level changes of marine mammals. However, it is currently not possible to predict the extent of this. To date, there is little evidence of recovery of commercially-exploited whale populations to pre-exploitation levels. **Further information:** Appendix 3a.1.7. Hammond *et al.* (2006).
Sites and species of nature conservation importance Given that much of the SEA 7 is remote from human influence, it could be assumed that there would be reduced pressure on features of nature conservation importance. However, the proposed Lewis windfarm which would, if given permission be sited on or close to an SPA and SAC, and the concerns over increasing visitor numbers to the St. Kilda World Heritage Site indicate that there are real pressures on some of the region's conservation features.

Likely evolution of baseline
Further information: Appendices 3a.2 and 3.i. AICSM & Hartley Anderson (2006).
Geology and sediments
The large-scale geology of the SEA 7 area is controlled by geological and geomorphological processes which operate over very long timescales. At a local level, the distribution of sediments and sediment bedforms is largely a result of bottom currents and wave action which are tied into large scale oceanographic, geographic and climatic processes. Therefore, the environmental baseline is likely to evolve over quite long timescales in the absence of anthropogenic influences. At present there are no anthropogenic activities which are likely to cause significant changes to the geology and sediments of the SEA 7 area. Given the remote nature of the SEA 7 area, the level of contamination will likely remain at very low levels unless there is a major shipping or industrial accident in the region. **Further information:** Appendix 3b. Holmes *et al.* (2006), Jacobs (2006).
Landscape/Seascape
There is a reasonable likelihood of major landscape effects from wind generation projects in the SEA 7 area. The proposed wind farm on Lewis would likely have a major impact on the rural landscape of the region. Associated transmission infrastructure would also have potential landscape effects. **Further information:** Appendix 3c.
Water environment
The environmental baseline is likely to be affected by large scale climatic and oceanographic processes such as changes in the NAO index affecting wave height and the influx of different water masses into the area affecting sea surface temperatures. At a local level, topography often interacts with these principal forces, focusing currents and leading to the generation of amplified current flow or eddies. At present there are no local anthropogenic activities within the SEA 7 area that are likely to change significantly the physical properties of the water environment. Given the limited amount of information available on the ambient noise baseline within the SEA 7 area it is very difficult to predict its likely evolution. However, at present ambient noise over much of the area would appear to be dominated by natural processes such as wind and precipitation rather than anthropogenic sources. During calm periods, noise from shipping may be more important. **Further information:** Appendix 3d. SAMS (2006) Harland & Richards (2006).
Air quality
Given the lack of industrial development and remoteness of the SEA 7 area, air quality will likely remain good over much of the region. Prevailing weather conditions will ensure that any reductions in air quality are likely to be localised and of short duration. **Further information:** Appendix 3e.
Climatic factors
At continental, regional, and ocean basin scales, numerous long-term changes in climate have been observed. These include changes in Arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones (IPCC 2007). **Further information:** Appendix 3f.
Population and human health
The population density and human health of the SEA 7 area is unlikely to change considerably in the near future. **Further information:** Appendix 3g. Harland & Richards (2006).
Material assets (infrastructure, other natural resources)

Likely evolution of baseline
Existing activities beyond 3 nautical miles include shipping, military activity, fishing, submarine cables and marine waste disposal sites, particularly munitions dumps. These activities are unlikely to undergo major changes in intensity or expand their areas of operation in the foreseeable future. There is interest in developing marine renewables but technological restrictions will limit the sector to coastal waters for the foreseeable future. The draft Marine Bill is likely to be important in determining how the region evolves as it will put in place a system for delivering sustainable development of the marine and coastal environment and will address both the use and protection of marine resources. **Further information:** Appendix 3h. Stocks & Hobbs (2006).
Cultural heritage, including architectural and archaeological heritage
Currently there are few activities that would adversely affect the known and as yet undiscovered submerged archaeological resource of the SEA 7 area. The development of increasingly sophisticated detection methods, mapping, and underwater excavation means that the recovery of archaeological information from SEA 7 is increasingly likely. There are concerns about the increase in visitor numbers to St. Kilda, a dual World Heritage Site for both natural and cultural heritage. Increasing numbers of visitors are arriving via cruise ships, private vessels and high speed RIBs, bringing with them associated risks to the natural and cultural heritage of the islands. Visitor access and management forms an integral part of the St. Kilda WHS management plan. **Further information:** Appendix 3i. Wickham-Jones & Dawson (2006), Wessex Archaeology (2006).

4.5 Review of baseline for previous SEA areas

In the licence rounds that followed SEA 3, SEA 4, SEA 5 and SEA 6, in addition to the blocks covered by the respective SEA, the DTI offered for licensing the unlicensed blocks in areas previously subject to SEA. These unlicensed blocks in the area included those blocks for which licences were not applied for in the previous round and those which had been relinquished in the intervening period.

To inform the reoffer of blocks from previous SEA areas, the environmental baseline for each SEA area was reviewed taking account of new information on the environment since the original SEA was completed. This review is documented in Appendices 4 to 9 which highlights new information sources since the original SEA, provides a summary of changes to the environmental baseline, and describes the potential implications for SEA.

Table 4.3 below provides a summary of changes to the environmental baseline since the original SEA. For ease of use, the information is arranged in the same order as the headings under which the environmental characteristics were described in Section 4.2 and Appendix 3:

- Biodiversity, habitats, flora and fauna
  Including plankton, benthos, cephalopods, fish and shellfish, marine reptiles, seabirds and coastal waterbirds, marine mammals, and sites and species of nature conservation importance
- Geology and sediments
- Landscape/Seascape
- Water environment
- Air quality
- Climatic factors
- Population and human health
- Material assets (infrastructure, other natural resources)
- Cultural heritage, including architectural and archaeological heritage

Key points to emerge from baseline review

- Seabed surveys commissioned through the SEA process have provided a great deal of new information about benthic habitats particularly those of conservation importance.

- With the possible exception of the SEA 6 area, European Seabirds at Sea (ESAS) survey coverage of the SEA areas is limited.
- A number of offshore draft and possible Special Areas of Conservation have been designated and other areas of potential Annex I habitat have been identified for consideration as SACs.
- Offshore oil and gas production from the UKCS is continuing to decline although recent high oil prices have encouraged greater uptake of licences and exploration activities.

Table 4.3 – New information available on the environment of the previous SEA areas

SEA	SEA 1	SEA 2	SEA 3	SEA 4	SEA 5	SEA 6
Biodiversity, habitats, flora and fauna						
Plankton	Plankton assemblage appears to be changing with range extension of warmer water species and restriction of colder species.	As for SEA 1.	As for SEA 1.	As for SEA 1.	As for SEA 1.	As for SEA 1.
Benthos	Distribution patterns and abundance of benthic species fairly well documented. Further information collated (often as part of the SEA process) on potential habitats of international importance including deep water coral reefs.	Distribution patterns and abundance of benthic species in the North Sea fairly well documented. Further information collated (often as part of the SEA process) on potential habitats of international importance including pockmarks.	As for SEA 2.	As SEA 1.	As for SEA 4.	-
Cephalopods	Limited information about cephalopod life histories, distribution and abundance, particularly of deeper water species.	As for SEA 1.	As for SEA 1.	As for SEA 1.	As for SEA 1.	-
Fish and shellfish	Further clarification of the importance of the FSC for migrating salmon.	There appears to have been a gradual change in the demersal fish communities of the	As for SEA 2.	Further clarification of the importance of the region for migrating salmon.	Further clarification of the importance of the region for migrating salmon.	Further clarification of the importance of the region for basking shark.

SEA	SEA 1	SEA 2	SEA 3	SEA 4	SEA 5	SEA 6
		North Sea with overexploitation and climate change potential drivers.			There appears to have been a gradual change in the demersal fish communities of the North Sea with overexploitation and climate change potential drivers.	
Marine reptiles	Marine turtles rarely sighted in the SEA 1 area with the majority of UK sightings recorded from the south and west.	Marine turtles rarely sighted in the North Sea with the majority of UK sightings recorded from the south and west.	As for SEA 2.	Occasional recordings of marine turtles from coastal waters of Orkney and Shetland. Majority of UK sightings from the south and west.	As for SEA 4.	Irish Sea appears to be an important area for marine turtles with a large proportion of sightings recorded from the area.
Seabirds and coastal waterbirds	Limited information on seabirds present over SEA 1 area due largely to the low survey coverage of the area (8% overall).	Further clarification on the distribution and abundance of coastal waterbirds and seabirds. However, overall survey coverage of the SEA 2 area very limited (12%).	Further clarification on the distribution and abundance of coastal waterbirds and seabirds. Overall survey coverage of SEA 3 area only 17%. Small-scale boat-based seabird surveys by wind farm developers have improved coverage in some areas.	Further clarification on the distribution and abundance of coastal waterbirds and seabirds. Overall survey coverage of SEA 4 area only 14%.	Further clarification on the distribution and abundance of coastal waterbirds and seabirds. Overall survey coverage of SEA 5 area only 16%.	Further clarification on the distribution and abundance of coastal waterbirds and seabirds. Overall survey coverage of SEA 6 area was 33%.
Marine mammals	Seal tagging studies indicate that seals forage more widely than previously thought although likely to be present in the SEA 1 area only rarely.	SCANS II survey provides updated information on the numbers and densities of small cetaceans in the North Sea and NE Atlantic. Recent tagging studies indicate that seals	As for SEA 2.	As for SEA 2.	As for SEA 2.	As for SEA 2.

SEA	SEA 1	SEA 2	SEA 3	SEA 4	SEA 5	SEA 6
		forage extensively in nearshore and offshore areas. Potential declines in the UK harbour seal population.				
Sites and species of conservation importance	The Darwin Mounds on the Wyville Thomson Ridge have been designated a possible SAC for reef habitat. The Wyville Thomson Ridge has also been proposed as a draft SAC for stony reef habitat. Areas of potential Annex I habitat for consideration as SACs include iceberg ploughmarks on northern shelf breaks (reefs).	Number of offshore sites put forward as draft SACs in the area - the Dogger Bank, North Norfolk Sandbanks and Saturn Reef, Scanner pockmark, and the Braemar Pockmarks. Areas of potential Annex I habitat for consideration as SACs include carbonate structures in Block 23/16; Haddock Bank; Haisborough Tail, Hewett Ridges, Hammond Knoll & Smiths Knoll.	Number of offshore sites put forward as draft SACs in the area - the Dogger Bank and North Norfolk Sandbanks and Saturn Reef. Areas of potential Annex I habitat for consideration as SACs include Haisborough Tail, Hewett Ridges, Hammond Knoll & Smiths Knoll; Galloper; Inner Gabbard; Outer Gabbard' and North and South Falls.	Protected reef habitats include the Darwin Mounds pSAC and the Wyville Thomson Ridge dSAC. Areas of potential Annex I habitat for consideration as SACs include iceberg ploughmarks on northern shelf breaks; Turbot, Otter & Papa Banks, and Solan Bank & Rona.	Areas of potential Annex I habitat for consideration as SACs include the east of Shetland reef.	No offshore SACs designated in the SEA 6 area. Areas of potential Annex I habitat for consideration as SACs include the mid Irish Sea reef, NW Irish Sea mounds, North Anglesey Reef; the Isle of Man sandy mound, and Texel 11.
Geology and sediments						
Geology and sediments	Further characterisation of the geology and sedimentary processes shaping the area. In general, very little contamination of water and sediments. Sediment hydrocarbon concentrations above background close to	Further characterisation of the geology and sedimentary processes shaping the area. BGS completed a study of the origin of shallow gas in Blocks 15/20c and 15/25d.	Further characterisation of the geology and sedimentary processes shaping the area. The potential environmental impacts of cuttings piles and other pollutants further defined.	As for SEA 3.	Further characterisation of the geology and sedimentary processes shaping the area. The potential environmental impacts of relevant pollutants further defined.	The potential environmental impacts of relevant pollutants further defined.

SEA	SEA 1	SEA 2	SEA 3	SEA 4	SEA 5	SEA 6
	production installations.	The potential environmental impacts of cuttings piles and other pollutants further defined. Contaminant sampling of the Fladen Ground by FRS and UKOOA has indicated that hydrocarbon concentrations in sediments have declined significantly in recent years.				
Landscape/ Seascape						
Landscape/ Seascape	-	-	Strategic assessment of the sensitivity of the seascape/ landscape of wind farm strategic areas in the southern North Sea to development.	Characterisation of the Scottish coastal seascape and its sensitivity to development.	As for SEA 4.	-
Water environment						
Water environment	Further characterisation of the tidal currents and waves of the region. Information on temporal and spatial changes to water masses and flow through the region. Underwater ambient noise likely to be dominated by noise from anthropogenic sources (e.g. shipping and production installations)	As for SEA 1.	As for SEA 1.	As for SEA 1.	Information on temporal and spatial changes to water masses and flow through the region. Underwater ambient noise likely to be dominated by noise from anthropogenic sources (e.g. shipping and production installations) during calm periods. Natural sources (wind, rain and waves) likely to dominate during storm	Underwater ambient noise likely to be dominated by noise from anthropogenic sources (e.g. shipping and production installations) during calm periods. Natural sources (wind, rain and waves) likely to dominate during storm periods.

SEA	SEA 1	SEA 2	SEA 3	SEA 4	SEA 5	SEA 6
	during calm periods. Natural sources (wind, rain and waves) likely to dominate during storm periods.				periods.	
Air quality						
Air quality	Further characterisation of air quality, emissions and deposition of pollutants to the area.	As for SEA 1.	As for SEA 1.	As for SEA 1.	As for SEA 1.	As for SEA 1.
Climatic factors						
Climatic factors	Further characterisation of the drivers of climate change and potential implications.	As for SEA 1.	As for SEA 1.	As for SEA 1.	As for SEA 1.	As for SEA 1.
Population and human health						
Population and human health	-	-	-	-	-	-
Material assets						
Material assets	Offshore oil and gas production from the UKCS continuing to decline. Recent high oil prices have encouraged greater uptake of licences.	Offshore oil and gas production from the UKCS continuing to decline. Recent high oil prices have encouraged greater uptake of licences particularly in the North Sea.	As for SEA 2.	As for SEA 1.	As for SEA 2.	As for SEA 1.
Cultural heritage						
Cultural heritage	Prospect of archaeological remains in the SEA 1 area limited.	Further definition of potential and actual archaeological resource.	As for SEA 2.	As for SEA 2.	-	-

5 SUMMARY OF ASSESSMENT

5.1 Introduction

The SEA objectives and key points and conclusions from the assessment (Appendix 11) are summarised below.

5.2 Biodiversity, habitats, flora and fauna

SEA objective(s)

- Avoids damage to conservation sites, and protected species
- Conserves the wildlife and wildlife habitats of the United Kingdom

Assessment summary

All areas of the UKCS contain potentially vulnerable habitats and species. In recognition of this and in response to developing societal expectations, regulatory control of oil industry activities, including assessments as part of permitting requirements, and increasingly stringent discharge and emissions standards have been introduced over the years (regulatory and other controls on oil and gas activities are given in Appendix 10). Risk assessment for specific activities are required which take particular note of seasonal variations in seabird vulnerability, marine mammal distributions and seal moulting/pupping periods. The majority of exploration drilling and all field developments would be subject to statutory Environmental Impact Assessment (EIA) which is documented in an Environmental Statement and subject to public consultation allowing stakeholder input to the consent decision making process. Pre-activity studies conducted by operators include documentation of the key components of the local environment, such as mapping of seabed topography and habitats and filling (as necessary) gaps in understanding of seabird and marine mammal distribution and abundance. These results are used to inform risk and other assessments required as part of an operator's Environmental Management System and for permit/consent application. As a result of the above, significant effects on the marine environment as a result of routine operations are mitigated to acceptable levels. Consequently, for previous SEA areas there seems no reason not to re-offer blocks offered for licensing in previous rounds (unless DTI assessment is continuing, as for some blocks in Cardigan Bay and the Moray Firth). For the SEA 7 area the magnitude of the gaps in basic understanding are such that a precautionary approach is suggested to licensing to allow some of the gaps to be filled.

For accidental events, regulations are in place which require operators to develop effective oil spill plans and mitigation measures, covering the organisation of response and the provision of physical and human resources. For some potential locations, estimated times within which oil might beach are very short under worst case trajectory modelling conditions of a constant 30knot wind blowing onshore. Effective contingency planning and local resources will therefore be necessary to allow the deployment of response measures where appropriate. In some cases, there is strong seasonality in specific sensitivities – in particular in relation to bird populations. Existing regulatory controls emphasise the risk management and contingency planning aspects of environmental management, including the timing of operations.

Since the start of the DTI offshore energy SEA programme, a number of Natura 2000 conservation sites have been proposed in offshore waters. In respect of coastal, marine and

offshore Natura 2000 conservation sites, an Appropriate Assessment (AA) screening or full assessment (as appropriate) of the plan would be undertaken by the DTI after the block applications have been received. The AA process considers the potential of likely resultant activities in the blocks to adversely affect the integrity of Natura 2000 sites. The AA provides a further opportunity for the DTI to draw operator attention to block or local environmental sensitivities and, if viewed as necessary, to place specific temporal, spatial or other conditions on block licences. Operators should be made aware of the possibility that subsequent project level AA for a proposed operation which might affect Natura 2000 sites may conclude that consent is withheld if there is a risk to site integrity which cannot be effectively mitigated. The geology near St. Kilda is not considered prospective for hydrocarbons and on this basis applications for licences in the vicinity of the islands are not expected.

For the SEA 7 area it is concluded that blocks west of 14 degrees west should be withheld from licensing for the present. This is in view of the paucity of information on many potentially vulnerable components of the marine environment (such as marine mammals, seabirds and seabed features) and that the analysis of SEA collected seabed data on carbonate mounds and coral reefs in the area and hence potential designation of areas as Natura 2000 sites is not yet complete. The offer of licences east of 14 degrees west is supported since there is relatively more data available including that generated during past seismic and drilling activities in the area. The DTI should draw to the attention of applicants that for some activities in certain areas of SEA 7, baseline data on selected components of the marine environment will require to be collected in advance of operations to underpin risk and other assessments.

For the previous SEA areas, the blocks in or overlapping with the boundaries of the Moray Firth and Cardigan Bay SACs (see maps in Appendix 12) should be withheld from licensing for the present whilst the further assessments initiated following the 24th Licensing Round applications are concluded.

It is concluded that the SEA 7 objectives could be met given the regulatory controls in place, the mitigation measures available and with the proposed block exclusions.

5.3 Geology and sediments

SEA objective(s)

- Protects the quality of the seabed and sediments
- Avoids damage to geological conservation sites and protects important geological features

Assessment summary

All SEA areas include a wide range of geomorphological features resulting from the underlying solid geology, past glaciations and recent processes, with sediments including muds to boulders. Various oil industry activities would result in sediment disturbance and potentially, without mitigation, destruction of small scale features. The seabed mapping routinely undertaken in advance of operations would allow the identification and hence avoidance of valued features. Contamination of sediments may occur from existing sources in area e.g. dumped munitions (OSPAR 2005, Beddington & Kinloch 2005) and discharges of drilling wastes, production wastes such as produced water, or spills. The composition of planned discharges is regulated, with increasingly stringent controls applied in recent years (see Appendix 10). Monitoring results indicate that sediment contamination from E&P discharges controlled under modern legislation is not a significant issue. The information

derived from seismic survey and the drilling of wells is regarded as a positive contribution to the understanding of the UKCS geological setting and history.

There are various munitions dump sites as well as former mine fields on the UKCS. A precautionary approach should be taken to the design of rig site and pipeline route seabed mapping surveys to ensure that such features are identified.

5.4 Landscape/seascape

SEA objective(s)

- Minimises adverse impact on seascape/landscape including designated and non-designated areas

Assessment summary

Areas potentially prospective for hydrocarbons in the SEA 7 area are beyond the sight of land and landscape or seascape interactions are not envisaged. Certain blocks within the previous SEA areas abut or are close to the coast, and for these areas exploration drilling or field developments would be subject to statutory EIA which would include visual impact assessment. The Environmental Statements produced as part of the EIA process are subject to public consultation allowing stakeholder input to consent decisions. It is concluded that the SEA objective would be met if a 25th Licensing Round were to be held.

5.5 Water environment

SEA objective(s)

- Protects surface water and aquifer resources

Assessment summary

Contamination of water may occur from discharges of drilling wastes, production wastes such as produced water (i.e. water produced along with oil and gas during the production phase), or oil or chemical spills. It is not expected that significant discharges of produced water will be made from field developments that may arise from a 25th Licensing Round, since there is a strong presumption against marine discharge and regulatory preference for reinjection to a suitable subsurface formation.

Drilling discharges are comprehensively regulated, with the discharge of oil-based drilling fluids effectively banned and strict controls implemented over chemical additives used in water-based fluids. In view of the projected number and timing of wells and developments, and the water depths and current regimes prevalent in prospective parts of the SEA 7 area, significant contamination or ecological effects of drilling discharges are not expected.

Other operational discharges are subject to regulatory controls, and are not considered to have significant environmental risk.

Monitoring results indicate that water column contamination and associated biological effects are not significant issues. This would apply to blocks in all SEA areas under consideration in SEA 7.

5.6 Air quality

SEA objective(s)

- Avoids degradation of regional air quality from oil and gas activities

Assessment summary

Atmospheric emissions from the potential activities likely to follow implementation of the DTI's draft plan could affect local air quality. Gaseous emissions contribute to regional acid gas loads and local tropospheric ozone and potentially photochemical smog formation. The principal routine operational emissions during oil industry E&P operations are of combustion products (CO_2, CO, NO_X, SO_2, CH_4, and volatile organic compounds (VOCs)) from power generation and engines on rigs, production facilities, vessels and helicopters. Fugitive emissions such as from cement tanks, diesel storage and cooling/refrigeration systems could potentially occur, resulting in emissions of dust/particulates, VOCs, hydrofluorocarbon refrigerants etc dependent on source. The scale and timing of projected activity in the SEA 7 area, the distance offshore and limited other such sources in the region indicate that significant effects on local and regional air quality will not occur. A similar assessment is made for the other SEA areas although in some there is appreciable other oil industry, fishing and vessel traffic contributions. The implications of atmospheric emissions from all exploration wells and all field developments would be assessed through the statutory EIA process, which would serve to identify if further mitigation was required.

5.7 Climatic factors

SEA objective(s)

- Minimises greenhouse gas emissions

Assessment summary

Atmospheric emissions from the potential activities following implementation of the DTI's draft plan will contribute to local, regional and global concentrations of CO_2 and other greenhouse gases. There are growing concerns about the effects of fossil fuel combustion in terms of climate change and ocean acidification (IPCC 2007, OSPAR undated). However, the contribution of atmospheric emissions from activities that may result from implementation of draft plan alternative 2 or 3, or the end use of any hydrocarbons produced, would represent a minor fraction of existing UK, European and global emissions.

In response to climate change concerns the UK government and European Union have and are introducing a variety of policy initiatives intended to stabilise and reduce greenhouse gas emissions (see Appendix 2). All recognise the long term nature of the challenge and that there is no one solution, with a series of contributory steps being required (along the lines of the "Princeton stabilization wedges" described by Pacala & Socolow 2004). These steps include reduction in energy demand through increased energy efficiency, promotion of renewable fuels and electricity generation, fuel switching to lower carbon alternatives, carbon capture and storage etc.

In the near term, UK energy demand not met from indigenous sources (whether fossil or renewable) will be supplied by imported fossil fuels – with little distinction in terms of resultant atmospheric emissions. Thus domestic hydrocarbon production would be neutral in the attainment of UK climate change response policy objectives, and potentially positive in respect of oil, since associated gas is put to beneficial use rather than mostly flared as in

some other sources of potential supply (see Gerner *et al*. 2004 for context and comparative figures). In addition, domestic hydrocarbon production makes a positive contribution to the UK economy and security of supply.

For the reasons and uncertainties above, and because the scale of hydrocarbon discoveries and production in the SEA 7 and previous SEA areas is uncertain, attempts at quantification of the potential CO_2 and other greenhouse gas emissions that could result from a 25th Licensing Round are not made. Such quantification has been made in the DTI SEA for Round 2 of wind leasing, but it may be noted that quoted best practice figures for oil and coal power generation do not include carbon capture and storage as a potential mitigation measure.

Further licensing as envisaged by the draft plan may result in the development known small oil and gas fields in currently unlicensed acreage or the discovery of new fields. Smaller fields are generally produced as subsea tiebacks to existing production facilities and export infrastructure, and can result in substantially extended lifespans for the host facilities. This extension of economic viability of some infrastructure is likely to result in the positive benefit of it being available for potential use in carbon capture and storage operations.

In addition, domestic hydrocarbon production has a positive contribution to the UK economy and security of supply which helps to attain the policy objectives of the DTI and HM Treasury (HM Treasury, 2007).

In recognition of the national and international focus on climate change and curbing fossil fuel emissions, the DTI should seek and give consideration to CO_2 emission reduction proposals at both the licensing and development Environmental Statement and production consent application review project stages. Examples of such proposals are the capture and storage of CO_2 from gas processing operations offshore (rather than venting).

5.8 Population and human health

SEA objective(s)

- Has no adverse impact on human health
- Avoids disruption, disturbance and nuisance to communities

Assessment summary

In view of the nature of activities resulting from the proposed licensing; low risk (based on historic frequency and severity) of major accidental events; occupational health regulation of risks to workforce; controls on use and discharge of chemicals and other marine discharges and remoteness from coastlines and major centres of population, no effects on population or human health are expected.

Licensing is likely to result in continued activity and investment in the UK offshore oil and gas industry and hence positive benefits in terms of employment, tax revenues and security of energy supply.

5.9 Material assets (infrastructure, other natural resources)

SEA objective(s)

- Protects other United Kingdom resources of economic and amenity value

- Promotes waste reduction

Assessment summary

There is no existing oil and gas infrastructure in the SEA 7 area and interactions with other users of the marine environment are not likely to result in significant detriment to other activities. Within the SEA 7 and previous SEA areas it is not considered that oil and gas exploration and production would result in "sterilisation" of the area in respect of renewable energy development or for underground storage of captured carbon dioxide although this should be reviewed during the consideration of licence applications. The continued use and maintenance of existing offshore oil and gas infrastructure provides the opportunity for its potential future use in carbon capture and storage projects.

5.10 Cultural heritage, including architectural & archaeological heritage

SEA objective(s)

- Protects the historic environment and cultural heritage of the United Kingdom

Assessment summary

Offshore cultural heritage in deeper waters consists chiefly of shipwrecks and crashed aircraft, with no significant interaction expected. A likely positive effect of activities in licensed areas is wreck discovery and potentially identification during oil industry rig site or pipeline route surveys. No interactions are foreseen between activities in blocks potentially licensed in a 25th Round and the abundant coastal archaeological heritage of the SEA 7 area. If commercial quantities of hydrocarbons are discovered and a pipeline to shore is considered, offshore aspects would be covered by a statutory EIA and onshore elements through the planning process. Similar considerations apply to the previous SEA areas.

The geology near St. Kilda is not considered prospective for hydrocarbons and on this basis interactions with the World Heritage Site are not anticipated.

5.11 Interrelationships - cumulative effects

Assessment summary

Cumulative effects from activities resulting from the proposed 25th round licensing have the potential to act incrementally with those from other oil and gas activity, including both existing activities and new activities in existing licensed areas, or to act cumulatively with those of other human activities (e.g. fishing and shipping). Secondary effects comprise indirect effects which do not occur as a direct result of the proposed activities, while synergistic effects are considered to be potential effects of E&P activities where the joint result of two or more effects is greater than the sum of individual effects.

Cumulative effects in the sense of overlapping "footprints" of detectable contamination or biological effect were considered to be either very limited (noise, physical presence, physical damage, emissions, discharges) given the past level of activity in the SEA 7 area, or unlikely (accidental events). A similar assessment is made for the areas covered by previous SEAs since monitoring data indicates that the more stringent emissions, discharge and activity controls introduced over recent years have been effective and there is no evidence for significant cumulative effects from current activities.

Atmospheric emissions from activities that may result from implementation of draft plan alternative 2 or 3, and the end use of any hydrocarbons produced will contribute to the overall global emissions of greenhouse gases and consequently to climate changes, ocean acidification and other indirect effects. However, the scale of such emissions although uncertain would be relatively small, and they will be included in overall UK emissions inventories and the longer term initiatives to shift the balance of energy demand and supply towards a low carbon economy.

The pathways by which climate change may affect health are diverse and complex (WHO 2003). The IPCC 3rd assessment (IPCC 2001) concluded that overall, negative effects are expected to outweigh positive impacts. It is predicted that climate change impacts will affect some regions more than others Important influences on health may include changes in the frequency and intensity of extremes of heat, cold, droughts, floods, hurricanes, tornadoes and other forms of extreme weather. Climate change also will impinge on health by disrupting ecological and social systems, resulting in changes in infectious disease transmission, food production, air pollution, population displacement and other forms of social disruption. The UK response to this challenge is part of the broader policy framework of the 2003 Energy White Paper Our energy future - creating a low carbon economy.

Besides an indistinguishable contribution to climate change and ocean acidification, no secondary or synergistic effects from the draft plan were identified that were considered to be potentially significant, although the effects of multiple noise sources, including the interaction of seismic survey and military sonars, were identified as areas requiring better understanding.

5.12 Interrelationships - Wider policy objectives

Assessment summary

The SEA Directive requires that, in considering the likely significance of effects, the degree to which the plan or programme influences other plans and programmes should be addressed, together with the promotion of sustainable development. Activities which may follow licensing in a proposed 25th Licensing Round are subject to regulatory control and are not predicted to have a significant negative impact on UK Government or other wider policy and commitments. The contribution of atmospheric emissions from activities that may result from implementation of draft plan alternative 2 or 3, or the end use of any hydrocarbons produced, would represent a minor fraction of existing UK, European and global emissions. Consequently they would be neutral in the attainment of UK climate change response policy objectives, and potentially positive in respect of oil since associated gas is husbanded rather than mostly flared as in some other sources of potential supply.

The outcome of the 25th Licensing Round has the potential to contribute positively to UK energy supply and policy, although the scale of this is uncertain particularly in respect of the SEA 7 area. No major negative effects on other policies or programmes are foreseen.

5.13 Transboundary effects

Assessment summary

The SEA 7 area is contiguous with waters under the jurisdiction of the Republic of Ireland and the Faroes. Based on the likely area where blocks would be applied for prevailing wind and major water mass movements will normally result in the transport of atmospheric

emissions, marine discharges and spills towards the west coast of Scotland. However, SEA 7 activities may occur adjacent to the median lines and sources of potentially significant environmental effects, with the additional potential for transboundary effects, therefore include:

- Underwater noise
- Marine discharges
- Atmospheric emissions
- Accidental events – oil spills

All of the four aspects above may be able to be detected physically or chemically in Irish or Faroese waters. A similar consideration applies to the potential for transboundary effects from activities in SEA areas 1 to 6, variously in the waters of adjacent States.

The scale and consequences of environmental effects in adjacent state territories due to activities resulting from the proposed 25th Round licensing will be less than those in UK waters and are unlikely to be significant.

5.14 Conclusions

The SEA considered the alternatives to the draft plan and the potential implications of the resultant activities in the context of the objective of the draft plan, the SEA objectives, the existing regulatory and other control mechanisms, and the existing environmental problems and their likely evolution over time. A number of recommendations are made, listed in Section 6. The conclusion of the SEA is that alternative 3 to the draft plan, with the area licensed restricted spatially through the exclusion of certain blocks, is the preferred option for a 25th Licensing Round.

The location (and the scale) of activities that could follow adoption of the draft plan is uncertain. This issue will be addressed in respect of Natura 2000 conservation sites (see Appendix 12) by the Appropriate Assessment (AA) screening or full assessment of the plan to be undertaken by the DTI after the block applications have been received.

The AA process will consider the potential of likely resultant activities in the blocks to adversely affect the integrity of Natura 2000 sites. The AA provides a further opportunity for the DTI to draw operator attention to block or local environmental sensitivities and, if viewed as necessary, to place specific temporal, spatial or other conditions on block licences.

6 RECOMMENDATIONS AND MONITORING

6.1 Recommendations

Recognising progress made in implementing the recommendations from previous DTI Offshore Energy SEAs as well as other initiatives (e.g. through UKOOA, Oil and Gas Producers and Research Advisory Group on Marine Renewable Energy) to improve understanding of receptors and effects, the following recommendations are made from the SEA 7 process:

1. In areas with high renewable energy generation potential the DTI should ensure decisions on licensing for oil & gas are coordinated with renewable energy leasing to minimise potential sterilisation of areas for either industry. A similar recommendation applies to maintaining options for potential geological storage of captured carbon dioxide.

2. In areas of cold water coral reefs and other vulnerable habitats and species, physically damaging activities such as rig anchoring and discharges of drilling wastes should be subject to detailed assessment prior to activity consenting so that appropriate mitigation can be identified and agreed which may include no anchoring and zero discharge.

3. For the SEA 7 area it is recommended that blocks west of 14 degrees west should be withheld from licensing for the present. This is in view of the paucity of information on many potentially vulnerable components of the marine environment, and other considerations.

4. For the previous SEA areas, the blocks in or overlapping with the boundaries of the Moray Firth and Cardigan Bay SACs should be withheld from licensing for the present whilst the further assessments initiated following the 24th Licensing Round applications are concluded.

5. For blocks which contain good examples of habitats/species on the Habitats Directive Annexes, operators should be made aware that a precautionary approach will be taken and blocks or part-blocks with relevant interests may either not be licensed until offshore designations are completed or subject to strict controls on potential activities in the field. Similarly, operators should note that the DTI will continue to conduct Appropriate Assessments/screenings to consider the potential of proposed licensing and subsequent activities to affect site integrity.

6. The lack of bird data is noted, particularly for offshore SEA 7 areas. Operators should be made aware of the need to have access to adequate data on seabird distribution and abundance as a prerequisite to effective oil spill contingency planning. Particular consideration should be given to the bird populations at St. Kilda, although it is recognised that the area is not viewed as prospective for hydrocarbons.

7. In addition to the DTI funding of the forthcoming CODA survey of cetacean distribution beyond the continental shelf, consideration should be given to continuing the monitoring of large whales to the west of Britain through analysis of SOSUS hydrophone data.

8. Observations and research should be undertaken if necessary by block operators and others on cetacean distribution and ecology, including of beaked whales in deeper water areas, to increase the confidence with which predictions of behavioural responses and mitigation proposals can be made.

9. If there is appreciable interest in licences in the SEA 7 area, the DTI should consider encouraging the reinvigoration of the Atlantic Frontier Environmental Network or establishment of a similar group to promote collaborative studies and data collection.

10. The onshore implications of offshore activities in areas where there are not established supply bases and routes (e.g. for materials transport and waste disposal) should be considered in the EIA process.

11. Potential applicants for licences in the 25th licensing round should be reminded that the expectation for facilities design will be for zero discharge of oil in produced water.

12. In recognition of the national and international focus on climate change and curbing fossil fuel emissions, the DTI should seek and give consideration at both the licensing and project consenting stages to CO_2 emission reduction proposals e.g. capture and storage (rather than venting) of CO_2 from gas treatment offshore. In addition, the DTI's central role in UK energy policy and climate change response policy is recognised and the department may have the opportunity to promote the integration of strategic assessments into plans or programmes across these areas.

6.2 Monitoring

The SEA Regulations require the DTI as Responsible Authority for oil and gas licensing to:

> *"….monitor the significant environmental effects of the implementation of each plan or programme with the purpose of identifying unforeseen adverse effects at an early stage and being able to undertake appropriate remedial action."*

In so doing, the Regulations allow for the responsible authority's monitoring arrangements to comprise or include arrangements established otherwise than for the express purpose of complying with the Regulations e.g. monitoring conducted for other regulatory purposes.

The types of relevant monitoring already undertaken or proposed for this SEA fall into four types:

- Activity monitoring
- Emissions monitoring
- Effects monitoring
- SEA objectives monitoring

Each of these is summarised below.

Activity monitoring

The scale of oil and gas exploration and production activities resulting from the implementation of the DTI's draft plan to hold a 25th round of offshore licensing will be monitored by the DTI using existing mechanisms to keep track of operator delivery of commitments made at the time of licence application. The SEA has used activity scenarios

in the assessment of effects. Actual activity levels over time are compared with the predicted levels, in order to monitor a key basis for the SEA conclusions.

Emissions monitoring

As required by the various environmental permits and other environmental legislative requirements (see Appendix 10), operators must monitor and report the quantities of solid, liquid and atmospheric emissions, discharges and wastes via the Environmental Emissions Monitoring Scheme and all oil or chemical spills via Petroleum Operations Notice Number 1 (PON 1). As well as monitoring compliance with individual permit conditions the data provides a benchmark which allows performance trends to be monitored over time, and projected increases from a new DTI draft plan to be placed in context. The DTI's Offshore Environmental Inspectorate is responsible for ensuring that operators comply with environmental legislative requirements and all offshore installations are inspected.

Effects monitoring

There has been extensive monitoring of the effects of UK offshore oil and gas activities dating back to 1975, and several regional surveys have been undertaken in recent years under the auspices of DTI/UKOOA Monitoring Committee, FRS, CEFAS and the National Marine Monitoring Programme. There is also a large body of monitoring work from other North Sea states and internationally. Studies include operational effects monitoring at field or regional scales, themed research projects and academic studies. This existing monitoring activity is reviewed as part of the DTI SEA process and to date has been found adequate to understand the evolution of baseline conditions in respect of sediment contamination and biological effects across the SEA areas.

SEA objectives monitoring

The draft SEA 7 objectives and indicators were considered during scoping (see Appendix 1), at the assessment workshop and the stakeholder meeting (see Appendix 11). The agreed objectives and indicators are given in Section 3.4. The SEA indicators will be monitored by the DTI and the SEA team to track SEA performance over time.

Where unforeseen adverse effects are identified the DTI will seek to establish the cause in consultation with the Consultation Bodies and other stakeholders. Remedial action will be developed and agreed with relevant parties and implemented as appropriate.

7 NEXT STEPS

The SEA 7 Environmental Report and supporting documents are available for review and public comment for a period of 12 weeks from date of publication in April 2007. The documents are being made available from the SEA website (www.offshore-sea.org.uk) or on CD or printed copy. Comments and feedback should be marked "SEA 7 Consultation" and may be made via the website or by letter or e-mail addressed to:

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On completion of the public consultation phase feedback will be collated and a Post Consultation Report prepared and made publicly available.

The DTI will consider comments received during the public consultation in their decision making regarding the draft plan.

In addition, if the licensing round is held and blocks applied for, prior to the award of any licences the DTI will undertake a plan level Appropriate Assessment to consider the potential implications of activities within a block for the integrity of Natura 2000 conservation sites.

On adoption of the plan a Statement will be published detailing:

a) how environmental considerations have been integrated into the plan
b) how the Environmental Report has been taken into account
c) how opinions expressed by the consultation bodies and public consultees on the relevant documents have been taken into account
d) how the results of any consultations entered into with other Member States have been taken into account (if required)
e) the reasons for choosing the plan as adopted, in the light of the other reasonable alternatives dealt with; and
f) the measures that are to be taken to monitor for potential significant environmental effects of the implementation of the plan.

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GLOSSARY AND ABBREVIATIONS

Term	Definition
μg	Microgram(s)
μPa	Micropascal(s) (unit of pressure)
AA	Appropriate Assessment
Abiotic	Refers to nonliving objects, substances or processes e.g. climate
Abyssal	Relating to the great depths of the ocean, typically in water depths of 2000-6000m
Accretion	An increase resulting from depositional processes
Actinaria	Sea anemones
Aeolian	Wind-borne source
AFEN	Atlantic Frontier Environmental Network
AGLV	Areas of Great Landscape Value
Amphipods	Small crustaceans e.g. “sandhoppers”
Anadromous	Migrating from marine environments to freshwater rivers to breed
Anemone	Flower-like marine Cnidarians with a flexible cylindrical body and tentacles surrounding a central mouth
Annex I	Under the Habitats Directive, a list of habitats considered to be most in need of conservation at a European level
Annex II	Under the Habitats Directive, a list of species considered to be most in need of conservation at a European level (excluding birds)
Annex IV	Under the Habitats Directive, a list of ‘animal and plant species of Community interest in need of strict protection’, of which the deliberate capture, killing or disturbance of such species is banned, as is their keeping, sale or exchange
Anthropogenic	Relating to/caused by humans
AOB	Apparently Occupied Burrows (birds)
AON	Apparently Occupied Nests (birds)
AONB	Area of Outstanding Natural Beauty
AOS	Apparently Occupied Sites (birds)
AoSP	Area of Special Protection
AOT	Apparently Occupied Territories (birds)
AQMA	Air Quality Management Areas
Aquaculture	The cultivation of aquatic plants and animals for food or other purposes
Archipelago	A group of many islands in a large body of water
ARU	Automated recording unit
Ascidians	Minute sedentary marine invertebrate having a saclike body with siphons through which water enters and leaves
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (United Nations)
ASSI	Area of Special Scientific Interest
Auks	Diving seabirds of the family Alcidae, characterised by a chunky body, short wings and webbed feet e.g. razorbills, guillemots, puffins
Autotrophic	An organism capable of synthesizing its own food from inorganic substances, using light or chemical energy e.g. green plants, algae, certain bacteria
Bacterioplankton	The bacterial component of plankton
Ballast water/sediments	Water (and suspended sediments) put into a vessel to enhance stability
BAP	Biodiversity Action Plans
Barchan dunes	Type of sand dune found in areas of limited sediment supply with peak currents in excess of $0.4ms^{-1}$
BAT	Best available techniques

Term	Definition
Bathymetry	The measurement of the depth of bodies of water
Beam trawling	A bottom trawl that is kept open laterally by a rigid beam
BECPELAG	ICES study "Biological Effects of Contaminants in Pelagic Ecosystems"
Bedform	Seabed features (e.g. sandwaves, ripples) resulting from the movement of sediment, from seabed erosion or deposition
Benthic	Relating to organisms living in or on the seabed
Benthos	Organisms living in or on the seabed
BEP	Best Environmental Practice
Bioaccumulation	The accumulation of a substance, such as a toxic chemical, in various tissues of a living organism
Biodiversity	The variety of life in all its forms, levels and combinations. Includes ecosystem diversity, species diversity, and genetic diversity
Biogenetic Reserve	An area of conservation which includes species for the purposes of genetic preservation
Biogenic	Produced by the action of living organisms
Biogeographic	Relating to the geographical area characterised by distinctive flora and fauna
Biomass	Living material; e.g. the total mass of a species or of all living organisms present in a habitat; usually excluding shell mass
Biosphere reserve	Non-statutory protected area representing significant examples of biomes protected for their conservation purposes (UNESCO)
Biota	The total flora and fauna of a given area
Biotopes	The smallest unit of habitat where all environmental conditions and all types of organisms found within it are the same throughout
Bioturbation	Physical disturbance of sediment or soil by organisms, especially by burrowing or boring
Birds Directive	Council Directive 79/409/EEC on the conservation of wild birds
Bivalves	Marine or freshwater molluscs having a soft body with plate-like gills enclosed within two shells hinged together
Block	See *Licence Block*
Bloom	Rapid increase in concentration of phytoplankton, often dominated by one species; may be seasonal (spring bloom); natural or anthropogenic
Blowout	An uncontrolled flow of fluids from rock into a well, sometimes catastrophically to the surface. May consist of salt water, oil, gas or a mixture of these
BODC	British Oceanographic Data Centre
boe/day	Barrels of oil equivalent per day
Boreal	Relating to the north, particularly forest areas of the northern North Temperate Zone
BP	Before Present
Brachiopods	Marine invertebrates of the phylum Brachiopoda with bivalve dorsal and ventral shells, similar in appearance to bivalve molluscs e.g. lamp shells
Brackish	Slightly salty
Bryozoans	Small aquatic animals of the phylum Bryozoa that reproduce by budding and form moss-like or branching colonies permanently attached to stones or seaweed
BTO	British Trust for Ornithology
By-catch	Species caught which are not the targeted species of the fishery; may be retained or discarded
Byssus	A tough, thread-like structure by which mussels attach themselves to the substratum
Candidate Special Area of Conservation	Conservation site submitted to the EC for designation by national government, but not yet formally adopted

Term	Definition
Carboniferous	a major division of the geologic timescale extending from approximately 360-300Ma
Carse	A low flat, peat or marsh covered plain, normally estuarine
CCW	Countryside Council for Wales
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
Cephalopods	Marine molluscs including squid, octopus and cuttlefish
Cetaceans	Aquatic mammals including whales, dolphins and porpoises
CFCs	Chlorofluorocarbons
Chemosynthetic	Synthesis of carbohydrate from carbon dioxide and water using energy obtained from the chemical oxidation of simple inorganic compounds
Chlorophyll	Photosynthetic pigment found in most plants, algae and cyanobacteria. Sea surface chlorophyll concentration is often used as an index of phytoplankton abundance/primary productivity
CITES	Convention on International Trade in Endangered Species
Clupeids	Fish of the family Clupeidae including herring, sprat and anchovy
CMA	Centre for Maritime Archaeology
CMS	Convention on the Conservation of Migratory Species of Wild Animals (also known as the Bonn Convention - 1979)
Cnidaria	A diverse phylum of relatively simple aquatic organisms containing specialised stinging cells e.g. jellyfish, anemones, corals
Coastal lagoon	Small, shallow basin which has very low (or negligible) freshwater input
Coccolithophorids	Exclusively marine phytoplankton characterised by calcium carbonate plates
Coelenterates	Invertebrate animals of the phylum Cnidaria including the jellyfishes, hydras, sea anemones, and corals
Community	A group of animals or plants living or growing together in the same area
Continuous Plankton Recorder	A plankton sampling instrument designed to be towed from merchant ships on their normal sailings, with plankton collected on a moving band of filter material (Continuous Plankton Recorder)
Copepods	Small crustaceans, usually planktonic
CPA	Coast Protection Act
CPR	See *Continuous Plankton Recorder*
Creels	Basket-like fish traps placed on the seabed, usually to target crustaceans
Cretaceous	A major divisions of the geologic timescale, extending from approximately 146-65.5Ma
Crinoid	Echinoderms of the class Crinoidea including feather stars and sea lilies
Crustaceans	Arthropods (mostly aquatic) usually having a segmented body and chitinous exoskeleton e.g. crabs, lobsters, copepods
cSAC	See *Candidate Special Area of Conservation*
Ctenophores	Any of various marine animals of the phylum Ctenophora, having transparent, gelatinous bodies bearing eight rows of comb-like cilia used for swimming
dB	Decibel(s)
Decalcified fixed dunes	Mature stages of sand dune succession
Decapods	Crustaceans characterised by ten legs, such as lobsters, crabs, shrimps and prawns
Defra	Department for Environment, Food and Rural Affairs
Delphinids	Dolphins and porpoises
Demersal	Living at or near the bottom of the sea
DEPCON	Deposit Consent (included in Pipeline Works Authorisation)
Development well	Well drilled in order to produce hydrocarbons from a proven field
Diadromous	Migratory between fresh and salt waters (fish)
Diamicton	Thick unconsolidated muddy and gravelly unsorted sediments

Term	Definition
Diatoms	Microscopic algae, with cell walls of silica consisting of two interlocking symmetrical valves
Dinoflagellates	Minute single-celled organisms, primarily marine plankton, with one or more whip-like organelles (flagella) generally used for locomotion. Approximately half are photosynthetic, and some species may produce toxins
Draft Special Area of Conservation	Conservation site which has been formally advised to UK government as suitable for selection as a SAC, but has not been formally approved by government as sites for public consultation.
Drifters	Oceanographic instruments released into the water column to obtain information on currents
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 exert hydrostatic pressure to maintain well control
dSAC	See *Draft Special Area of Conservation*
DSFB	District Salmon Fishery Boards
DTI	Department of Trade and Industry
Dune slacks	Low-lying areas within dune systems that are seasonally flooded and where nutrient levels are low
E&P	Exploration and Production
EAC	Ecotoxicological assessment criteria
EC	European Community
Echinoderms	Radially symmetrical marine invertebrates e.g. starfish, sea urchins
Echiurans	Non-segmented worms, usually burrowing
Ecosystem	An ecological community together with its environment, functioning as a unit
Eddy	A current of water or air, moving contrary to the direction of the main current, especially in a circular motion
EHS	Environment and Heritage Service (Northern Ireland)
EIA	See *Environmental Impact Assessment*
Elasmobranchs	Any of numerous fishes of the class Chondrichthyes, characterised by a cartilaginous skeleton and including the sharks, rays, and skates
EN	English Nature now Natural England
ENAW	Eastern North Atlantic Water
Endocrine disruption	Disruption of the hormonal systems of organisms
Environmental Impact Assessment	Systematic assessment of the environmental effects a proposed project may have on its surrounding environment
Environmental Statement	Formal document presenting the findings of an EIA 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	Benthic organisms that live upon the surface of seabed sediments or soils
ES	See *Environmental Statement*
ESA	Environmentally Sensitive Area
ESAS	European Seabirds at Sea
ESCR	Earth Science Conservation Review
Espoo Convention	The Convention on Environmental Impact Assessment in a Transboundary Context (1991)
Estuarine	Of, relating to, or found in an estuary
Estuary	The wide part of a river where it nears the sea; normally where fresh and salt water mix
Eulittoral	The intertidal band, in-between the low and high water line

Term	Definition
Euphausiids	Commonly known as krill, they are shrimp-like, small marine crustaceans forming an important component of zooplankton
Eutrophic	Rich in dissolved nutrients, photosynthetically productive and often deficient in oxygen during warm weather
Evaporites	Natural salt or mineral deposit formed from by evaporation of water
Exploration well	Well drilled to determine whether hydrocarbons are present in a particular area
Fault	A fracture in the continuity of a rock formation caused by a shifting or dislodging of the earth's crust, in which adjacent surfaces are displaced relative to one another and parallel to the plane of fracture
FEPA	Food and Environment Protection Act
Fetch	The un-interrupted distance over which wind acts to produce waves
Fjord	A long, narrow, deep inlet of the sea between steep slopes
Fluvial	Produced by the action of a river or stream
Fog	When describing marine weather, visibility less than 1 mile.
Formation	An assemblage of rocks or strata
Fronts	The interface between water masses of different characteristics, usually temperature and/or salinity
FRS	Fisheries Research Services
Fugitive emissions	Very small chronic escape of gas and liquids from equipment and pipework
Ga	Billion years ago
Gadoid	Fish of the cod family
Gastropods	Univalve molluscs, usually with a coiled or spiralled shell e.g. snails, periwinkles, whelks
GCR	Geological Conservation Review site
Geomorphology	The study of the underlying form, and weathering processes, of rocks and land surfaces
Gillnet	Nets that hang vertically in the water, either in a fixed position (e.g. surface or seabed) or drifting, that trap fish by their gill covers
Glacigenic	Relating to glacial activity
Gravity survey	A survey technique used to measure the gravitational pull of the Earth over an area, to determine the density of the underlying rocks, helping to locate rock formations that might contain trapped oil
Grey dunes	Mature dunes, normally vegetated and inland
Grilse	A young Atlantic salmon on its first return from the sea to fresh or brackish waters
Gyre	A circulatory ocean current
Ha	Hectare(s)
HAB	Harmful algal bloom
Habitats Directive	Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, see *Habitats and Species Directive*
Haline	Salty or regarding salt content
Heritage Coast	Sections of coast that are of exceptionally fine scenic quality, substantially undeveloped and containing features of special significance and interest
Heterotrophic	Unable to synthesize food and is dependent on complex organic substances for nutrition
Hexactinellid sponges	Sponges with a skeleton made of four- and/or six-pointed silaceous spicules, often referred to as glass sponges
HMSO	Her Majesty's Stationery Office
Holocene	Geological period since latest glaciation; from about 10,000 years ago to present
Holoplankton	Planktonic organisms that spend all developmental stages within the plankton.

Term	Definition
Holothurians	Sea cucumbers
Hydrocarbon	Compounds containing only the elements carbon and hydrogen, (such as oil and natural gas)
Hydrodynamic	Of, relating to, or operated by the force of liquid in motion
Hydrography	In this context, the study of sea water masses, currents and tides
Hydroid	Any of numerous characteristically colonial hydrozoan coelenterates having a polyp rather than a medusoid form as the dominant stage of the life cycle
Hypoxia	Deficiency in the amount of oxygen
Hz	Hertz (unit of frequency)
IACMST	Inter-Agency Committee on Marine Science and Technology
IBA	Important Bird Area
Iceberg ploughmarks	Ridge/trough features on the seabed created by icebergs
ICES	International Council for the Exploration of the Sea
ICZM	Integrated Coastal Zone Management
Igneous	Rocks formed when molten rock cools and solidifies
IMO	International Maritime Organisation
Imposex	When male sex characteristics, such as the development of male sex organs i.e. penis and/or vas deferens, are stimulated to form on normal female gastropods
Infauna	Aquatic organisms (usually animals, but sometimes algae) living within sediments or soil
Interglacial	Geological interval of warmer global average temperature separating colder periods (glacials)
Internal waves	Within the sea, these are waves generated on the interface between two fluids of different densities
INTERREG	European Commission community initiative that aims to stimulate interregional co-operation in the EU.
Intertidal	The coastal zone between high water mark and low water mark
Invasive species	A species that is non-native to the ecosystem and whose introduction causes or is likely to cause economic or environmental harm or harm to human health
Invertebrate	Animals without backbones
IOPP	International Oil Pollution Prevention
IPCC	International Panel on Climate Change
IPPC	Integrated Pollution Prevention and Control
Irish Sea Pilot	A pilot project set up in 2002 following the UK Government Review of Marine Nature Conservation to test the potential for an ecosystem approach to managing the marine environment at a regional sea scale
Isopod	Any of numerous crustaceans of the order Isopoda, characterised by a flattened body bearing seven pairs of legs and including the sow bugs and gribbles
IUCN	The World Conservation Union
JESS	Joint Energy Security of Supply Working Group
JMCs	Joint Maritime Courses
JNCC	Joint Nature Conservation Committee
Jurassic	A major unit of the geologic timescale, extending from approximately 200-146 Ma
Ka	Thousand years ago
Kelp	Any of often very large brown seaweeds of the order Laminariales
Km	Kilometre(s)
Lagoon	Stretch of salt water separated from the sea by for example, a low sandbank

Term	Definition
Lamprey	Primitive elongated fishes characterised by a jawless sucking mouth with rasping teeth
LBAP	Local Biodiversity Action Plans
Lewisian gneiss	Metamorphic rocks which have been modified by heat and pressure several times. Up to approximately 3,000 million years old
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. A Block is approximately 200-250 square kilometres
Licensing round	An allocation of licences made to oil companies
Limpet	Gastropods, usually marine, with low conical shells
LIMPET	Worlds first commercial wave power station located on the shoreline of Islay
Littoral	The edge of the sea, but particularly the intertidal zone
LNG	Liquefied Natural Gas
LNR	Local Nature Reserve
Loliginid	Squids of the family Loliginidae, mostly neritic and ranging in size from approximately 3-100cm mantle length
Lough	A lake, or bay/inlet of the sea (Ireland)
Ma	Million years ago
Machair	A distinctive sand dune formation, comprising a fertile low-lying raised beach. Found only in western Ireland and the north and west of Scotland
Maerl beds	Calcified red seaweeds which grow as unattached nodules on the seabed, and can form extensive beds. Slow-growing, but over long periods its dead calcareous skeleton can accumulate into deep deposits
Marine Environment High Risk Area	Area of high environmental sensitivity at risk from shipping
Marine spatial planning	A means of bringing together separate sectoral policies with the aim of allocating and managing sea space to minimise conflicts between existing users and between users and the environment
MARPOL	The 1973/1978 International Convention for the prevention of pollution from ships
MASH	OSPAR working group on Marine Protected Areas and Species Habitats
MCA	Maritime and Coastguard Agency
MCA	Marine Consultation Area
MCS	Marine Conservation Society
MDAC	Methane derived authigenic carbonate
Medusae	A type of jellyfish
Megafauna	Large animals
Megaplankton	Very large zooplankton between 20 and 200cm in size e.g. large jellyfish
Megaturbidite	A thick, extensive deposit from an exceptionally large mass flow
MEHRA	see *Marine Environment High Risk Area*
Meiofauna	Small benthic animals
Meroplankton	Plankton that spend only part of their life cycle in the water column before settling to the bottom
MESH	Mapping European Seabed Habitats
Mesolithic	The middle Stone Age, marked by the appearance of small stone tools and weapons and by changes in the nature of settlements
Mesoscale	Of intermediate scale
Mesozoic	The era of geologic time that includes the Triassic, Jurassic, and Cretaceous periods
Meteorology	The study of the processes and phenomena of the atmosphere, especially as a means of forecasting the weather

Term	Definition
Metocean	Relating to meteorology and oceanography
Middens	A mound or deposit containing shells, animal bones, and other refuse that indicates the site of a human settlement
Miocene	epoch of geologic time extending from approximately 23.0-5.3Ma
MNCR	Marine Nature Conservation Review
MNR	Marine Nature Reserve
MOD	Ministry of Defence
Molluscs	Invertebrates (mainly marine) typically having a soft unsegmented body, a mantle, and a protective calcareous shell. They also include cephalopods e.g. squid, octopus, cuttlefish
Moraines	Rock debris transported by glaciers or ice sheets
Morphological	Concerned solely with shape
Moulting	The routine of shedding old feathers (birds) or hairs (mammals)
MPA	Marine Protected Area
MSPP	Marine Spatial Planning Pilot
Mudstones	Dark clay rock
MW	Megawatt
NAC	See *North Atlantic Current*
NAEI	National Atmospheric Emissions Inventory
Nanoplankton	Planktonic organisms 2-20µm in diameter
NAO	See *North Atlantic Oscillation Index*
NAS Scotland	Nautical Archaeological Society Scotland
National Monuments Record	The national repository for archaeological and historic data
Natura 2000 Network	A network of sites, Special Areas of Conservation and Special Protection Areas, of conservation value designated under the EU Habitats and Birds Directives respectively
NCR	Nature Conservation Review sites
NEAFC	North East Atlantic Fisheries Commission
Necropsy	Examination of a body to determine or confirm the cause of death
Nematode	Roundworms (free-living or parasitic in plants and animals)
Nemertea	Soft unsegmented marine worms
Neolithic	A period in the development of human technology that is traditionally the last part of the Stone Age, characterised by the use of crops and domesticated animals
Nepheloid layers	Particle-rich layer above the ocean floor
Nephrops	Abbreviation of *Nephrops norvegicus*, commonly known as Norway lobster, Dublin Bay prawn or langoustine. A small orange-pink lobster found in the north-east Atlantic and Mediterranean Sea. The tail is frequently eaten, often under the name "scampi"
Neritic	Relating to the ocean waters between low tide and a depth of approximately 200m
NGO	Non-Government Organisation
NMMP	National Marine Monitoring Programme
NMR	See *National Monuments Record*
NNR	National Nature Reserve
Non-statutory	Having no basis in statute or in law
NORM	Naturally Occurring Radioactive Material
North Atlantic Current	A powerful warm ocean current that continues the Gulf Stream north west before splitting in two west of Ireland. One branch (the Canary Current) goes south while the other continues north along the coast of north western Europe

Term	Definition
North Atlantic Oscillation Index	An index based on the pressure difference between the Azores high and the Icelandic low pressure areas
NPOA	National Plans for Action
NPPG	National Planning Policy Guidelines
NSA	National Scenic Area
Nursery	A subset of all habitats where juveniles of a species occur
Oceanography	The scientific study of the ocean and its phenomena
Octocoral	Corals with eight tentacles on each polyp. There are many different forms, which may be soft, leathery, or even those producing hard skeletons
Odontocetes	Toothed cetaceans
Oligotrophic	Lacking in plant nutrients and having a large amount of dissolved oxygen throughout
Ommastrephid squid	Short-finned squid
OPF	Organic-Phase Drilling Fluids
Ophiuroids	Brittle stars, Echinoderms of the class Ophiuroidea
OPRC	The International Convention on Oil Pollution Preparedness, Response and Cooperation (1990)
OSPAR	Oslo and Paris Commission – for the protection of the marine environment of the North East Atlantic (1992)
Otter trawling	A demersal trawl that is held open laterally by otter boards or 'doors'
OVI	Offshore Vulnerability Index
PAH	Polycyclic aromatic hydrocarbon
Palaeogene	Geologic period extending from approximately 65-23Ma
Palaeolithic	The 'old' Stone Age (being the period of the emergence of primitive man) about 2.5 million to 3 million years ago until about 12,000 B.C.
Paralytic Shellfish Poisoning	An illness caused by consumption of shellfish (principally bivalves such as clams, mussels, oysters, snails and scallops) contaminated by poisonous concentrations of toxins produced by algae (diatoms and dinoflagellates)
Parasitic cones	Small satellite cones of igneous rock around a volcano where lava has been forced through lines of weakness at the side of a volcano
PCB	Polychlorinated biphenyl
PEC:PNEC	Predicted Effect Concentration: Predicted No-Effect Concentration
Pelagic	Relating to a distribution within (or above) the water column of the sea, generally away from the coast and seabed
Pennatulid	Sea pen: colonial marine cnidarians
Peri-glacial	Characteristic of a region adjoining a glacier or ice sheet
Permian	Geologic period extending from approximately 299-251Ma
Petrels	Tube-nosed, pelagic seabirds in the order Procellariiformes
Petrogenic	Derived from mineral hydrocarbons
PEXA	Practice and Exercise Area
Phalaropes	Any of several small wading birds of the family Phalaropodidae
Photic zone	The upper layers of bodies of water into which sunlight penetrates sufficiently to influence the growth of plants and animals
Physiographic	The study of the natural features of the earth's surface, especially in its current aspects, including land formation, climate, currents, and distribution of flora and fauna (also called physical geography)
Phytodetritus	Detritus originating from photosynthetic organisms, typically phytoplankton, in the upper layers of the water column which then falls towards the seabed. Also known as 'marine snow'
Phytoplankton	Free floating microscopic plants (algae); including diatoms and dinoflagellates
Picoplankton	Tiny plankton between 0.2 and 2µm in size, mostly bacteria

Term	Definition
PILOT programme	PILOT is the successor to the Oil and Gas Industry Task Force (OGITF)
Pingo	Dome-shaped mound found in permafrost areas
Pinnipeds	Marine mammals including seals, sea lions and walruses
Plankton	Free-floating microscopic organisms
Pleistocene	Epoch on the geologic timescale from approximately 1.81-0.01Ma
Pliocene	Epoch on the geologic timescale from approximately 5.3-1.8Ma
PM_{10}	Particulate matter of less than 10 micrometres in diameter
$PM_{2.5}$	Particulate matter of less than 2.5 micrometres in diameter
PMSU	Prime Minister's Strategy Unit
Pockmarks	Depressions or craters in the seabed, typically in 0.5-20m in depth and 1-1000m in diameter in the North Sea, generally believed to be formed by the expulsion of fluid (gas or water) through seabed sediments
Polychaetes	Annelid worms, chiefly marine
Polychlorinated biphenyls	Persistent, toxic organic compounds once widely used in industry
PON	Petroleum Operations Notice
Possible Special Area of Conservation	Conservation site which has been formally advised to UK Government, but not yet submitted to the EC.
Progradation	General term for a coastline which is advancing into the sea
Protozoan	Single-celled organisms with a nucleus
pSAC	See *Possible Special Area of Conservation*
PSP	See *Paralytic Shellfish Poisoning*
Pteropods	Small marine gastropod molluscs of the subclass Opisthobranchia with wing-like lobes on the feet
Purse seines	A deep curtain of netting that is shot in a circle to form an enclosing cylinder around shoals of pelagic fish
Pycnocline	Water column layer separating mixed surface and bottom layers during thermal stratification
Quadrant	Subdivision of sea area for purposes of awarding licences for hydrocarbon exploration and exploitation. A whole quadrant contains thirty blocks, and is approximately 7,500km^2
Quaternary	Geologic time period extending from approximately 1.8Ma to the present
Radionuclide	Natural or artificial radioactive isotope
RAF	Royal Air Force
Ramsar sites	Areas designated by the UK under the Ramsar Convention (Convention on Wetlands of International Importance especially as waterfowl habitat)
Raptors	Birds of prey, characterised by a hooked beak, sharp talons and good eyesight
RCAHMS	Royal Commission on the Ancient and Historical Monuments of Scotland.
Red Data Book	Documents the current status of globally threatened biodiversity
Richter local magnitude	A logarithmic scale which assigns a single number to quantify the size of an earthquake based on measurements of seismic waves
Riverine	Relating to or resembling a river
RLD	Regional Landscape Designation
RMNC	Review of Marine Nature Conservation
Roche moutonée	Small bare outcrop of rock shaped by glacial erosion
Ro-ro	Roll on-roll off
ROV	Remotely Operated Vehicle
ROW	Receiver of Wreck
RSPB	Royal Society for the Protection of Birds
RSPB	Royal Society for the Protection of Birds

Term	Definition
SAC	See Special Area of Conservation
SAHFOS	Sir Alister Hardy Foundation for Ocean Science
Salicornia	Glassworts: salt-tolerant plants growing on beaches, saltmarshes or mangroves
Salmonids	Fishes of the family Salmonidae which includes salmon and trout
Salps	Any of various free-swimming tunicates
Saltmarsh	Low coastal grassland normally overflowed by the tide
Sarn	Relict glacial outwash features composed of ridges of boulder to pebble-size rocky material
SCANS	Small Cetacean Abundance in the North Sea
SCC	See *Scottish Coastal Current*
SCI	See *Site of Community Importance*
Scottish Coastal Current	A northward flowing current, derived from North Atlantic and Irish and Clyde Sea waters, running along the west coast of Scotland through the Minch and to the west of the Outer Hebrides
SCR	Seabird Colony Register
SEA	See *Strategic Environmental Assessment*
Sea urchin	Spiny, hard-shelled animal that lives on the rocky seafloor or burrows into soft sediments
Seamount	Permanently submerged mountains rising from the seafloor, typically formed from extinct volcanoes
SEC	See s*helf edge current*
SEERAD	Scottish Executive Environment and Rural Affairs Department
Seismic survey	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, data processing method and temporal elements, the seismic is referred to as either 2-D, 3-D or 4-D
SEPA	Scottish Environment Protection Agency
Sessile	Permanently attached or fixed; not free-moving
SFG	Scope For Growth
Shelf break	Region of bathymetric change between the gently inclined continental shelf to the much steeper depth gradient of the continental slope
Shelf edge current	A poleward flowing current following the shelf edge to the north west of Ireland and west of Scotland
Shellfish	General term for commercially fished Molluscs and Crustaceans
Shingle	Beach material which is intermediate in size between sand and cobbles
Shorebirds	Any of various birds, such as the sandpiper and plover, that frequent the shores of coastal or inland waters
Shoreline Management Plan	A document that sets out a strategy for coastal defence for a specified length of coast, taking account of natural coastal processes and human and environmental influences and needs
Significant wave height	Average height (trough to crest) of the largest one third of waves for a given period of time
Silt	A sedimentary material consisting of very fine particles intermediate in size between sand and clay
SINTEF database	The SINTEF Offshore Blowout Database is a comprehensive event database for blowout risk assessment
Site of Community Importance	Conservation site that has been adopted by the EC but not yet formally designated by the government of a country
Skerries	Small rocky islands, usually too small for habituation, and may be submerged at high tide

Term	Definition
Smolts	A young salmon at the stage intermediate between the parr and the grilse, when it becomes covered with silvery scales and first migrates from fresh water to the sea
SMRU	Sea Mammal Research Unit
SNH	Scottish Natural Heritage
SOMAP	Sound of Mull Archaeological Project
Sonar	A system using transmitted and reflected underwater sound waves to detect and locate submerged objects or measure the distance to the floor of a body of water
SOPEP	Shipboard Oil Pollution Emergency Plan
SOSREP	Secretary of State Representative
SOTEAG	Shetland Oil Terminal Environmental Advisory Group
SPA	See *Special Protection Area*
Spawning	The release of eggs of aquatic animals such as bivalve molluscs, fish and amphibians
Special Area of Conservation	Areas designated as European Sites (Natura 2000) under the Habitats and Species Directive
Special Protection Area	Areas designated as European Sites (Natura 2000) under the Birds Directive
Spicules	Calcareous or siliceous skeletal structures that occur in most sponges, providing structural support, as well as deterrence against predators
Sponges	Chiefly marine invertebrate animals of the phylum Porifera, characteristically having a porous skeleton and often forming irregularly shaped colonies attached to an underwater surface
SSSI	Site of Special Scientific interest
SST	Sea Surface Temperature
Stack	A residual rock pinnacle which marks coastal cliff retreat and/or the landward advance of a rock platform
Statutory	Prescribed, authorised or punishable under a statute
Storm surge	A positive or negative storm surge occurs respectively with a rise or fall of water against the shore, positive sometimes produced by strong winds blowing onshore, negative surge sometimes produced by strong winds blowing offshore. Currents produced can predominate over tidal streams and local wind-driven currents
Strand	General description of a wide intertidal area usually composed of sand
Strategic Environmental Assessment	An appraisal process through which environmental protection and sustainable development is considered in advance of decisions on policy, plans and programmes
Stratification	Development of a stable layered density structure in the water column; may be as a result of temperature gradients (thermal stratification) or salinity gradients; often seasonal
Sublittoral	Below intertidal, permanently submerged by seawater
Sweep	Addition of a batch of additive to a drilling fluid; typically of a viscous additive to clear the hole of cuttings
SWT	Scottish Wildlife Trust
TAC	Total allowable catch
Taxa	Taxonomic category or group
TBT	Tributyltin
Telemetry	The science and technology of automatic measurement and transmission of data by wire, radio, or other means from remote sources, to receiving stations for recording and analysis
Thermal stratification	Layering of the water column due to temperature gradients between different depths
Thermocline	Layer within the water column where temperature changes rapidly with depth

Term	Definition
Tombolo	A sand or gravel bar connecting an island with another land mass
Topography	Surface features of an area
Trawling	Actively pulling a net through the water behind a vessel. Pelagic trawling does not make contact with the seabed; demersal trawling involves the use of a weighted line (footrope) which makes contact with the seabed
Triassic	Geologic period extending from approximately 251-200Ma
Trophic	Relating to the nutrition/feeding habits of organisms
Trophic level	The position occupied by an organism in a food chain or a food web
Tubificids	A type of annelid worm
Tunicates	Chordate marine animals with a cylindrical or globular body enclosed in a tough outer covering e.g. sea squirts
UK	United Kingdom
UKCS	United Kingdom Continental Shelf
UKOOA	United Kingdom Offshore Operators Association
UKOPP	United Kingdom Oil Pollution Prevention
UNESCO	United Nations Organisation for Education, Science, Culture and Communications
Vitellogenesis	Formation of the yolk of an egg
Waders	Any of many long-legged birds that wade in water in search of food (includes oystercatcher, whimbrel, snipe, avocets, stilts, plovers, sandpipers, godwits, curlews, snipe and phalarope)
Waterbirds	Group of birds which include divers and grebes, bitterns and herons, rails, crakes and coots, wildfowl and waders
Waterfowl	Collective term for all swimming waterbirds including grebes, coots and all wildfowl
WBM	Water Based Mud
WeBS	Wetland Bird Survey
WFD	Water Framework Directive (Directive 2000/60/EC)
Whelk	Predatory marine gastropod mollusc of the family Buccinidae.
White dunes	Embryonic small dunes on the upper beach
WHO	World Health Organisation
WHS	World Heritage Site
Wildfowl	Collective term for all ducks, shelducks, geese and swans
WNAW	Western North Atlantic Water
Wrasse	Fishes of the family Labridae
Xenophyophores	Large, single celled organisms of up to 10cm diameter, usually epifaunal benthic deposit feeders
Zoanthid	A soft coral
Zooplankton	Free floating animals (often microscopic)