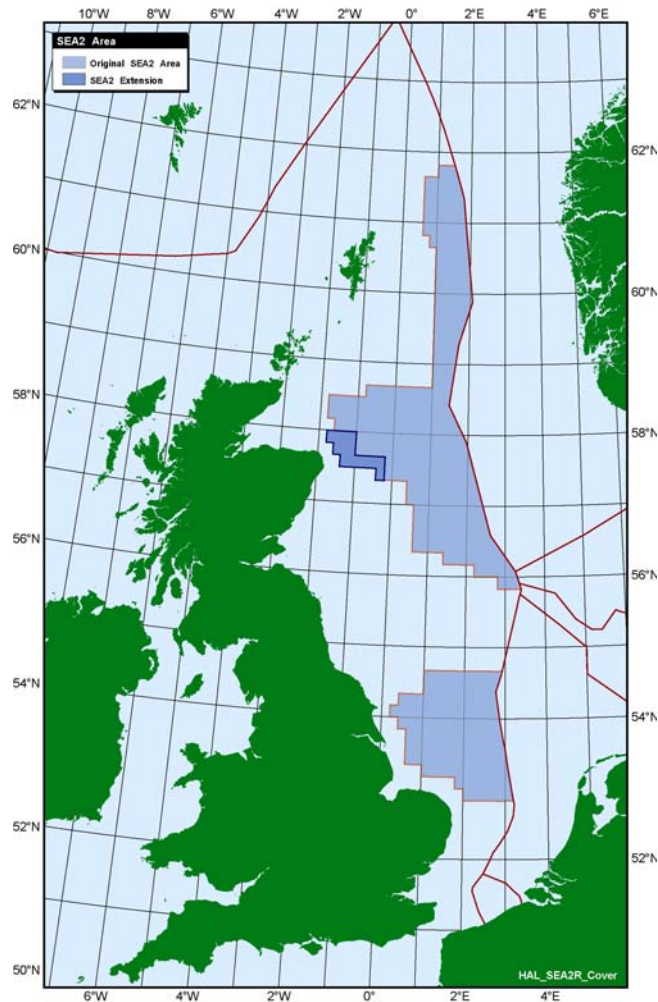


**Report to the
Department of Trade and Industry**

**Extension to 2nd Strategic Environmental
Assessment of the Mature Areas of the
Offshore North Sea**

Consideration of Issues



October 2002

CONTENTS

1	Summary	5
2	Introduction and Background	6
2.1	Introduction	6
2.2	Background and purpose	6
3	Extension Block Consideration	8
3.1	Activities	8
3.2	Environmental controls and regulation	12
3.3	Environmental information	12
4	Issues	29
4.1	Introduction	29
4.2	Noise	29
4.3	Potential effects on herring spawning grounds	30
4.4	Oil Spills	31
4.5	Cumulative, incremental and synergistic effects	36
5	Conclusion	36
5.1	Introduction	36
5.2	Noise	36
5.3	Effects on herring spawning grounds	36
5.4	Oil spill	37
5.5	Cumulative, incremental and synergistic effects	37
5.6	Overall conclusion	37
6	References	39

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1 SUMMARY

Background

- The DTI's 2nd Strategic Environmental Assessment (SEA 2) was completed during 2001 and addressed the implications of licensing for oil and gas exploration and production in parts of the offshore North Sea.
- Following stakeholder and public consultation on SEA 2, over 270 unlicensed blocks and part blocks in the SEA 2 area were offered in the 20th Licensing Round with parts of 4 blocks not being offered for environmental reasons. The Round resulted in 25 production licences covering 36 whole and part blocks which were awarded in July 2002.
- The SEA 2 documentation including the post consultation report are all available from the DTI SEA website www.habitats-directive.org
- The Buzzard field, potentially the largest oilfield to be found in the North Sea over the last 25 years, was discovered in 2001, by an exploration well in Block 20/06. Block 20/06 lies within the area addressed by SEA 2 - see Figure 2.2.
- The discovery of the Buzzard oilfield has increased interest in further hydrocarbon exploration in blocks adjacent to the SEA 2 area.

Proposal

- In the interests of facilitating potential synergies in this important area, the DTI wishes to bring forward the consideration for licensing of these blocks. The DTI proposal is to make a minor modification to the SEA 2 area to cover an additional 14 blocks immediately adjacent to the SEA 2 central North Sea area, and then to offer these blocks for licensing in the next Licensing Round.
- To this end, the information base and activity scenarios used for SEA 2, together with the assessment of the potentially significant effects of licensing, overall conclusions, consultation feedback and post consultation report have been reviewed for applicability to the SEA 2 extension blocks.

Consideration of issues

- The blocks are similar in environmental character to the adjacent SEA 2 blocks although they are closer to the north-east Scottish coast.
- Additional consideration (over and above that given in SEA 2) has been made of potential effects on herring spawning grounds, and from underwater noise and oil spills.
- The review concluded that given available controls and mitigation, the proposed extension of the SEA 2 area and offer of these blocks for licensing would not be likely to result in significant environmental effects.

Purpose of this document

- This document is intended to summarise the consideration and basis for the proposal to offer the SEA 2 extension blocks for licensing for stakeholders and the public.

Contact

Questions regarding the SEA 2 extension and licensing should in the first instance be made by e-mail to Christine.Weare@DTI.gsi.gov.uk or letter to Ms Christine Weare, DTI Oil and Gas Directorate, 86-88 Atholl House, Guild Street, Aberdeen, AB11 6AR.

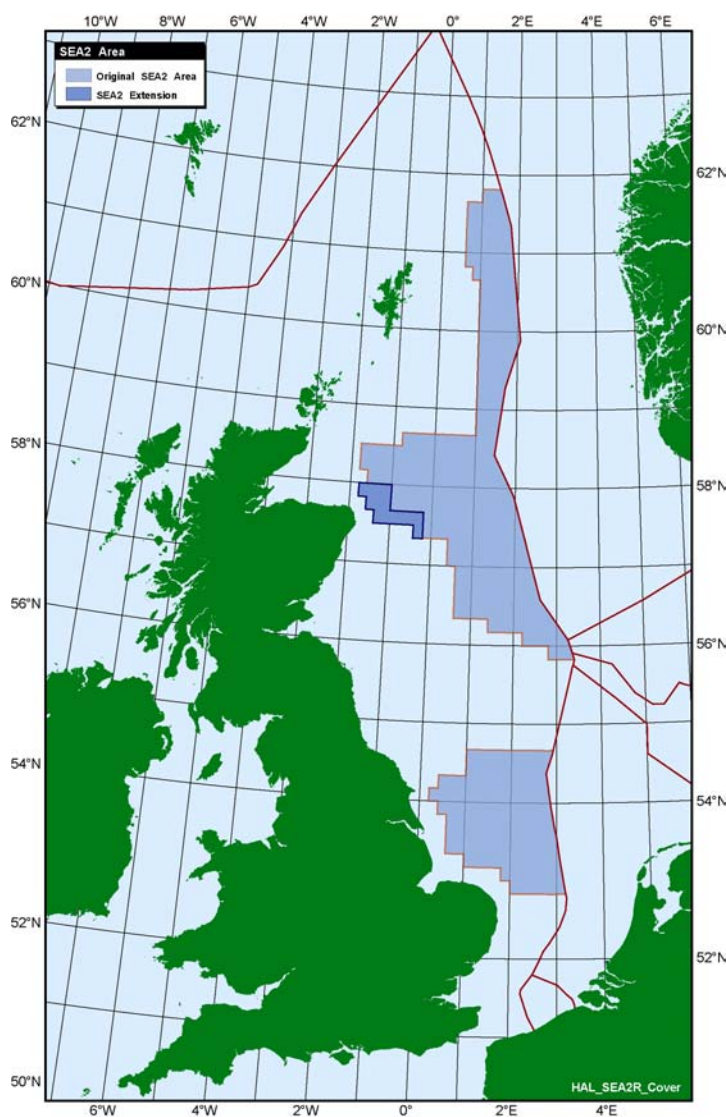
2 INTRODUCTION AND BACKGROUND

2.1 Introduction

The UK Department of Trade and Industry (DTI) is the principal regulator of the offshore oil and gas industry and has taken a proactive stance on the use of SEA as a means of striking a balance between promoting economic development of the UK's offshore oil and gas resources and effective environmental protection. In 1999, the Department of Trade and Industry (DTI) began a sequence of sectoral SEAs considering the implications of further licensing of the UK Continental Shelf (UKCS) for oil and gas exploration and production with a view to these covering the whole UKCS.

2.2 Background and purpose

Figure 2.1 – SEA 2 areas and proposed SEA 2 extension blocks



The 2nd in the sequence of SEAs, SEA 2, was completed during 2001 and addressed the implications of licensing for oil and gas exploration and production parts of the offshore North Sea. The SEA 2 area (see pale blue shaded area in Figure 2.1) contains the majority of existing producing installations and contains some 400 UKCS blocks. Following SEA 2, over 270 unlicensed blocks and part blocks in the SEA 2 area were offered in the 20th Licensing Round (note; parts of 4 blocks were not offered for environmental reasons).

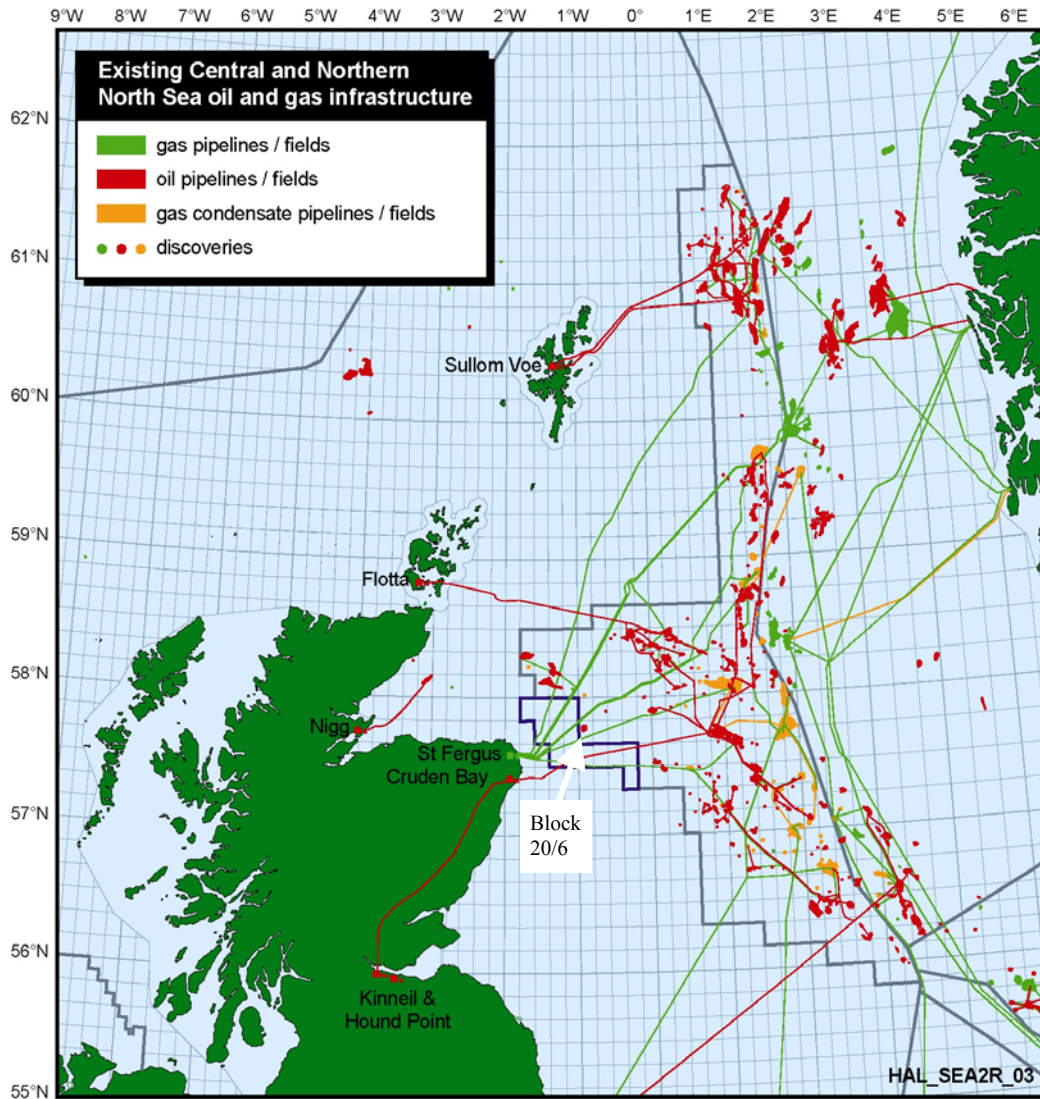
The DTI, for the reasons explained in this document, are proposing a minor modification to the SEA 2 area, encompassing some 14 additional blocks which would be offered for licensing at the next Licensing Round.

The DTI Oil and Gas Directorate's overall aim is to maximise the economic benefit to the United Kingdom of its oil and gas resources, taking into account the environmental impact of hydrocarbon development, and the need to ensure secure, diverse and sustainable supplies of energy at competitive prices. The DTI have instigated several initiatives aimed at

promoting continued exploration and development of UK hydrocarbon resources and information on these can be accessed from (www.og.dti.gov.uk).

The Buzzard field, potentially the largest oilfield to be found in the North Sea over the last 25 years, was discovered in 2001, by an exploration well in Block 20/06. Block 20/06 was licensed in the 18th Licensing Round and lies within the area addressed by SEA 2 - see Figure 2.2.

Figure 2.2 – Existing oil and gas activity



As a result of this discovery and ongoing review of geological interpretations, interest has increased in further hydrocarbon exploration in the area. However, in the current SEA sequence, blocks in this area would not be addressed until the 5th SEA in two years time. In the interests of facilitating potential synergies in this important area, the DTI wishes to bring forward the consideration for licensing of a limited number of blocks in UKCS Quadrants 19 and 20. To do this the DTI propose to extend SEA 2 to cover an additional 14 blocks immediately adjacent to the SEA 2 central North Sea area, hereafter called the SEA 2 extension blocks – see darker shaded blocks on Figure 2.1.

To consider whether licensing the proposed extension blocks would be likely to result in significant environmental effects, the information base and activity scenarios used for SEA 2, together with the assessment of the potentially significant effects of licensing, overall conclusions, consultation feedback and post consultation report have been reviewed for applicability to the SEA 2 extension blocks. These documents can be accessed on the DTI’s SEA website at www.habitats-directive.org.

In completing the review, the following were also considered:

- New environmental information which has become available since the completion of SEA 2
- Environmental sensitivities specific to the SEA 2 extension block area
- Predicted SEA 2 activity scenarios against work programmes agreed with successful applicants in the 20th round
- Predicted extension block activity scenarios
- Existing and impending regulations and controls

This document summarises the review and its conclusions with regard to implications of licensing the SEA 2 extension blocks. Where information is available in existing SEA documentation this is referred to rather than repeated here unless essential to understanding.

This general approach was discussed and agreed in principle with the SEA steering group at the SEA 3 Assessment Workshop held in July 2002.

3 EXTENSION BLOCK CONSIDERATION

3.1 Activities

3.1.1 Introduction

This section includes information to allow a perspective on the potential scale of exploration and development activity which may result if the 14 SEA 2 extension blocks were offered for licensing, together with past licensing history of the blocks and a comparison between predicted SEA 2 activity scenarios against the work programmes agreed with successful applicants in the 20th round.

3.1.2 Alternatives

The alternatives to proceeding with the SEA 2 Extension are to:

1. Never license the blocks
2. Offer the blocks as part of a Licensing Round but wait until SEA 5 is completed
3. Offer the blocks as part of the next Licensing Round

The first option of never licensing the blocks would mean that potentially substantial (but as yet unquantified) hydrocarbon reserves would effectively be lost to the UK.

Waiting until SEA 5 is completed would entail a delay of at least two years and consequently potential synergies with the development of facilities for the newly discovered Buzzard oil field could be lost. Such synergies are of course contingent on additional hydrocarbon reserves being found.

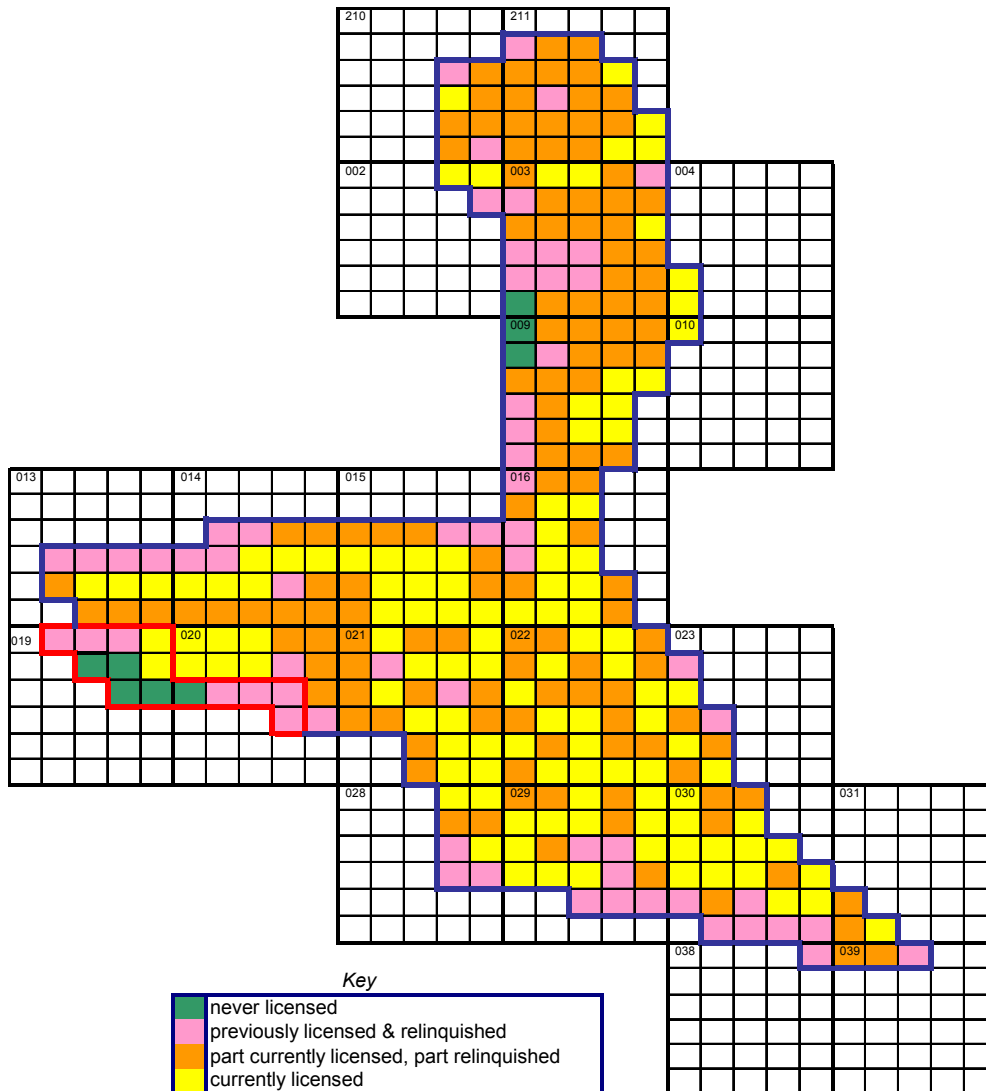
The SEA 2 extension blocks are Exploratory Blocks for which full and open competition should be allowed. Offering the 14 blocks out of Round would in effect, be a mini-round rather than the normal out of Round process which usually applies to 1 or 2 blocks only. By including the SEA 2 extension blocks in the 21st Licensing Round, they would potentially be licensed more quickly and ensure the competition that should benefit UK hydrocarbon exploration as a whole.

3.1.3 Licensing history

The SEA 2 extension area is within UKCS Quadrants 19 and 20 and comprises 14 contiguous blocks of which 2 are currently under licence, 7 which have been licensed but are now wholly relinquished,

and 5 which have not previously been licensed - see the schematic representation in Figure 3.1 (which also shows licensing in the adjacent northern and central North Sea SEA 2 Area for context).

Figure 3.1 – Licensing status of blocks in the SEA 2 extension area and adjacent northern and central North Sea SEA 2 area



Source: DTI website

3.1.4 Estimates of potential activity

Projections of the scale of potential exploration and production activity which could follow licensing of the 14 additional blocks forming the SEA 2 extension have been provided by the DTI Licensing and Consents Unit. The projections are best estimates on the basis of current understanding and thus indicative. Based on the Buzzard discovery, and for the purposes of consideration of issues the prospectivity is assumed to be light-medium oil.

Seismic surveys

It is estimated that at least 10 of the blocks would require 3D seismic surveys to refine present information on subsurface geology and the location of potential hydrocarbon reserves. These surveys

can be expected to occur within two years of award, but may be combined into one or more (most probably in three) survey packages.

Exploration wells

Possibly 5 exploration wells would be drilled, within three or four years of award (2 in 2005; 3 in 2006). Further appraisal wells will depend on the success of the exploration wells, but assuming a 1 in 3 success rate, possibly six wells may be drilled, within 6 years of award (2 in 2006; 2 in 2007; 2 in 2008).

Developments

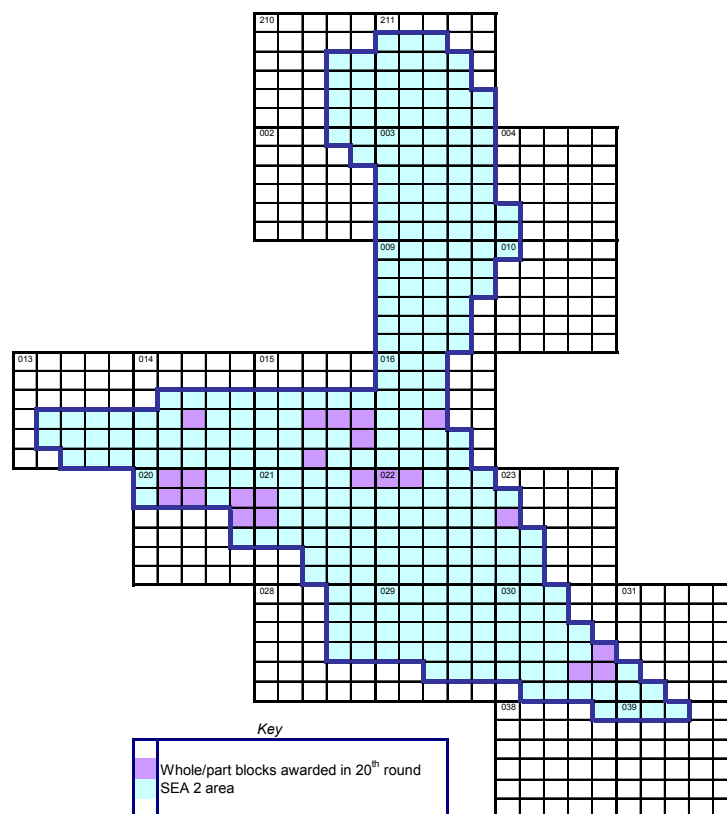
One further oil development may result from licensing the SEA 2 extension area within 7 to 10 years of award. The scale of facilities needed would depend on field size, with at least a minimal facilities platform and associated pipelines that would probably be tied back (linked) to the Buzzard facilities or an existing pipeline.

The Buzzard field discovery will probably require major infrastructure development in the SEA 2 area of the central North Sea although the nature and timing is not yet defined.

3.1.5 Review of SEA 2 activity predictions

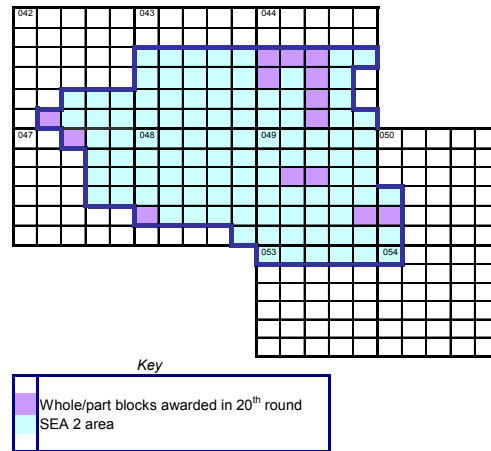
Over 270 whole and part blocks in the SEA 2 Areas were offered in the 20th Licensing Round. As a result of the Licensing Round production licences covering 36 whole and part blocks were awarded in July 2002 - see schematic Figures 3.2a and b.

Figure 3.2a – Blocks awarded in the 20th Licensing Round within the northern and central North Sea SEA 2 area



Source: DTI website

Figure 3.2b – Blocks awarded in the 20th Licensing Round within the southern North Sea SEA 2 area



Source: DTI website

As noted above the predictions of exploration and development activities are best estimates made on the basis of current understanding and are thus indicative. To gain an impression of the relative accuracy of these estimates, the predictions made for SEA 2 are compared with the number of block awards and actual work programmes committed to in the 20th licensing round – see Table 3.1.

Table 3.1 – Comparison of activity predicted in SEA 2 resulting from 20th Licensing Round licensing in the SEA 2 Areas

Area	Part/whole Blocks Awarded	Seismic Surveys		Exploration wells		Developments	
		Predicted	Actual ^{1, 2}	Predicted	Actual	Predicted	Actual ⁴
Northern North Sea	0	10	0	5	0	1	0
Central North Sea	22	18	11 Firm 3 Contingent	10	4 Firm ³ 5 Contingent ⁴ 10 D/D ⁵	2	See notes ⁶
Southern North Sea	14	18	8 Firm	6	9 D/D ⁵	2	See notes ⁶

Notes:

1. The number of seismic surveys reflects the number of blocks included in a licence to allow comparison on the same basis as the DTI predictions.
2. Where work programmes have indicated “acquire seismic data” this has been interpreted for comparison purposes as a seismic survey although it may in fact, merely be the purchase of for reprocessing of existing seismic data.
3. A Firm well is a commitment to drill, which is not contingent upon any further evaluation. No waivers will be considered for Firm wells.
4. A Contingent well is a commitment to drill, contingent upon additional evaluation. These are not firm wells although, the Operator must make a technical case to the DTI for a waiver of the commitment if the Operator no longer feels the drilling of the Contingent well is justified on technical, geological or other grounds.
5. D/D or a Drill or Drop well is a commitment to drill or relinquish the licence within a specified time frame – again these wells may not be drilled unless geological evaluations prove to be favourable.
6. Development plans for discoveries are dependent on the finding of economically viable reserves as a result of exploration activity and therefore it is not yet possible to review this aspect.

With the exception of the Northern North Sea, where no block applications were received, the predicted versus actual activity levels are in sufficiently close agreement that the conclusions reached in SEA 2 regarding potentially significant environmental effects are likely to remain valid.

3.2 Environmental controls and regulation

Exploration and production in the oil and gas industry is regulated primarily through a licensing system managed by the DTI Oil and Gas Directorate's Exploration and Licensing Branch. A brief overview of the regulatory context for Strategic Environmental Assessment together with the offshore or "Seaward" licensing process is given in Section 3 of the SEA 2 and more recently the SEA 3 consultation documents (see www.habitats-directive.org) with more detail to be found on the DTI's website at www.og.dti.gov.uk/upstream/licensing.

There is a wide range of International, European Union, UK and industry measures aimed at protecting the marine environment and applicable to offshore activities and Section 3.3 of the SEA 3 Consultation Document provides an overview.

3.3 Environmental information

The applicability to the SEA 2 extension blocks of the information base documented for SEA 2 (and where appropriate SEA 3) in the Consultation Document and Technical Reports was reviewed. This review aimed to identify any gaps, new information or areas where SEA 2 extension block area specific information was felt necessary. The review is summarised in Table 3.1 which provides a high level overview of the various components of the environment. For convenience the table follows the order of the sections in the SEA 2 Consultation Document and cross references are given to SEA 2 & 3 documentation. The review identified the following areas requiring some SEA 2 extension blocks area specific information:

- Fish spawning areas
- Marine reptiles
- Sea and other birds
- Offshore conservation sites
- Coastal sensitivities
- Fisheries
- Marine archaeology

The relevant section numbers of these topics are also given in Table 3.2.

Table 3.2 – Summary of the environment of the SEA 2 extension blocks

Summary	Implications for SEA	Assessment of Information base ¹
GEOLOGY & SUBSTRATES		
Sediments of the area are dominated by well sorted sands, sand and gravel, and muddy sands in deeper waters. In some areas, sand waves and megaripples occur. Glacial "erratic" boulders are known from the area.	Biodegradation and accumulation of contaminants Range of benthic habitats present	SEA 2 information applicable See TR008
CLIMATE & METEOROLOGY		
Meteorological patterns are typical for the UK with a predominantly south-westerly airflow, although, strong winds and gales come from all compass points. Summer is the most quiescent time of year.	Oil spill trajectory Atmospheric dispersion	SEA 2 information applicable See Section 5.3 ²

Summary		Implications for SEA	Assessment of Information base ¹
OCEANOGRAPHY & HYDROGRAPHY			
General bathymetry	The blocks are located in the western central North Sea in water depths of around 100m. The seabed of the region slopes gently to the north and east. Bosie's (South) bank in the south rises to 60m.	Dispersion of discharges Seabed features of potential conservation interest	SEA 2 information applicable See Section 5.4 ²
Water masses	The blocks lie near the boundary between oceanic water of Atlantic origin and coastal/mixed waters of the Moray Firth. The position of this water mass interface varies over time. The water column generally stratifies thermally at between 30-50m during summer. Bottom water temperatures range between 7°C and 10°C. Surface water temperature ranges from 6 °C in winter to 15 °C in summer.	Pattern of discharge dispersion Rate of degradation of organic materials Spilled oil behaviour	SEA 2 information applicable See Section 5.4 ²
Water currents and waves	Currents in the region are complex because of the variability of the Fair Isle current. Tidal streams over the blocks flow predominantly north-south with a maximum speed of 0.75m/s. Off Fraserburgh, around the south-east corner of the Moray Firth currents are very strong and may exceed 2m/sec. Residual currents generally flow to the south-east. The significant wave height for a 50 year return period is 25-28m.	Spilled oil behaviour and response options Particulate dispersion and redispersion	SEA 2 information applicable See Section 5.4 ²
Existing contamination	Existing levels of contamination are reported to be low.	Discharge quality criteria.	SEA 2 information applicable See TR004
PLANKTON			
	The plankton community of the area is influenced by the inflow of nutrient rich Atlantic water which sustains phytoplankton blooms for longer than in some other areas of the North Sea. The copepod <i>Calanus finmarchicus</i> and euphausiid <i>Thysanoessa</i> spp may form more than 70% of zooplankton biomass in summer forming a key linkage between primary productivity and fisheries productivity.	Vulnerability to spills Pelagic-benthic system coupling, rapid transfer of material to the seabed	SEA 2/3 information applicable See TR005 rev1
BENTHOS			
	Available information on the seabed faunal community of the area indicates that the fauna is similar to that found in adjacent areas. No large or fragile species are known from the area	Vulnerable faunal community or species Rate of recovery Contaminant transfer into food web	SEA 2 information applicable See Section 6.3 ²
CEPHALOPODS			
	A range of Cephalopod species are found in the area. Cephalopods play an important part in marine food webs, and are prey to whales, dolphins, seals, birds, some large fish species and other cephalopods.	Possible vulnerability to drilling and operational discharges or spills.	SEA 2/3 information applicable See TR009 rev1
FISH			
	The blocks lie within the spawning grounds of a range of species (see Section 3.3.1 of this document) with sensitivity to seismic activity occurring between and February and June.	Possible vulnerability to drilling and operational discharges or spills Timing of seismic surveys	SEA 2 information applicable See TR003 See also Section 3.3.1 of this document

	Summary	Implications for SEA	Assessment of Information base ¹
MARINE REPTILES			
	Leatherback turtles <i>Dermochelys coriacea</i> are occasionally recorded off eastern coasts of the UK from Shetland coast to Norfolk, mostly in summer/autumn and most commonly in northern areas. (see Section 3.3.2 of this document)	Possible vulnerability to drilling and operational discharges or spills Timing of seismic surveys	SEA 2/3 information applicable See Section 6.6 ² See also Section 3.3.2 of this document
SEABIRDS (& COASTAL BIRDS)			
	The area is very important for seabirds, in particular auks with high densities during and post breeding. Other species occurring in high densities are fulmars, kittiwakes and various gulls. The Moray Firth and the north-east coast of the Scottish mainland contain breeding colonies of national and international importance. Further information is given in Section 3.3.3 of this report.	Vulnerability to oil spills	SEA 2 information applicable See Section 6.7 ² See also Section 3.3.3 of this report
SEALS AND CETACEANS			
Seals	Orkney, the north-east coast of the Scottish mainland and the Moray Firth hold important breeding colonies for grey and common seals. Although they usually remain close to the shore, they are now known to forage well offshore.	Potential disturbance by seismic noise Vulnerability to oil spill	SEA 2/3 information applicable See TR006 rev1
Cetaceans	The Moray Firth has a semi-resident population of bottlenose dolphins which move around the area and could be expected to visit the blocks. Harbour porpoises are common in the area year round. Minke whales are regular visitors between July and October. Other cetacean species likely to be seen in the area include white-sided and common dolphins and long-finned pilot whales.	Potential disturbance by seismic noise Vulnerability to oil spills	SEA 2/3 information applicable See TR006 rev1
POTENTIAL OFFSHORE CONSERVATION SITES			
	There are no known or proposed offshore (outside territorial waters) SACs or SPAs within the SEA 2 extension blocks - see Section 3.3.4.2 of this report.		SEA 2 information applicable See Section 7 ² See also Section 3.3.4.2 of this report
EXISTING HUMAN ACTIVITIES			
	The majority of the information base for SEA 2 and supplemented by updates/new technical reports for SEA 3 is applicable to this area. Some site specific information is given in Section 3.3.5 of this report.		SEA 2 information applicable See TR007 See also Section 3.3.5 of this report
COASTAL SENSITIVITIES			
	The adjacent coastline, both within and outside the Moray Firth, is scenically beautiful and of high nature conservation value. This is reflected in the number of sites designated as being of international, national and local importance. Many of the sites are designated in recognition of their importance as seabird breeding and/or feeding areas. See Section 3.3.4.3 of this report	Vulnerability to oil spills	Available information adequate See Section 3.3.4.3 of this report

Notes:

1. Technical Reports and SEA Consultation Documents are available on the DTI SEA website (www.habitats-directive.org)
2. Section of SEA 2 Consultation Document

3.3.1 Fish

A wide range of commercially important fish species spawn in or around the SEA 2 extension blocks area and the most important of these are illustrated in Figures 3.3-3.5. The majority of species spawn pelagically (into the water column) and over wide areas. In contrast, herring spawn at the seabed onto gravel banks and often return to discrete spawning grounds year after year.

Figure 3.3 – Fish spawning in the SEA 2 extension block area (1)

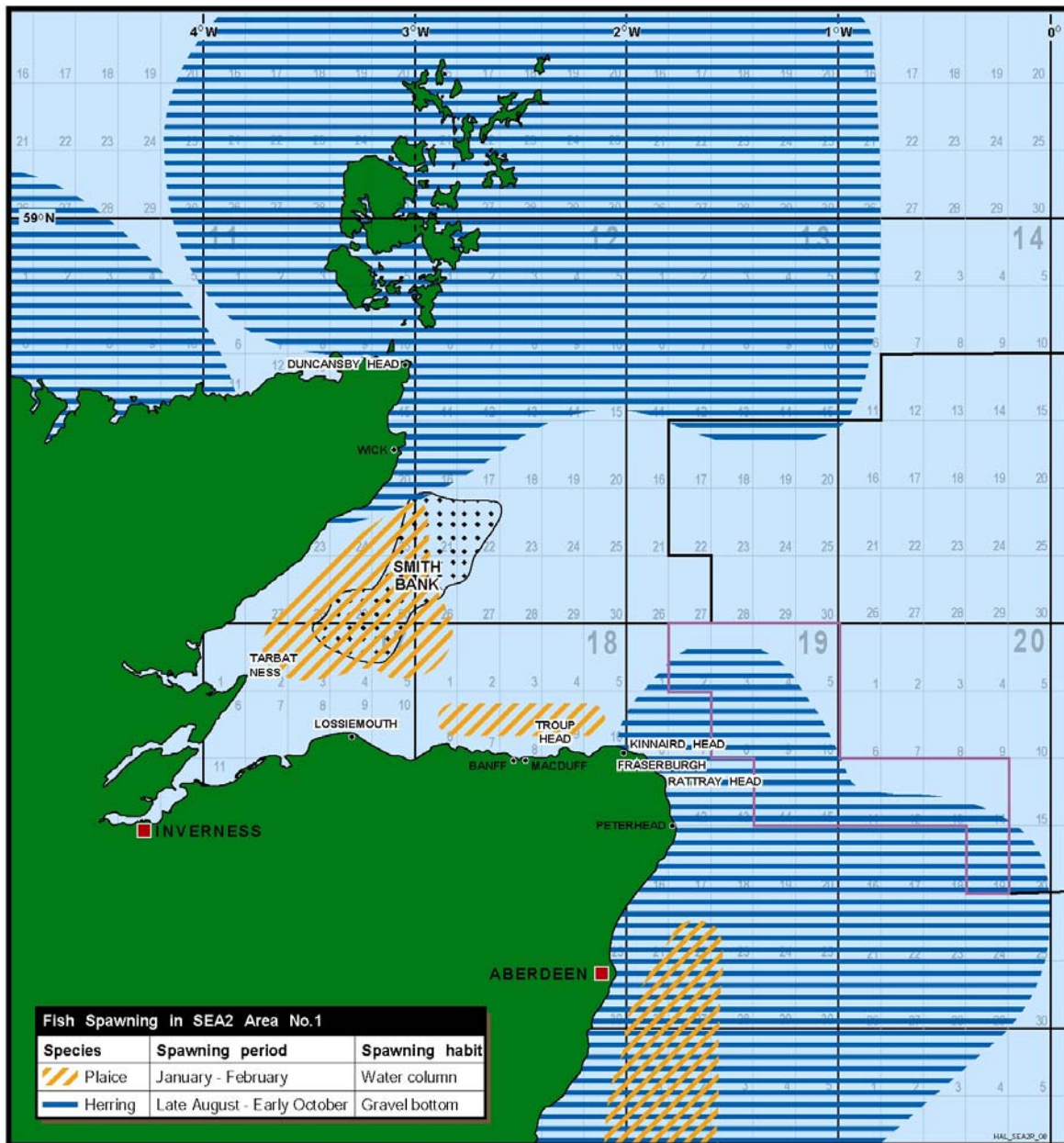


Figure 3.4 – Fish spawning in the SEA 2 extension block area (2)

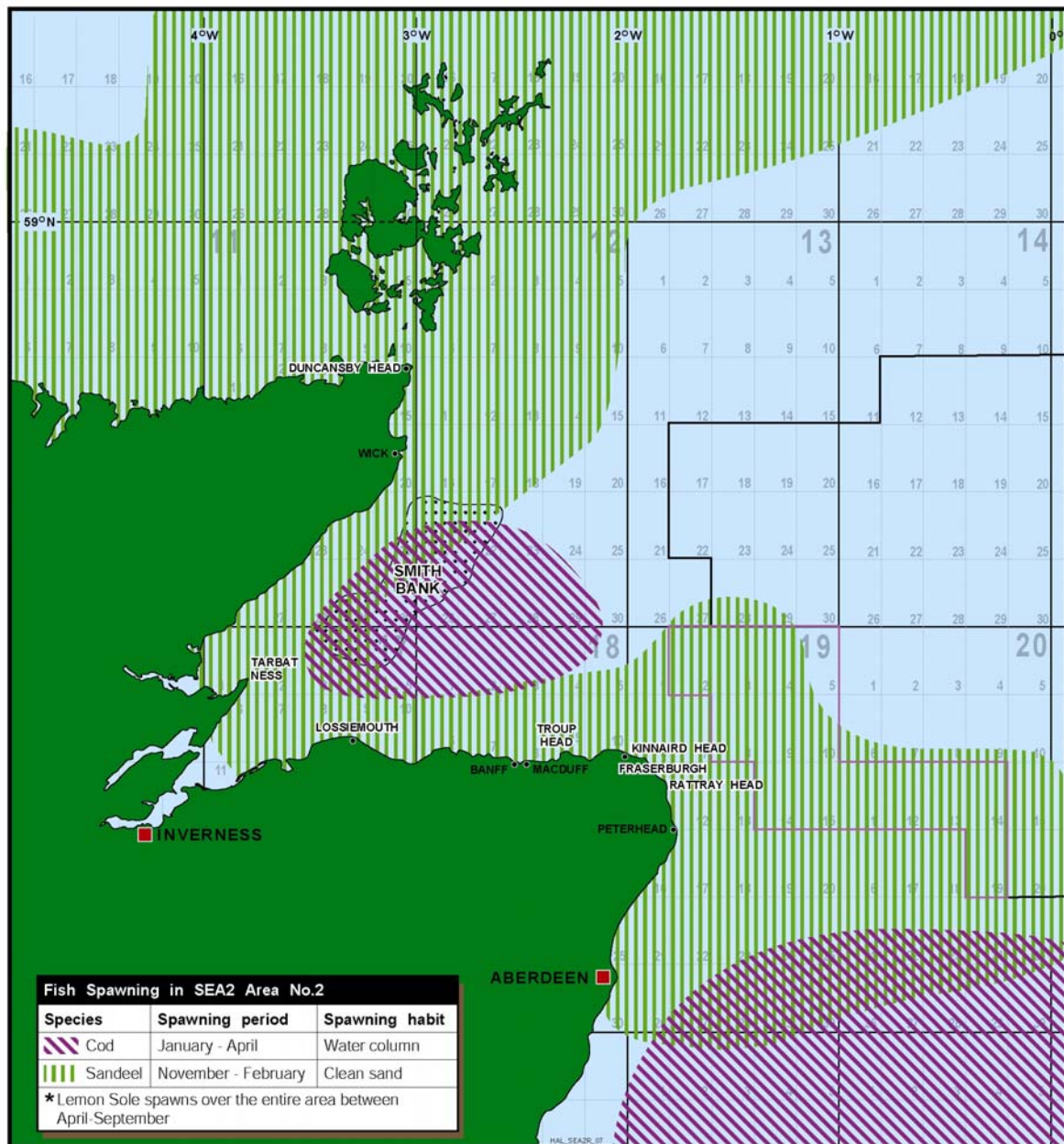
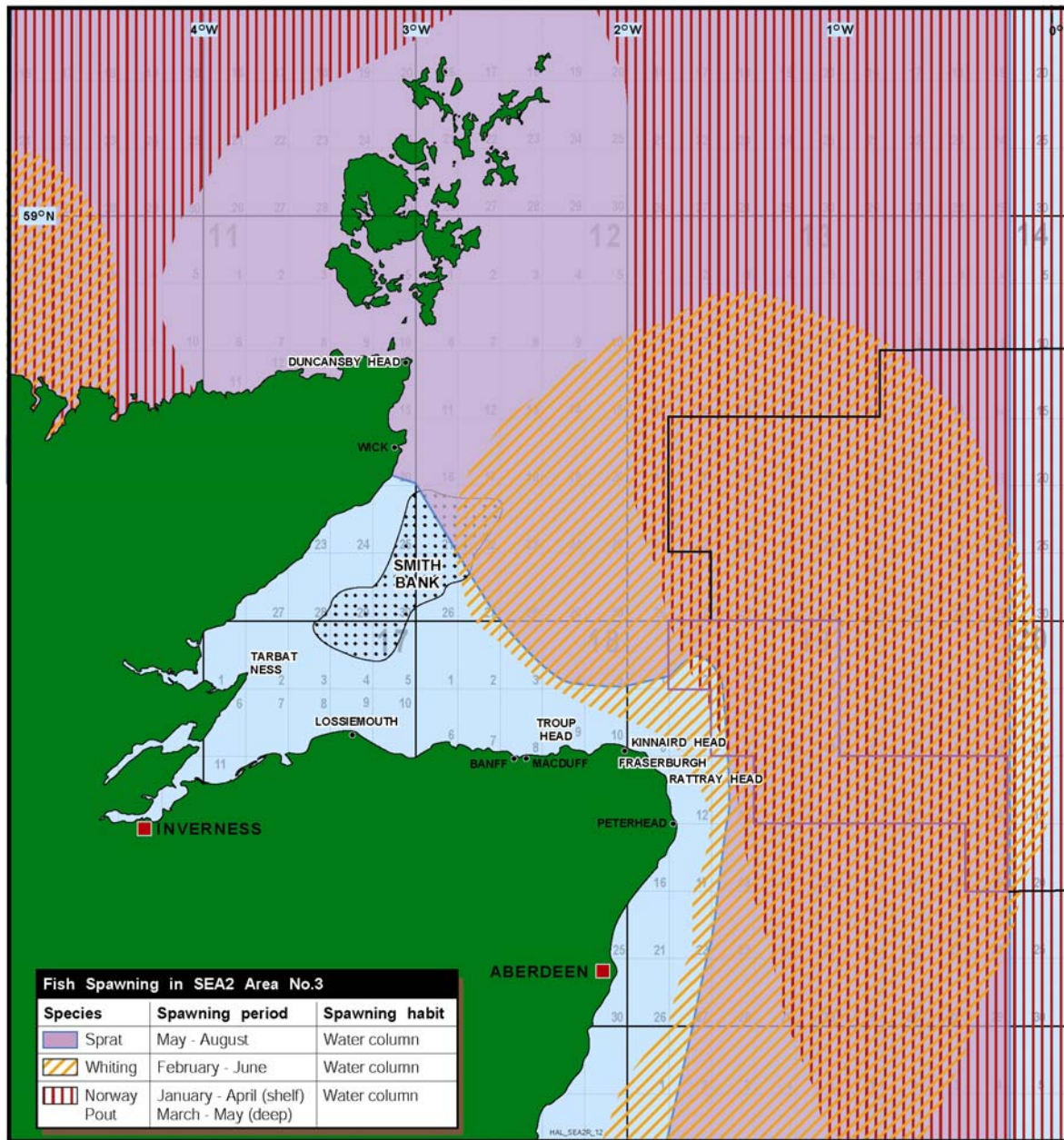


Figure 3.5 – Fish spawning in the SEA 2 extension block area (3)



3.3.2 Marine reptiles

Leatherback turtles *Dermochelys coriacea* are occasionally recorded off eastern coasts of the UK from Shetland coast to Norfolk, mostly in summer and most commonly in northern areas. The leatherback turtle is the most frequently recorded species although four other species of turtle have been recorded more rarely, from south and west coasts of Britain and Ireland.

Bycatch and strandings data for turtles are held in the database TURTLE (Pierpoint & Penrose 1999), and bycatch data have been analysed by Pierpoint (2000) in relation to Biodiversity Action Plan and Habitats Directive obligations of the UK. The timing of turtle sightings throughout UK waters imply that leatherbacks move into British and Irish waters from the south and west, and move northwards with some entering the North Sea in late summer and autumn.

3.3.3 Sea and other birds

Seabirds and other waterbirds were considered in some detail in SEA 2 and only 2 graphics are included here to provide some additional information on the birds of the Moray Firth (Figure 3.6) and overall vulnerability to surface pollution (Figure 3.7).

3.3.4 Conservation sites

3.3.4.1 Introduction

The cliffs which dominate the northern coast of Scotland stretch round as far as Helmsdale on the north east coast, from where the cliffs give way to a number of well developed raised beaches. The Moray Firth coast consists of sand and shingle spits and barriers intermingled with stretches of cliff. Much of the northern coast of Moray and Aberdeenshire is plateau-like, broken by sea cliffs ranging in height from 30-90m. West of Roseheartly the cliff level falls to a low shore that extends to Peterhead. Further south, sandy beaches are replaced by red granite cliffs and stacks which again give way to sand dunes at the mouth of the Ythan Estuary. Dune-backed sandy beaches characterise the coast southwards to Aberdeen.

The Moray Basin and its associated inner firths form an important sequence of estuarine habitats and support important numbers of wintering waterfowl. The Moray Firth also supports the only semi-resident population of bottlenose dolphin *Tursiops truncatus* in the North Sea. The population is estimated to be around 130 individuals which are present all year, although animals range widely, and are sighted as far south as the Firth of Forth. The presence of this population has led to the area being designated a candidate Special Area of Conservation (JNCC website).

The region is primarily agricultural and silvicultural, and the only major population centres are Inverness and Aberdeen. There are numerous fishing ports and harbours with Peterhead, Fraserburgh and Aberdeen being nationally important. The largely undeveloped coastline attracts many tourists and a range of watersports are popular in the region.

3.3.4.2 Offshore conservation sites

Enabling legislation is due late 2002 to implement the Habitats Directive and the Birds Directive in UK offshore waters. The selection of marine Special Areas of Conservation (SAC) and Special Protection Areas (SPA) in the UK has so far been confined to UK territorial waters (out from the coast to 12 nautical miles).

The JNCC have recently reviewed site selection criteria and identified relevant habitats and species to be considered for selection of Natura 2000 sites in UK offshore waters - *Natura 2000 in UK Offshore Waters: Advice to support the implementation of the EC Habitats and Birds Directive in UK offshore waters*. JNCC Report 325 (Johnston *et al.* 2002). JNCC and UK Government are now in the process of identifying possible SACs and SPAs in UK offshore waters.

The location and extent of areas of possible Annex I habitat in UK offshore waters have been mapped by the British Geological Survey (BGS) for the JNCC. Limitations on using existing geological map interpretations to map the location and extent of Annex I habitats in UK offshore waters were encountered, principally because the Folk classification category of 'gravel' used in the geological maps does not match the Habitats Directive definition of 'reef' (Johnston *et al.* 2002). On the basis of Admiralty charts and the BGS information compiled for the JNCC, there are no known seabed features for which consideration for SAC designation is needed. Similarly, available information does not indicate the likelihood of SAC (for marine species) or SPA designation in the SEA 2 extension blocks area.

Figure 3.6 - Seasonal distribution and movements of seabirds and waterbirds in the North Sea including the SEA 2 extension blocks area

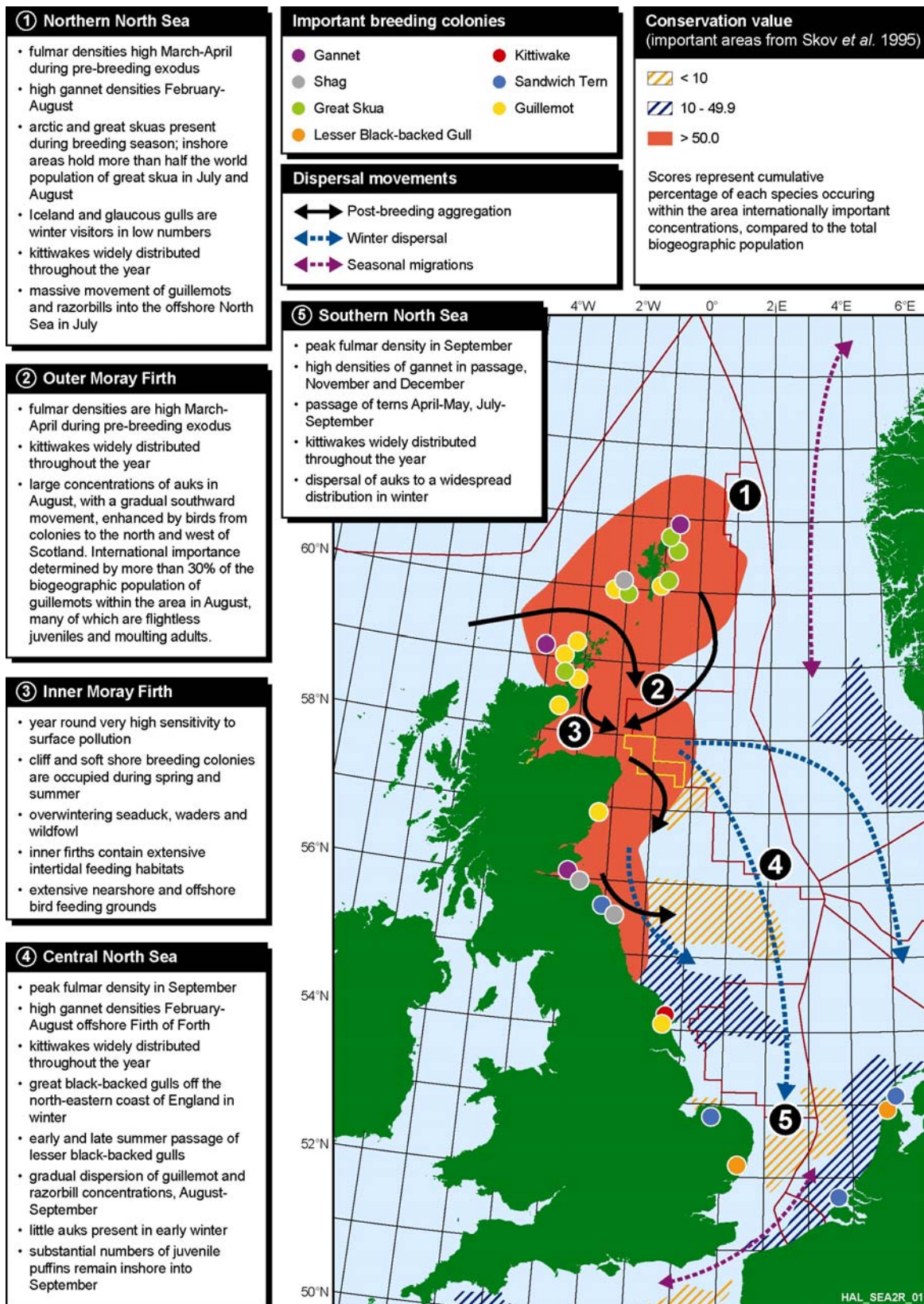
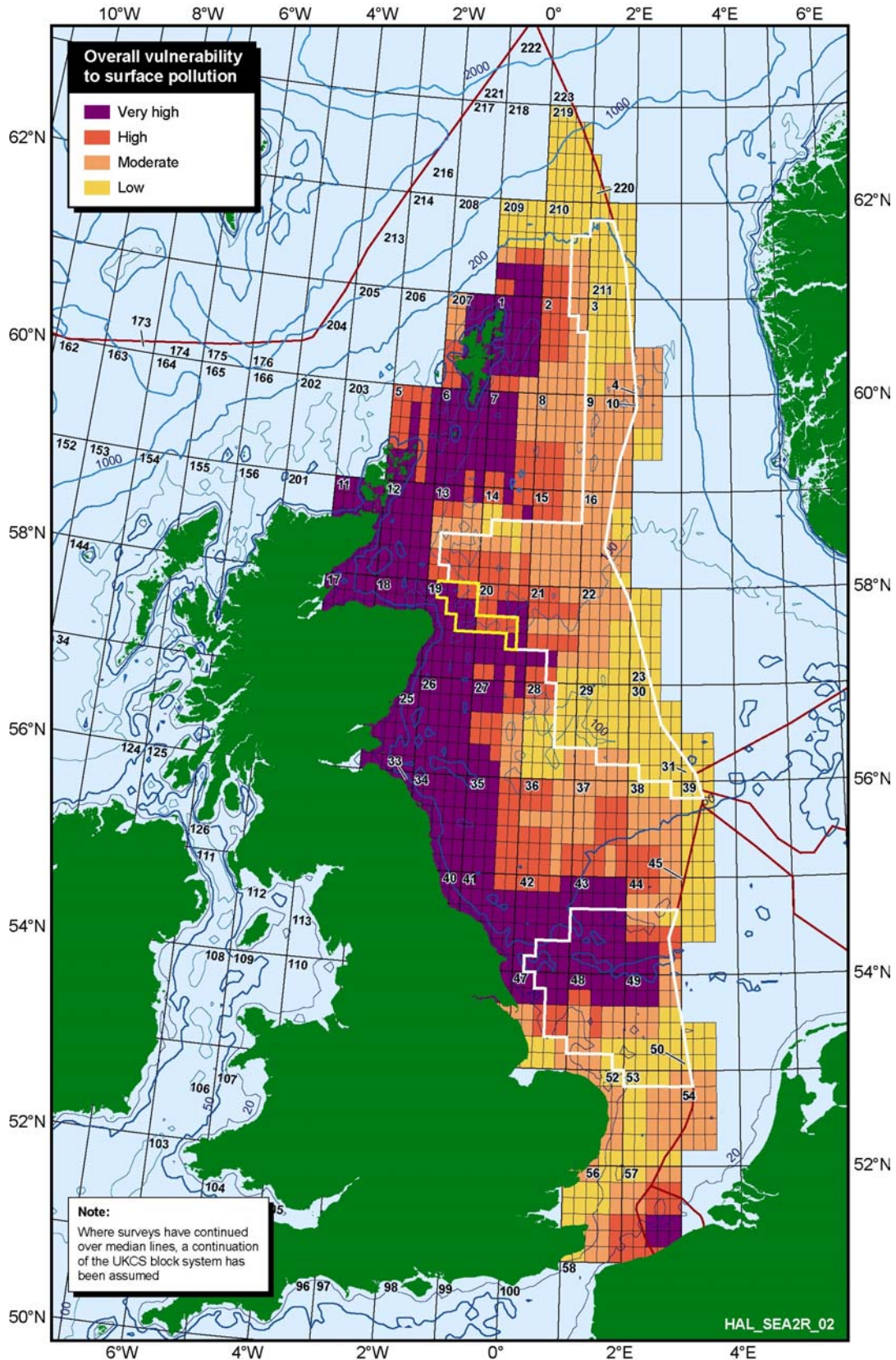


Figure 3.7 - Overall bird vulnerability to surface pollution in the North Sea including the SEA 2 extension blocks area



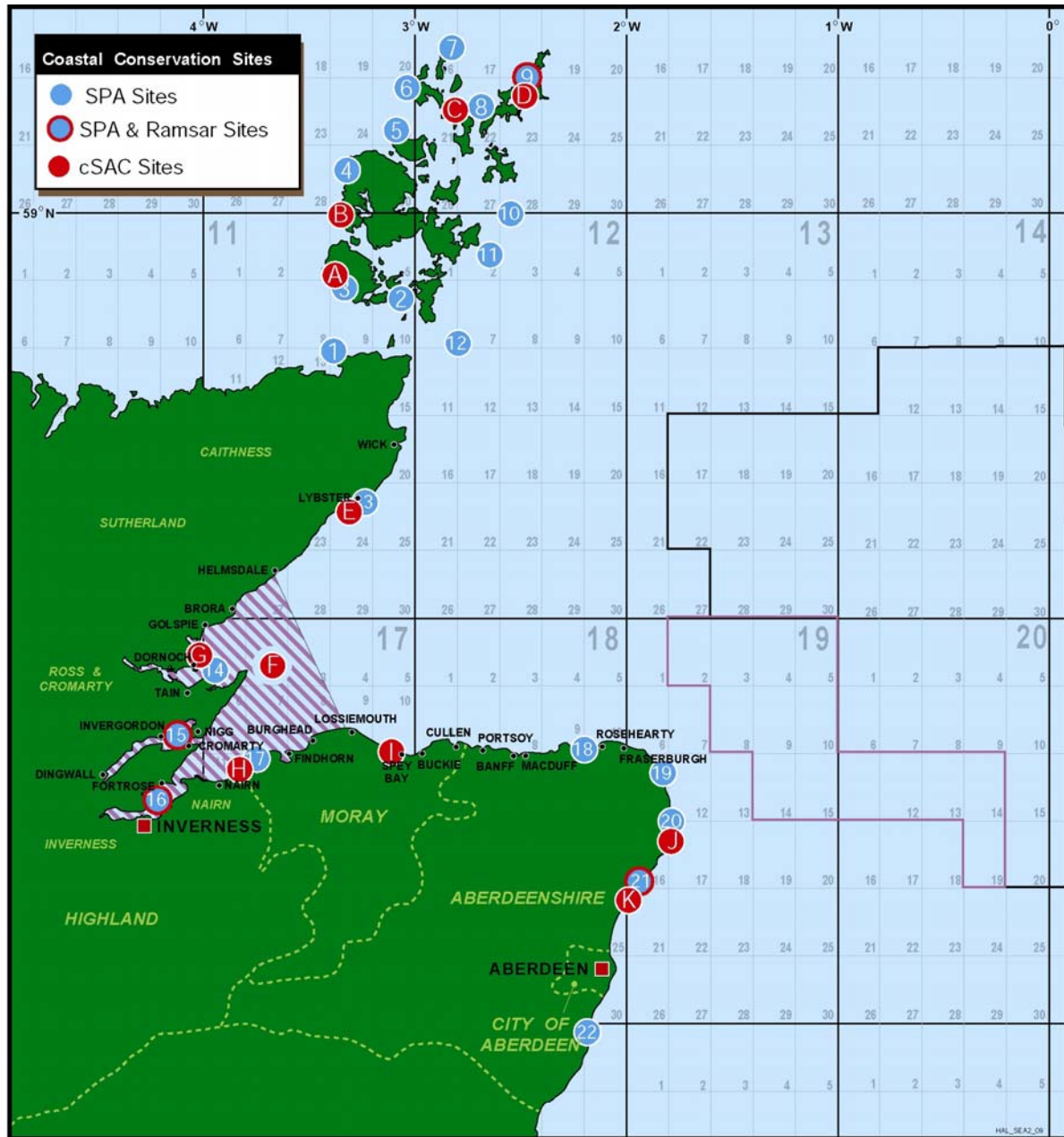
3.3.4.3 Coastal Conservation Sites

The impressive landscapes and significant wildlife interest of this part of the Scottish coastline has led to the establishment of international, European and nationally recognised conservation areas. The principal European designations are SPAs established under the 1979 EC Directive on the conservation of Wild Birds, and SACs under the 1992 EC Habitats and Species Directive. Ramsar Sites are designated by national governments under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971). Current coastal SPAs and Ramsar sites in the region are described in Table 3.3, the map reference referring to the location of the site on Figure 3.8.

Table 3.3 - SPA and Ramsar sites on the NE Scottish coast

Map Ref.	Name	Area (ha)	Status	Description
1	North Caithness Cliffs	557.73	SPA	Breeding auks, gulls and peregrines
2	Switha	57.39	SPA	Winter roost Greenland barnacle geese
3	Hoy	9499.7	SPA	Breeding peregrine, red-throated diver and great skua
4	Marwick Head	8.7	SPA	Breeding guillemot and kittiwakes
5	Rousay	633.41	SPA	Breeding Arctic tern
6	West Westray	350.62	SPA	Breeding Arctic tern and guillemots
7	Papa Westray (North Hill and Holm)	245.71	SPA	Breeding Arctic tern and Arctic skuas
8	Calf of Eday	238.03	SPA	Internationally important nesting seabird assemblages
9	East Sanday Coast	1515.23	SPA/Ramsar	Wintering bar-tailed godwit, purple sandpiper and turnstone
10	Auskerry	101.97	SPA	Breeding Arctic tern and storm petrels
11	Copinsay	125.42	SPA	Internationally important nesting seabird assemblages
12	Pentland Firth Islands	170.51	SPA	Breeding Arctic tern
13	East Caithness Cliffs	442.62	SPA	Breeding peregrine, guillemot, kittiwake and razorbill
14	Dornoch Firth and Loch Fleet	7836.33	SPA	Breeding osprey, wintering bar-tailed godwit
15	Cromarty Firth	3766.24	SPA/Ramsar	Wetland, breeding common tern, osprey, wintering bar-tailed godwit and whooper swan
16	Inner Moray Firth	2339.23	SPA/Ramsar	Wetland, breeding common tern, osprey, wintering bar-tailed godwit
17	Moray & Nairn Coast	2410.25	SPA	Wetland, breeding osprey, wintering bar-tailed godwit and geese species
18	Troup, Pennan and Lion's Head	174.22	SPA	Breeding guillemot, razorbill, kittiwake, terns
19	Loch of Strathbeg	615.94	SPA	Wetland, breeding Sandwich tern, wintering geese species
20	Buchan Ness to Collieston Coast	208.62	SPA	Internationally important nesting seabird assemblages
21	Ythan Estuary, Sands of Forvie and Meikle Loch	1016.24	SPA/Ramsar	Wetland, breeding common, little and Sandwich terns, wintering pink-footed geese
22	Fowlsheugh	10.15	SPA	Breeding guillemots and kittiwakes

Figure 3.8 – Coastal conservation sites of international importance



Candidate SACs in the region are described in Table 3.4 and are also highlighted on Figure 3.8.

Table 3.4 - Candidate Special Areas of Conservation on the NE Scottish coast

Map Ref.	Name	Area (ha)	Description
A	Hoy	9499.7	Vegetated sea cliffs, alpine and subalpine heaths, wet heaths
B	Stromness Heaths and Coast	635.78	Vegetated sea cliffs, dry heaths
C	Faray and Holm of Faray	785.68	Grey seal
D	Sanday	10971.65	Reefs, sandbanks, mudflats and sandflats, common seal
E	East Caithness Cliffs	442.6	Vegetated sea cliffs
F	Moray Firth (marine)	151321.7	Bottlenose dolphins, sandbanks and estuaries
G	Dornoch Firth and Morrich More	8700.5	Estuaries, mudflats and sandflats, saltmarsh, sand dunes, otter, common seal
H	Culbin Bar	612.9	Vegetation of stony banks, saltmarsh
I	Lower River Spey-Spey Bay	652.6	Vegetation of stony banks
J	Buchan Ness to Collieston	207.5	Vegetated sea cliffs
K	Sands of Forvie	734.1	Dune habitats

Important Bird Areas

The north east coast of Scotland plays host to many areas which support internationally or nationally important numbers of breeding and/or non-breeding birds. These sites have been identified by BirdLife International (Heath & Evans 2000) and many are protected at national and/or international level and are listed in Table 3.5.

Table 3.5 - Important Bird Areas on the NE Scottish coast

Site Name (Area in hectares)	Notes
Hoy (11,170)	Also SPA, SSSI Covers large part of the island of Hoy including sandstone cliffs on the west coast Important for breeding seabirds (56,000 pairs), raptors and waders. Internationally important numbers of red-throated diver, great skua and great black-backed gull
Lochs of Harray and Stenness (1,930)	Also SSSI Brackish lagoon Lochs support large numbers of wintering wildfowl including internationally important numbers of whooper swan, greylag goose and scaup
Marwick Head (9)	Also Nature Reserve, SSSI, SPA Eroded sandstone cliffs and associated maritime grassland on the west coast of Orkney Site holds 26,000 pairs of breeding seabirds including internationally important numbers of guillemot
North Mainland coast (420)	Low lying rocky coastline interspersed with sandy bays Important for wintering waders including internationally important numbers of purple sandpiper, curlew, redshank and turnstone
Rousay (Part) (2,310)	Also Nature Reserve, SSSI, SPA Moorland and lochs Internationally important breeding colony of arctic tern
West Westray (350)	Also Nature Reserve, SSSI, SPA Sandstone cliffs and adjoining grassland along western coast of Westray Regularly supports 45,000 pairs of breeding seabirds including internationally important numbers of kittiwake, arctic tern and guillemot
North Westray coast (140)	2 sections of coastline on north Westray Internationally important numbers of breeding arctic tern and black guillemot

Site Name (Area in hectares)	Notes
Papa Westray (North Hill and Holm) (245)	Also Nature Reserve, SSSI, SPA Rocky coastline and island Internationally important numbers of breeding arctic tern and black guillemot
South Westray coast (530)	Low lying rocky coastline interspersed with sandy bays Important for wintering waders including sanderling and purple sandpiper
Faray and Holm of Faray (80)	Small island of Holm of Faray and most of the coastline of larger island of Faray Internationally important numbers of breeding great black-backed gull and black guillemot
North Ronaldsay coast (220)	Low lying rocky coastline interspersed with sandy bays Internationally important numbers of breeding black guillemot and wintering purple sandpiper
East Sanday (1,515)	Also SSSI, SPA, Ramsar Low lying rocky coastline interspersed with sandy bays Important for both wintering and breeding waders, including ringed plover, purple sandpiper, bar-tailed godwit, turnstone and Sandwich tern
Eday (930)	Also SSSI, SPA Rocky shore, maritime grassland and moorland Supports notable breeding populations of seabirds (10,700 pairs) including internationally important numbers of great black-backed gull
Sounds around Wyre (4,800)	Also SSSI A large sea area comprising the sounds of Eynhallow, Gairsay, Rousay and Wyre Internationally important numbers of wintering great northern diver
Rothiesholm peninsula, Stronsay (310)	Peninsula at the south-western end of Stronsay Internationally important numbers of breeding black-backed gull
South-eastern Stronsay (110)	Low lying rocky coastline interspersed with sandy bays Important for breeding seabirds and wintering waders and wildfowl, including internationally important numbers of breeding black guillemot
Auskerry (90)	Also SSSI, SPA Small island to south of Stronsay Internationally important numbers of breeding storm petrel
Copinsay (152)	Also Nature Reserve, SSSI, SPA Island with rocky cliffs and stacks Important for breeding seabirds, holding 16,500 pairs, including internationally important numbers of breeding great black-backed gulls
Scapa Flow (26,140)	Also Nature Reserve, SSSI A large sea area separating the islands of Orkney Mainland, Hoy and South Ronaldsay Important for wintering waterbirds including internationally important numbers of great northern diver, Slavonian grebe, shag, velvet scoter and breeding black guillemot
South Walls and Switha (260)	Also SNH run a refuge scheme for the geese Scrub and rocky shore Important for breeding seabirds and waders and supports internationally important numbers of wintering barnacle goose
Pentland Firth Islands (270)	Also SSSI, SPA 2 islands and a group of rocky islets in the Pentland Firth Important for breeding seabirds (11,600 pairs) including internationally important numbers of breeding great black-backed gull and arctic tern
Caithness Cliffs (1,053)	Also SSSI, SPA Cliff-lined coastal sections at Dunnet Head, Duncansby Head to Skirza Head and Wick to Helmsdale Cliffs support 127,000 pairs of breeding seabirds and 54,000 pairs of breeding waterbirds, including internationally important numbers of shag, herring gull, great black-backed gull, kittiwake, guillemot, razorbill and black guillemot
Moray basin, firths and bays (134,660)	Also National Nature Reserves, SSSI, SPA, Ramsar Complex area of coastline and estuary stretching from Helmsdale south to Spey Bay Internationally important for populations of wintering and passage wildfowl and holds 130,000 wintering and 31,000 passage waterbirds

Site Name (Area in hectares)	Notes
Troup, Pennan and Lion Heads (320)	Also SSSI, SPA Stretch of low cliffs and maritime grassland Supports 38,400 pairs of breeding seabirds and 36,100 pairs of breeding waterbirds, including internationally important numbers of kittiwake, guillemot and razorbill
Rosehearty to Fraserburgh coast (130)	Also SSSI Exposed rocky and sandy shoreline Internationally important numbers of wintering purple sandpiper and turnstone
Loch of Strathbeg (913)	Dune lake and surrounding dunes Important for wintering wildfowl and breeding terns and holds 42,800 wintering waterbirds. Internationally important bird assemblages include wintering whooper swan, pink-footed goose, greylag goose, barnacle goose and breeding Sandwich tern
Buchan Ness to Collieston coast (208)	Granite cliffs, offshore stacks and sandy beach Supports 23,800 pairs of breeding seabirds and 28,100 pairs of breeding waterbirds, including an internationally important breeding population of razorbill
Ythan estuary, Sands of Forvie and Meikle Loch (1,040)	Extensive mud and gravel flats, sand dunes Important for breeding seabirds and holds 26,700 wintering waterbirds. Internationally important numbers of breeding Sandwich tern and little tern, and wintering pink-footed goose
Fowlsheugh (10)	Sheer cliffs and cliff-top grassland Supports 52,900 pairs of breeding seabirds and 67,900 pairs of breeding waterbirds, including internationally important numbers of breeding herring gull, kittiwake, guillemot and razorbill

3.3.5 Existing human activities

3.3.5.1 Fisheries

North Sea commercial fisheries were considered in the SEA Technical Report No. 003. Fishing is an important industry in the region and there are numerous fishing ports along the coast. To provide some local context and specific information, Table 3.6 includes data on the fish landings and value into the main ports closest (see also Figure 3.11) to the SEA 2 extension blocks area, while Figure 3.9 summarises the shellfisheries of the area.

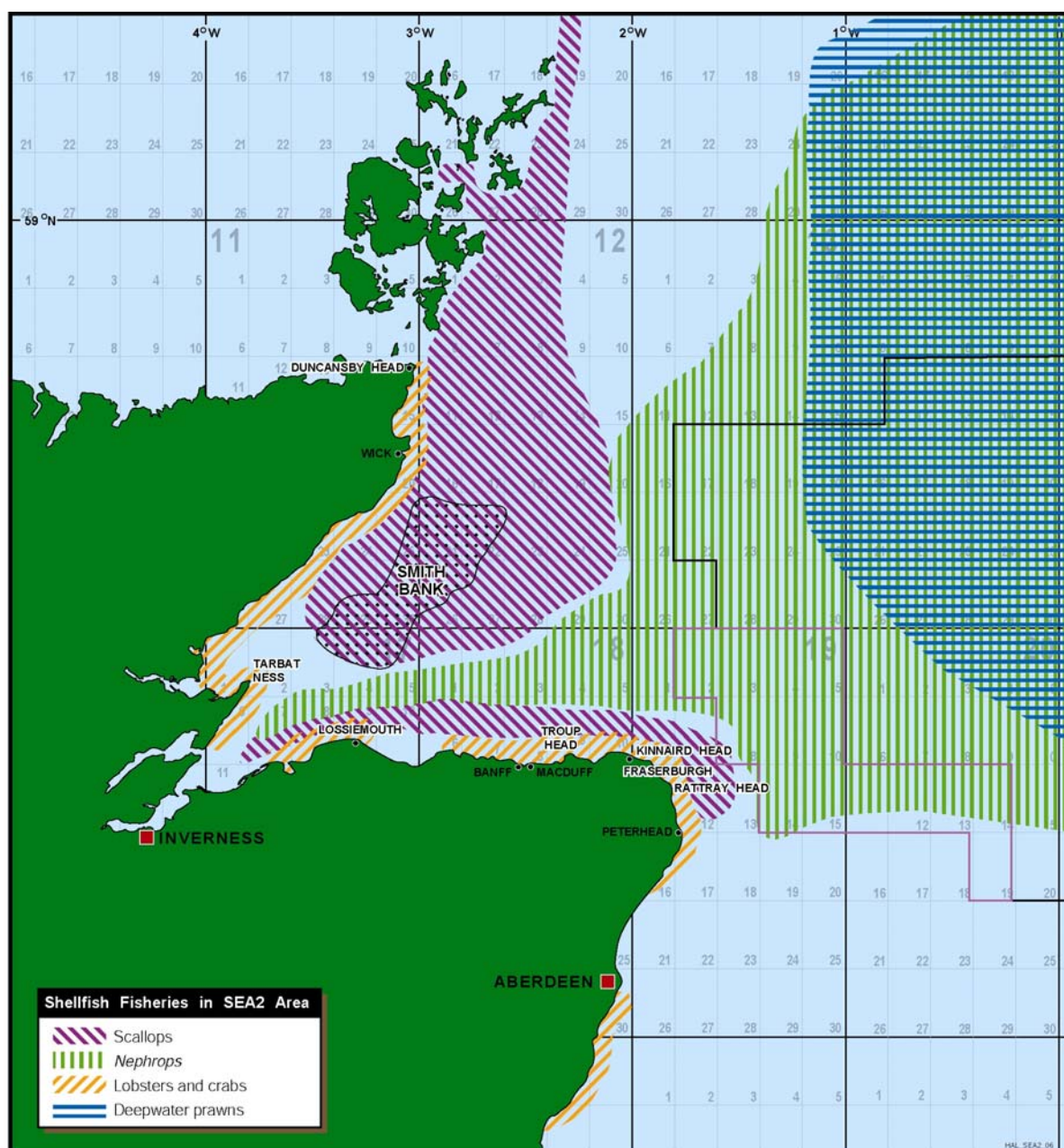
Table 3.6 – Fish landings into ports in the region, 1998-2000

Fishing port	Quantity ('000 tonnes)			Value (£million)		
	1998	1999	2000	1998	1999	2000
Kirkwall	1.0	1.4	0.9	1.4	1.8	1.3
Wick	2.8	1.7	1.6	2.6	1.9	1.7
Fraserburgh	30.3	32.6	33.5	25.2	27.9	25.2
Peterhead	112.1	98.5	87.9	82.9	78.8	70.5
Aberdeen	38.6	38.7	26.3	28.6	26.2	20.6

(Source: UK Sea Fisheries Statistics 1999 and 2000)

Peterhead received the greatest landings of fish in the UK with both Fraserburgh and Aberdeen also important nationally.

Figure 3.9 – Shell fisheries in and adjacent to the SEA 2 extension area



3.3.5.2 Recreational resources

The region's coast is an important tourist destination for visitors attracted to its wild natural scenery and unspoilt coastal environment. Walking and golf are popular along the coast and dolphin watching attracts many tourists to the Moray Firth. Numerous watersport facilities and marinas are present and there are also a number of designated bathing areas.

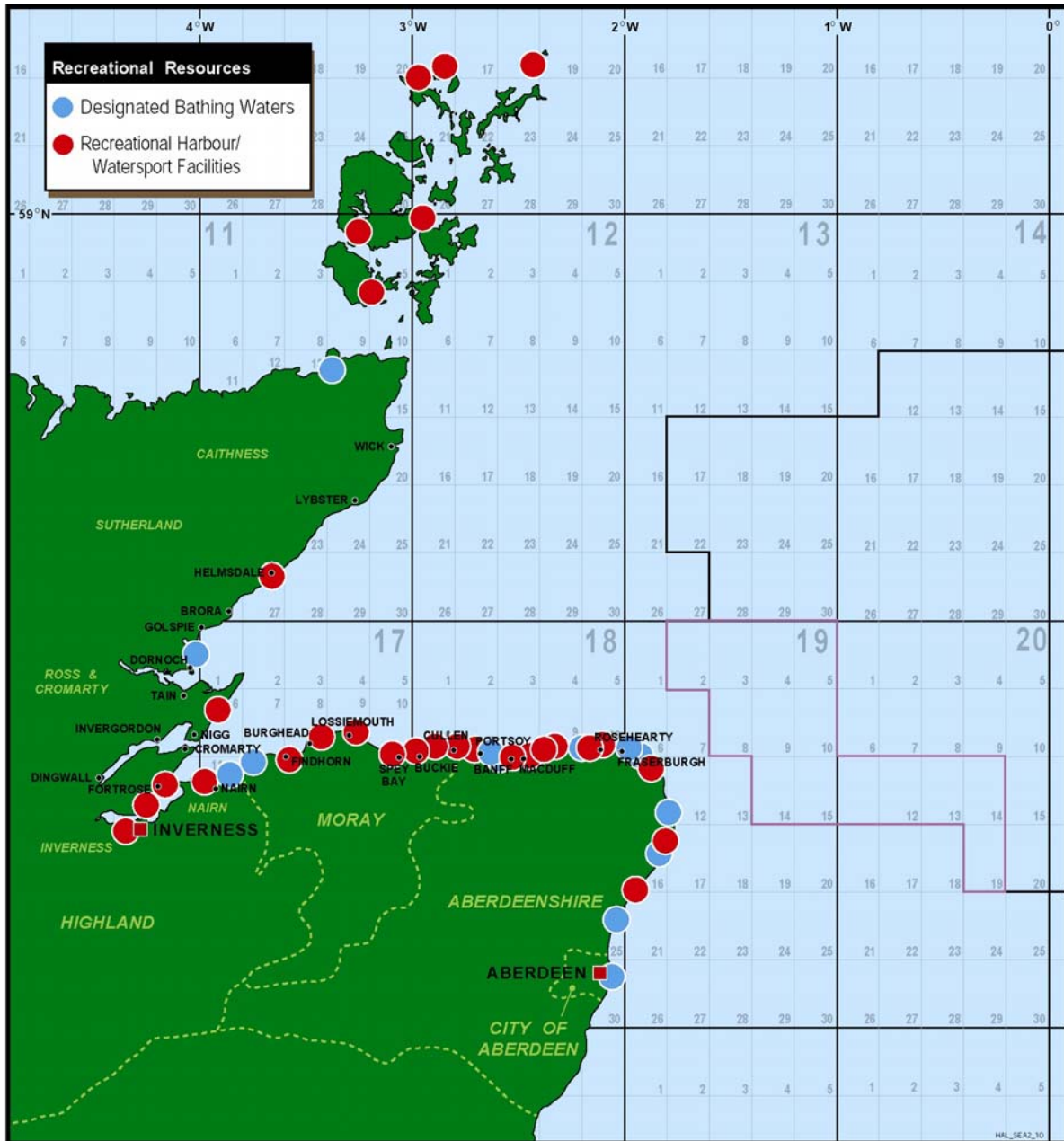
3.3.5.3 Designated Bathing Waters

The EC Bathing Water Directive requires member states to identify bathing waters and to bring these waters up to prescribed quality standards to protect public health and the environment. The Directive is implemented in Scotland through the Bathing Water (Classification) (Scotland) Regulations 1991. Designated bathing waters in the region are highlighted on Figure 3.10.

3.3.5.4 Watersport Facilities

The most important area for watersports in the region is the Moray Firth (see Figure 3.10 for locations). Its sheltered waters and good water sports facilities support sailing, water-skiing, sea-angling, swimming and surfing.

Figure 3.10 – Recreational resources in the region



3.3.5.5 Ports and Harbours

The region contains a number of important ports involved in fish landings, the transport of oil industry supplies and products as well as general cargo (Table 3.7 and Figure 3.11). In Orkney facilities include the tanker terminal facilities at Flotta and general cargo ports at Scapa and Kirkwall. The Cromarty Firth receives oil from the North Sea as well as providing building and maintenance

facilities for the industry. Aberdeen and Peterhead also perform an important supporting role for the North Sea oil industry. The blocks are traversed by a number of shipping routes and traffic is predominantly fishing vessels and oil industry supply vessels.

Figure 3.11 – Ports and harbours in the region

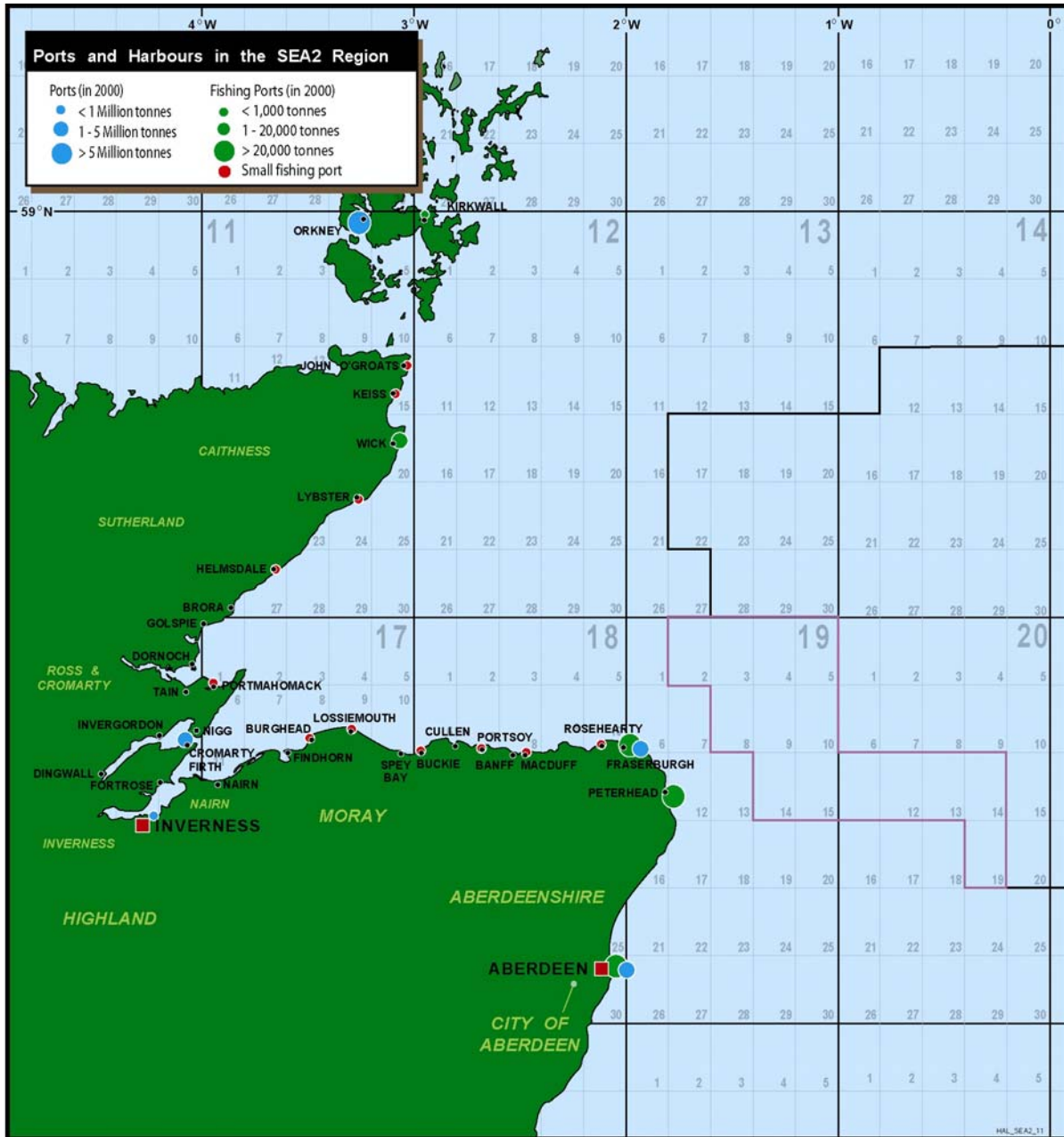


Table 3.7 - Foreign and Domestic Port Traffic, 1998-2000

Port	Foreign and domestic traffic ('000 tonnes)		
	1998	1999	2000
Orkney	16,156	16,998	22,798
Cromarty Firth	4,456	2,336	2,329
Inverness	763	783	724
Peterhead	2,818	2,209	1,123
Aberdeen	3,786	3,368	3,377

(Source: Maritime Statistics 2000)

3.3.5.6 Marine Archaeology

Prehistoric submarine archaeological remains dating back 100,000 years can occur over the floor of the North Sea, with the exception of the coastal waters around Scotland. The Scottish coast is substantially uplifted, therefore all Holocene and Devensian shorelines are above present sea levels. As a result, there are no occupied shoreline sites or submerged artefacts within several kilometres offshore from the Scottish coast. Underwater coastal lands from the past may be present some distance offshore, where coastal lands from the past are still underwater.

A potential archaeological site closest to the SEA 2 extension area is Bosie Bank (58-59°N 0-2°W), which is a local bathymetric high of gravely-sand flanked by sand and some gravel extensions, where gravel deposits could have been a source of flint for working into tools (Flemming 2002).

4 ISSUES

4.1 Introduction

The considerations of potentially significant effects included in SEA 2 (and where appropriate SEA 3) were reviewed for their applicability to the SEA 2 extension blocks. This review took into consideration the regional environment and block specific features. The review concluded that in only a few cases were the assessment and conclusions made for SEA 2 not equally applicable to the SEA 2 extension blocks. The following potential differences were identified as worthy of additional consideration:

- Underwater noise
- Potential effects on herring spawning grounds
- Oil spills

And these are discussed further below.

4.2 Noise

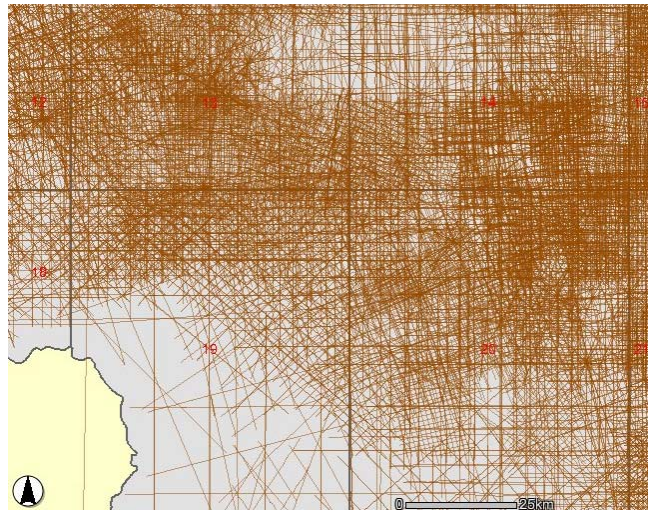
Sources and propagation of underwater noise associated with E&P were reviewed in SEA 2: sources include seismic, other geophysical surveys, drilling, construction, production and decommissioning.

Predicted activity scenarios for the proposed extension suggest that at least 10 of the Blocks will require 3D seismic surveys, within two years of award. These may, however, be combined into one or more survey packages, with a most likely number of three. In addition, around ten site surveys would be required for exploration, appraisal and development locations. This represents an

insignificant increment to previous geophysical activities in the area. By way of example, the 2D seismic survey lines listed by the DEAL database (Digital Energy Atlas and Library <http://www.ukdeal.co.uk/>) in the region are shown in Figure 4.1.

Figure 4.1 – Distribution of 2D seismic surveys in Quadrants 19, 20 & adjacent areas

Source DEAL website



As noted in SEA 2, marine mammals are generally considered to be the most sensitive species to noise disturbance, with potential effects ranging from physical damage, noise-induced hearing loss (temporary and permanent threshold shifts), behavioural responses (auditory masking, disruption of behaviour, habituation, sensitisation and individual variation in responsiveness), chronic effects and stress, to long term behavioural responses and exclusion (Richardson *et al.* 1995, Gordon *et al.* 1998). The proposed extension area is potentially of importance for minke whales, white-beaked dolphins and harbour porpoise (although the main concentrations in harbour porpoise

density are recorded further offshore). The recorded range of the Scottish east coast population of bottlenose dolphins is inshore of the proposed extension area, although bottlenose dolphins have been observed offshore by seismic survey monitoring studies.

There are no reliable data to suggest that vessel noise or drilling noise adversely affect seals or small cetaceans; however, behavioural disturbance by underwater noise would be expected within a “zone of effect” typically 1-2km from a seismic airgun array (SMRU commissioned studies for SEA 2 and 3). This is not considered likely to have significant effects, at the scale of proposed activities, on biogeographic populations or individual animals. It is possible that seismic surveys on the western fringe of the proposed extension area could result in noise propagation into the Moray Firth candidate SAC, which holds a semi-resident population of bottlenose dolphins. This potential source of effect would require assessment on a project-specific basis, including through the Appropriate Assessment process.

It is likely that both grey and harbour seals forage regularly within the proposed extension area. Although seals are sensitive to the low frequency sounds generated by oil exploration and production, the populations of both species as a whole spend a very small proportion of their time in these areas, and proposed activities are unlikely to result in a significant effect on seals. Other potential activities which would affect seal populations (e.g. control of seals known to cause problems at fixed gear fisheries and aquaculture sites) have been suspended (autumn 2002) in the Moray Firth in view of the possible impact of Phocine Distemper Virus (PVD) on seal populations, and the current status of local seal populations should be considered during any project-specific assessments in the proposed extension area.

4.3 Potential effects on herring spawning grounds

Herring eggs are normally laid on discrete beds of well oxygenated gravel and such beds are believed to occur in some parts of the SEA 2 extension blocks. Herring eggs are believed to be particularly susceptible to smothering, and the spawning beds can be rendered unsuitable by a change in sediment type for example through the deposition of fine sediment. For these reasons there has been a

requirement for many years that potential herring spawning areas are identified (by sidescan sonar and seabed sampling) in advance of drilling and development. Based on survey results appropriate mitigation such as timing, avoidance of specific areas or restrictions on drilling discharges is agreed with the regulatory agencies. Such mitigation measures would apply if the SEA 2 extension blocks were licensed and are believed to provide adequate protection.

4.4 Oil Spills

The environmental risk of oil spills is a key concern in relation to E&P activities in nearshore areas, including the outer Moray Firth and eastern North Sea. Individual “components” of oil spill risk – sources, probabilities, processes and consequences - were evaluated in SEA 2. The following assessment considers aspects of oil spill risk associated with the proposed SEA 2 extension which are significantly different to those considered in SEA 2, where available information has been updated, or where incremental or cumulative risk is identified.

4.4.1 Introduction

The anticipated level of activity resulting from the proposed extension involves up to five exploration wells, possibly six appraisal wells and one oil development. This represents about half of other anticipated SEA 2 activity in the CNS; and one-quarter of SEA 2 activity in the North Sea. Assuming that technical aspects of E&P are comparable with other normally-pressured basins of the North Sea, incremental frequencies of spill events would be expected to be broadly proportional to the increase in activity level.

As noted in SEA 2, large crude oil spills associated with E&P could result from uncontrolled well blowout, process equipment and pipeline failures, and shuttle tanker loading accidents. In view of the predicted reservoir fluids and development scenarios, identifiable major spill scenarios from the proposed SEA 2 extension therefore involve light-medium oil.

4.4.2 Spill Scenarios

The most recent published frequency data for oil spills in the UKCS were reviewed in SEA 3, and support the general conclusion of a downward trend in total spill quantity (78 tonnes in 2000), with continued improvement in reporting even the smallest of spills (405 reports for spills of less than 1 tonne in 2000; representing 96% of reports). There were no spills greater than 100 tonnes in 2000.

The major types of spill from mobile drilling rigs during exploration and development drilling have been organic phase drilling fluids (and base oil), diesel and crude oil. There has been a correlation between the number of reported spills and number of wells drilled, but no consistent trend in the volume of hydrocarbons spilled from mobile rigs since 1984 (a marked increase between 1986-1993, with a significant decrease to <100 tonnes/year subsequently).

Regulatory monitoring of oil spills from UKCS installations has been substantially increased in recent years, with a coordinated programme of reporting observed spills by surveillance overflights undertaken on behalf of the DTI, DETR, the Scottish Fisheries Protection Agency, and the Maritime and Coastguard Agency. In 2000, 300 hours were flown on 55 ‘dedicated’ patrols, funded solely by the DTI. In total, 2,219 surveys of installations were undertaken. The total amount of oil observed from unreported spills was just over 1 tonne from 32 separate detections (DTI 2001). In addition, a number of European countries mount pollution monitoring overflights, with data made available through OSPAR. These data indicate that reporting of oil spills by the E&P industry is generally accurate in terms of total quantity, but that a proportion of small spills remain unreported (and probably undetected by the installation involved). These are likely to result primarily from upsets in

the separation process, causing excess oil in produced water – an area which is currently being addressed by Government and industry.

As discussed in SEA 2, blowout risk is extremely low in modern E&P, and to date there have been no significant oil blowouts in the UK North Sea (around 4,000 exploration and appraisal wells over 37 years, and some 235 producing oil and gas fields) and only one in the Norwegian sector (Ekofisk, April 1997).

4.4.3 Spill Fate

The fate of oil spills to the sea surface is relatively well understood (see SEA 2), with eight main oil weathering processes: evaporation, dispersion, emulsification, dissolution, oxidation, sedimentation and biodegradation. These processes are equally applicable to the proposed extension area.

4.4.4 Spill Trajectory and Consequences

Deterministic trajectories (i.e. slick track predicted for defined arbitrary meteorological and hydrographic conditions, usually “worst case”) and time to beach from closest points to land were presented in SEA 2. These calculations assumed that a slick front will move at 3% of wind speed, and assumed constant 30 knot wind speed (consistent with “Essential Elements” criteria for oil spill response measures used in UKCS licence conditions for blocks in sensitive areas). Time to beach has also been calculated for summer and winter average wind speeds recorded from the area. Calculations on the same basis are presented for the proposed extension area in Figure 4.2 (trajectories E-H). These indicate shortest times to beach, under 30 knot wind conditions, in the range 18-75h to the Scottish mainland. The shortest comparable time to beach from the SEA 2 CNS area was 24h. Beaching is likely only under sustained, strong easterly wind conditions, which are relatively rare.

Nearshore tidal currents in the Moray Firth and north-east coastal waters of Scotland are aligned along-shore, and have maximum velocities less than 1 m/s except in the vicinity of Rattray Head, where maximum velocities are ca. 1.5 m/s. Local distortions of the tidal cycle occur in parts the Moray Firth; one such feature operates locally between Cullen and Kinnaird Head (near Fraserburgh) on the southern coast, extending offshore for about 13km. The southerly flood tide is deflected eastwards as it approaches the coast, while the area is ‘sheltered’ from a northerly or westerly flowing ebb current because of the curvature of the coastline beyond Kinnaird Head. The area therefore experiences easterly flood currents that are not cancelled by westerly ebb currents. An easterly flow runs for 9 hours on each tidal cycle and the flow is insignificant for the remaining 3 hours.

Since “worst case” time to beach is of the order of 1.5 tidal cycles, the effect of long-shore tidal current on a slick which is wind-driven shorewards, are to introduce an oscillation into the spill trajectory, which may be approximately 5-10km in horizontal magnitude. Horizontal shear resulting from tidal currents also increases the spreading and dispersion of a slick. Under more typical wind conditions, lateral advection by tidal currents is of greater importance, and in calm conditions, the trajectory of persistent oil residues can be expected to be determined primarily by residual currents.

Residual currents in the Moray Firth are weak and form a gyre in the inner part of the Firth together with an easterly flowing residual to the east of the Spey which follows the Moray coast turning southward beyond Kinnaird Head (see above; Adams & Martin, 1986). The resulting easterly residual flow will tend to reduce movement of oil (under calm conditions) into the Moray Firth. Residual currents on the east coast of Scotland (and England) are towards the south.

Offshore seabird, sea mammal and fisheries sensitivities within the SEA 2 and adjacent areas were reviewed in SEA 2 (section 6). Within the proposed extension area, overall seabird vulnerability to surface pollution is very high in Blocks 19/2, 19/3, 19/8, 19/9, 19/10, 19/14, 19/15 and 20/19; and

high in Blocks 19/4, 20/11, 20/12, 20/13 and 20/14. Much of this vulnerability is associated with post-breeding dispersal of auks in late summer, and is therefore seasonal. The Moray Firth-Aberdeen Bank area is one of 20 areas of the North Sea, the Channel and the Kattegat which contain concentrations of birds regarded as internationally important by Skov *et al.* (1995). This was mainly determined by more than 30% of the biogeographic population of guillemots within the area in August, mainly flightless moulting adults and fledging juveniles.

Twelve seabird breeding colonies adjacent to the proposed extension area were listed by Tasker (1996) as being of at least national importance (holding at least 1% of the GB population of any seabird species) – these extend from Troup Head in the north to Swallow Cove (near Catterline) in the south and hold important numbers of kittiwakes, guillemots, Sandwich, common, arctic and little terns, razorbills and shags. Fowlsheugh, south of Stonehaven, is the most important coastal colony in the area, holding almost 60,000 guillemots and 35,000 kittiwakes, and is a designated SPA. Birds associated with this and other coastal colonies during the breeding season will be extremely vulnerable to oil pollution within the vicinity. The Loch of Strathbeg (a coastal lake) is another SPA in the area, primarily of importance to wintering waterfowl (although important numbers of Sandwich tern also breed); and therefore is not associated with high sensitivity to offshore oil spills.

The area is of relatively low importance to offshore cetaceans (in a national context), with the exception of the Moray Firth population of bottlenose dolphins which make regular movements between the inner Moray Firth and St Andrews Bay, and are regularly present in coastal waters off Aberdeen. There are few breeding seals although a number of locations are important haul-outs for common seals (Don and Ythan estuaries) and grey seals (Pennan Head, Rattray Head, Catterline).

Potential mechanisms of effect of oil spills on seabirds, coastal waterfowl and marine mammals are reviewed in SEA 2 and SEA 3.

Coastal habitats adjacent to the proposed extension area are characterised by high exposure, sandy beaches and rock cliffs; generally of low vulnerability to oil spills (Gundlach & Hayes 1978). More sensitive coastal habitats, including estuarine mudflats and saltmarsh, are found in the inner Moray Firth and Beaulie, Cromarty and Dornoch Firths. The likelihood of oil spills from the proposed extension area affecting the inner Firths is very low, under normal weather and hydrographic conditions (see above).

Fish and fishery sensitivities in the proposed extension area relate mainly to specific herring and sandeel spawning areas, associated with particular substrates; with sprat, Norway pout and whiting also spawning more widely in the area. The Buchan/Shetland herring stock spawns off the northeast Scottish coast and Shetland coasts during August to September. Spawning normally takes place in relatively shallow water, on discrete grounds at depths of approximately 15-40m. Herring deposit their sticky eggs on coarse sand, gravel, shells and small stones, and shoals congregate on traditional spawning grounds where all members of the shoal spawn more or less simultaneously. The dependency of herring on specific substrates makes the species potentially susceptible to impacts resulting from oil spills, particularly where oil (or residues resulting from chemical dispersion) may adsorb onto particulates and sink. Sandeel eggs are also demersal, and are laid in sticky clumps on sandy substrates. Tagging experiments have shown that there is little movement between spawning and feeding grounds, indicating that fishing and spawning grounds may coincide (Kunzlik *et al.* 1986). Sandeels are an important food item for mackerel, whiting, cod, salmon, other economically important fish species, and sea birds.

The proposed extension area supports spawning populations of, and commercial fishing for, *Nephrops* and *Pandalus* (Atlantic prawn), and is at the offshore edge of the distribution of edible crab. The effects of oil spill events in the outer Moray Firth, on commercially exploited crustaceans, have been investigated (see below).

Figure 4.2 - Distances and beaching times to land from SEA 2 and SEA 2 extension areas

(A) Shortest distance to land: 72km (approx)		
Time for oil to beach (assuming an onshore wind)		
wind strength (knots)	time (hrs)	most frequent wind direction
30	42	--
17 (winter average)	80	SW (Winter)
12.5 (summer average)	103	W (Summer)

(F) Shortest distance to land: 125km (approx)		
Time for oil to beach (assuming an onshore wind)		
wind strength (knots)	time (hrs)	most frequent wind direction
30	75	--
27 (winter average) ¹	83	SW (Winter)
10 (summer average) ¹	225	SW (Summer)

(B) Shortest distance to land: 164km (approx)		
Time for oil to beach (assuming an onshore wind)		
wind strength (knots)	time (hrs)	most frequent wind direction
30	97	--
17 (winter average)	182	SW (Winter)
12.5 (summer average)	234	W (Summer)

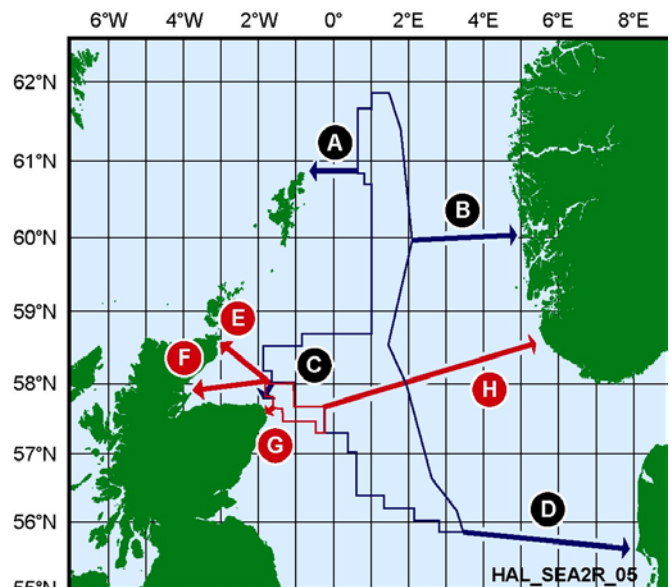
(G) Shortest distance to land: 30km (approx)		
Time for oil to beach (assuming an onshore wind)		
wind strength (knots)	time (hrs)	most frequent wind direction
30	18	--
27 (winter average) ¹	20	SW (Winter)
10 (summer average) ¹	54	SW (Summer)

(C) Shortest distance to land: 40km (approx)		
Time for oil to beach (assuming an onshore wind)		
wind strength (knots)	time (hrs)	most frequent wind direction
30	24	--
10.5 (winter average)	67	S (Winter)
8.5 (summer average)	80	S (Summer)

(H) Shortest distance to land: 360km (approx)		
Time for oil to beach (assuming an onshore wind)		
wind strength (knots)	time (hrs)	most frequent wind direction
30	215	--
27 (winter average) ¹	240	SW (Winter)
10 (summer average) ¹	648	SW (Summer)

(D) Shortest distance to land: 305km (approx)		
Time for oil to beach (assuming an onshore wind)		
wind strength (knots)	time (hrs)	most frequent wind direction
30	182	--
18 (winter average)	305	W (Winter)
12.5 (summer average)	436	W (Summer)

(E) Shortest distance to land: 100km (approx)		
Time for oil to beach (assuming an onshore wind)		
wind strength (knots)	time (hrs)	most frequent wind direction
30	60	--
27 (winter average) ¹	67	SW (Winter)
10 (summer average) ¹	180	SW (Summer)



Note: ¹ Estimation of wind strength using upper end of range (worst case scenario)

In 1997, an oil spill in the Captain Field, in the outer Moray Firth to the north of the proposed extension area, released some 685 tonnes of crude oil into the marine environment (FRS, undated). FRS Marine Laboratory obtained samples of plaice, haddock and *Nephrops* that had been caught

commercially on behalf of the operator of the Captain Field. These samples came from the suspected area of impact, and from adjacent and distant sites as reference. The samples were analysed for the presence of an oil taint by the FRS ML sensory panel, and for the presence of hydrocarbons in the muscle tissue and liver by chemical analysis. Samples of *Nephrops*, collected from within the suspected area of impact were considered to be tainted, and, in addition, contained elevated concentrations of polycyclic aromatic hydrocarbons (PAHs). As a consequence of these results, a fisheries exclusion zone was designated around the Captain Field on 21 October 1997 under the Food and Environment Protection Act 1985 (FEPA). In support of the FEPA order, a series of investigative cruises aboard the FRV *Scotia* were conducted. Further samples of fish, shellfish and sediment were collected for sensory and chemical analysis. Sediment samples were collected from a grid of sites in the suspected area of impact and from adjacent and distant sites as reference.

There was very little evidence of petrogenic contamination in the fish and shellfish, although one sample of *Nephrops* contained evidence of contamination by oil of Middle Eastern origin. The crude oil from the Captain Field contains a specific biomarker (a novel triterpane). Analysis demonstrated that this biomarker was not found in the tainted *Nephrops* and this oil was therefore not from the Captain Field.

Results of the sediment surveys conducted on behalf of the operator indicated that elevated hydrocarbon values were detected to the south and east of the Captain Field, and evidence suggested that the oil had moved to the west as it had dispersed. On subsequent monitoring studies by FRS, PAH concentrations were found to be higher than expected for uncontaminated sediments, but were not considered unusual for sediments collected from an area close to historic drilling activity, which may contain low levels of petrogenic hydrocarbons resulting from previous discharges of oil-based muds (such discharges are now prohibited). Geochemical biomarkers indicated that the oil in sediment was of Middle East origin.

4.4.5 Control and Mitigation

Control and mitigation of oil spills, in terms of risk assessment, prevention, contingency planning and response measures, was reviewed in SEA 3. Tiered response resources, available through industry and Government contingency arrangements, include facility for large-scale aerial application of dispersants within a few hours, if consultation with regulatory agencies judges this to be appropriate. Coastal oil spill risks would be a key issue in assessment and risk management of proposed drilling and any subsequent developments, under the Offshore Petroleum Production and Pipe-lines (Assessment of Environmental Effects) Regulations 1999 and the Merchant Shipping (Oil Pollution Preparedness, Response and Co-operation) Regulations 1998. In addition, spill risk and response would be part of the Appropriate Assessment conducted for activities judged to have the potential to affect adjacent SACs and SPAs.

Coastal oil spill contingency response arrangements are currently the responsibility of local authorities. Following previous licence Rounds, Operators of nearshore blocks have consulted and co-operated with local authorities on contingency planning, and in some cases have developed Coastal Protection Plans; and trained local authority personnel and provided response equipment.

Use of dispersants is a key aspect of oil spill response strategy in the UK, where there are no ecological or fisheries conflicts. The toxicity of oil spill dispersants to aquatic organisms under laboratory conditions appears to relate primarily to the chemical composition of the individual dispersant. In general, dispersants have been used following major oil spills in the UK in recent years (e.g. *Braer*, *Captain*, *Sea Empress*). In relation to the proposed extension area, the period of highest sensitivity to dispersant application corresponds to the herring spawning season (August – September), which coincides with the period of highest vulnerability of seabirds to surface pollution. This potential conflict should be considered carefully during environmental assessment, operational

planning and contingency plan preparation for E&P activities in the area, but is not considered to be an over-riding reason not to proceed with licensing – since mitigation measures are feasible and the incremental level of risk is low.

4.5 Cumulative, incremental and synergistic effects

The Technical Appendix in the SEA 2 Post Public Consultation Report (January 2002) addressed in detail the methodology and approach to the consideration of cumulative, incremental and synergistic effects for SEA 2. This appendix together with Section 10 of the SEA 2 Consultation Document have been reviewed in the context of projected combined levels of activity as part of the consideration of issues for the SEA 2 extension blocks. The review concluded that were the SEA 2 extension blocks to be licensed given the existing/impending controls and mitigations that no significant change to the SEA 2 conclusions is expected.

5 CONCLUSION

5.1 Introduction

The natural environment and existing uses of the SEA 2 extension blocks is not markedly different from the adjacent parts of the area considered in SEA 2. In addition, there are no known seabed features which would qualify for consideration as potential Special Areas of Conservation within the SEA 2 extension blocks. However, individual block licences and project-specific approvals should take account of any future designation of offshore conservation sites, for example SACs and SPAs.

Consequently, from these perspectives there are no overriding reasons not to consider the SEA 2 extension blocks for licensing. However, the blocks are adjacent to the northeast Scottish coast and consequently the potential differences in oil spill and underwater noise risks were evaluated.

5.2 Noise

The incremental risks posed by the underwater noise generated by the number of seismic and other geophysical surveys likely to be conducted in SEA 2 extension blocks are not regarded as appreciably greater than those anticipated for SEA 2 activities.

Existing acoustic disturbance mitigation mechanisms include the assessment element of PON 14 application for consent and if required, an Appropriate Assessment of the potential effects on the bottlenose dolphins of the Moray Firth candidate SAC. In view of these and the FRS/UKOOA guidance on periods when fish are most sensitive to seismic survey and the JNCC Guidelines, no other mitigation measures are suggested for consideration at the licensing stage. It is noted however, that coordination of seismic surveys in the SEA 2 extension blocks and adjacent areas is desirable to reduce the occurrence of multiple surveys at any one time.

5.3 Effects on herring spawning grounds

Existing consenting and mitigation measures are believed adequate to protect herring spawning grounds.

5.4 Oil spill

The incremental risk of oil spillage from licensing of the SEA 2 extension blocks is not substantially greater than that predicted for SEA 2, in view of anticipated activity levels and since predicted activities are consistent with previous operations in the region. The blocks are closer to the coastline than the adjacent blocks considered in SEA 2 although wind and tide characteristics would serve to reduce risk of coastal impacts. The coastal sensitivities are recognised as are the seasonal vulnerability of seabirds and fish spawning particularly herring.

Potential spill mitigation measures that could be considered at the licensing stage are to place restrictions on the timings of particular activities e.g. penetration of reservoir formations or well testing to avoid the most sensitive periods.

5.5 Cumulative, incremental and synergistic effects

The review concluded that were the SEA 2 extension blocks to be licensed given the existing/impending controls and mitigations that no significant change to the SEA 2 conclusions is expected. As in SEA 2, the potential for cumulative effects of seismic noise, emissions and discharges should also be considered prior to project-specific approvals in SEA 2 extension blocks.

5.6 Overall conclusion

The overall conclusion of this consideration of issues is that it is not expected that significant environmental effects would be likely to result from extending the SEA 2 area and offering these blocks for licensing.

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