



# OFFSHORE WIND FARMS

**Guidance note for Environmental  
Impact Assessment  
In respect of FEPA and CPA  
requirements**

**Version 2 - June 2004**



**Offshore Wind Farms:**

**Guidance Note for Environmental Impact  
Assessment in Respect of FEPA and CPA Requirements**

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**Prepared by the Centre for Environment, Fisheries and Aquaculture Science  
(CEFAS) on behalf of the Marine Consents and Environment Unit (MCEU)**

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1	Introduction	1
1.1	Guidance Note Aims	1
1.2	FEPA Framework	1
1.3	CPA Framework	3
2	Requirement for Environmental Impact Assessment	3
2.1	Statutory Requirements	3
2.2	Screening Opinion	6
2.3	Scoping Opinion	6
2.4	Habitats Directive and Birds Directive	7
2.5	Data for inclusion in the Environmental Statement	8
3	Coastal & Sedimentary Processes	9
3.1	Aims & Scope	9
3.2	Baseline Assessment	10
3.3	Impact Assessment	11
3.4	Survey Design	11
3.5	Mitigating Actions	12
3.6	Monitoring	12
4	Benthos	13
4.1	Introduction	13
4.2	Foreseeable effects	13
4.3	Targets for investigation	14
4.4	Design and conduct of surveys	14
4.5	Laboratory processing of samples	16
4.6	Analyses/reporting of data	16
4.7	Submission of sampling/analytical plans for regulatory approval	16
4.8	Collaborative Work	17
4.9	Selected Benthos References	17
5	Fish Resources	20
5.1	Introduction	20
5.2	Important fish resources	22
5.3	Important aspects of fish habitat and fish biology	23
5.4	Fish surveys	25
5.5	Summary	28
5.6	Selected Fisheries Resource References	28
6	Commercial Fisheries	29
6.1	Introduction	29
6.2	Data collection	30
6.3	Selected Commercial Fisheries References	31
7	Marine navigation	31
8	Archaeology and other historical uses of the seabed	31
9	Marine Mammals	32
10	Birds	32
11	Designated Sites and other Nature Conservation Interests	33
12	Cumulative impacts	33
13	Decommissioning	35
14	Summary	35
15	Contacts	36
16	References	39
	Appendices	
	Round 2 Offshore Wind farm Consents - Joint Formal EIA Scoping Opinion	40
	Useful Information on Marine EIA	41

# 1 Introduction

## 1.1 Guidance Note Aims

This Guidance Note has been prepared by the Centre for Environment, Fisheries and Aquaculture Science (CEFAS, an Agency of the Department for Environment, Food & Rural Affairs - Defra), on behalf of the Marine Consents and Environment Unit (MCEU)<sup>1</sup>. Its purpose is to assist the offshore wind farm industry and their consultants; the primary aim being to provide scientific guidance to those involved with the gathering, interpretation and presentation of data within an Environmental Impact Assessment (EIA) as part of the consents application process in England and Wales. The guidance is intended to supplement the Department of Trade and Industry's (DTI's) guidance "Offshore Wind Farm Consents Process" [[http://www.dti.gov.uk/energy/leg\\_and\\_reg/consents/guidance.pdf](http://www.dti.gov.uk/energy/leg_and_reg/consents/guidance.pdf)]. It is not definitive and it is therefore recommended that it be read in conjunction with the legislation and the other sources to which it refers. It replaces the November 2001 document of the same name.

Guidance provided by this document refers only to those requirements necessary to enable the assessment of an application under the Food and Environmental Protection Act 1985 (FEPA) and Section 34 of the Coast Protection Act 1949 (CPA). Both Acts require assessment of a proposed project within the marine environment with regards to its potential for environmental impact.

If the EIA is to be used for any other purpose/licence application then the appropriate authorities should be contacted in order to ensure that the EIA provides all relevant information required.

## 1.2 FEPA Framework

In simple terms, a FEPA licence is required for the deposit of any substances or articles in the sea or under the sea bed in UK waters, UK controlled waters, or from British vessels. The FEPA licensing process is well established with in excess of 300 applications a year for activities as diverse as disposal of navigation dredgings, flood defences, coast protection, port construction works, bridges and land reclamation.

When making applications for FEPA construction licences, applicants are required to provide specific details about the project. These details include, but are not limited to:

- The materials to be used including a detailed design specification.
- The construction methodology.
- The equipment to be used.
- Contractor details.
- The precise location of the development (with exact co-ordinates).

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<sup>1</sup> The **Marine Consents and Environment Unit** (MCEU) is an alliance of the Department for Environment, Food and Rural Affairs (Defra) - and the Department for Transport (DfT). It has responsibility for co-ordinating the administration of consents over the full range of marine works for which the two Departments and the National Assembly for Wales each has responsibility.

- The precise timetable for the construction works (start/end dates, key milestones).

The potential impacts on the marine environment can, therefore, be assessed by the statutory consultees against set parameters. The licensing authority can then make an informed decision on whether or not to license the development and where necessary include robust legally binding mitigation and monitoring measures. The materials and many of the potential construction techniques used in offshore energy developments are similar to those used in other marine construction projects so must be assessed on the same basis.

However, it is apparent from the FEPA applications for the Round 1 offshore wind farm developments that the project proposals are at a less advanced stage than is the norm for any other licence request. The applications were made with many uncertainties on project design with many of the above details being unavailable. Examples of this uncertainty in the project descriptions are:

- The foundation type is not decided upon - gravity base, monopile or tripod (drilled and/or driven).
- The materials are not specifically described.
- Precise location of turbines and configuration not decided upon.
- Cable type not decided upon.
- Cable route not decided upon.
- Onshore or offshore substation not decided upon.
- Construction methodology uncertain.
- No contractors appointed (construction problems not identified).
- Geotechnical surveys not undertaken – so suitability of the site not confirmed.
- Scour/cable protection requirements not assessed or formalised.
- Construction timetable not set.

All these uncertainties made a robust scientific assessment of the environmental impacts very difficult. Lessons learned from Round 1 applications showed that deficiencies in a project's information as listed above created delays and problems in issuing licences. The solution came in choosing one of the two only available options:

- To refuse the licence application until the project parameters could be clearly defined; or
- To take a pragmatic precautionary approach to issue the licences, where it was considered appropriate, but with detailed licence conditions that enable the many information gaps and uncertainties to be resolved in parallel to the research and construction programme, whilst minimising environmental impacts.

Defra, as the licensing authority, chose the second option as a suitable solution on the presumption that meeting the licence conditions and monitoring requirements during and after the construction of the first few offshore wind farm developments would contribute to the growing understanding of the engineering and environmental constraints. As this information is fed into the public domain it would allow the reassessment of the licence conditions for other consented or future projects, i.e. to learn from real operational examples.

The early developments during Round 1 are, therefore, significantly contributing to our current understanding of the issues associated with wind farm development in the marine environment. The complexity and range of FEPA licence conditions attached to all offshore wind farm developments is testament to this. However, this is all to the benefit of the growth of the offshore renewables industry for the other consented projects and all future rounds. Where monitoring outputs allow, the licence conditions will, where appropriate, be amended or even removed.

Wherever possible developers are recommended to work together in producing survey and monitoring packages and data collection so that costs and resources can be shared (see Section 4.7 for more detail). A coordinated approach such as that provided by AFEN (Atlantic Frontier Environmental Network) for the offshore oil and gas industry is a model worthy of further investigation by the renewables industry.

**It is suggested that applications are therefore submitted with a detailed project's description i.e. completed geotechnical surveys, known cable route, known foundation type etc. This allows a robust and thorough site specific assessment to be undertaken which will produce more focused and workable licence conditions.**

### **1.3 CPA Framework**

In simple terms the requirements for CPA consent are similar to those for FEPA. The main differences in the context of this Guidance Note are that CPA also covers dredging activities (FEPA is only concerned with the disposal of dredged material at sea) **and** the interference of the 'development' on navigation is given much higher prominence. There is a joint application form for FEPA and CPA consents (see [www.mceu.gov.uk](http://www.mceu.gov.uk)). Despite the legal differences the data requirements for CPA are to all intents and purposes identical to those for FEPA and therefore no further distinction is made in this Guidance Note.

## **2 Requirement for Environmental Impact Assessment**

### **2.1 Statutory Requirements**

The Environmental Impact Assessment Directive (97/11/EC) requires an EIA to be carried out in support of an application for development consent for certain types of project as listed in the Directive at Annexes I and II. Offshore wind farm developments are listed in Annex II as '*installations for the harnessing of wind power for energy production (wind farms)*' and these provisions have been transposed into UK legislation.

The term 'Environmental Impact Assessment' describes a procedure that must be followed for certain types of project before they can be given development consent.

The procedure is a means of drawing together, in a systematic way, an assessment of a project's likely significant environmental effects. This helps ensure that the importances of predicted effects, and the scope for reducing them, are properly understood by the public and the relevant competent authorities before a decision is made. From a developer's point of view, the careful preparation of an Environmental Statement (ES) will provide a number of benefits to a project:

- a useful framework within which environmental considerations and design development can interact
- environmental analysis may indicate ways in which the project can be modified to avoid or mitigate possible adverse effects
- thorough environmental analysis and provision of comprehensive information allows the consenting authorities to reach a decision more rapidly

Although new Regulations are under consideration to amend FEPA, the EIA Directive has not yet been applied to the Act. Nevertheless, there are existing provisions within FEPA to require licence applications to provide the licensing authority with such information as it deems necessary to enable it to properly consider the application. The licensing authority's policy being that this information shall include the equivalent of a formal ES in support of all offshore wind farm proposals to inform the process of impact assessment. With regard to the CPA, an EIA is also required to satisfy the Harbour Works (Environmental Impact Assessment) Regulations 1999 where a scheme is proposed which is to be sited in or partly within a port or harbour.

As stated above, an Environmental Impact Assessment (EIA) will be required for all offshore wind farm developments. The applicant will therefore need to show that a full EIA has been undertaken by preparing and submitting an Environmental Statement (ES) as part of the application process. Schedule 1 of The Harbour Works (Environmental Impact Assessment) Regulations 1999 (SI 1999 No. 3445) transposes the details of the information that must be included in an Environmental Statement from Article 5(1) of the Council Directive 97/11/EC.

## SCHEDULE 1 (definition of “environmental statement”)

### 1. Description of the proposed project, including in particular:

- a description of the physical characteristics of the whole project and the land-use requirements during the construction and operational phases,
- a description of the main characteristics of the production processes, for instance nature and quantity of the material used,
- an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed project.

### 2. An outline of the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account the environmental effects.

### 3. A description of the aspects of the environment likely to be significantly affected by the proposed project including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors.

### 4. A description of the likely significant effects of the proposed project on the environment (which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the project), resulting from:

- the existence of the project;
- the use of natural resources;
- the emission of pollutants, the creation of nuisances and the elimination of waste,

and a description by the developer of the forecasting methods used to assess the effects on the environment.

### 5. A description of the measures which the developer proposes to take in order to prevent, reduce, remedy or offset any significant adverse effects on the environment.

### 6. A non-technical summary of the information provided under paragraphs 1 to 5.

### 7. An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the developer in compiling the required information.

Where the various consents impose a requirement for more than one EIA, the consenting authorities will normally be content for the developer to provide a single document, provided that its scope is sufficient to embrace the range of environmental issues which each can be expected to consider. This may, for example, take the form of separate volumes addressing particular topics, such as the foreshore and land-based issues and sub-tidal matters.

Where an appropriate assessment is required under the Habitats Directive (see section 2.4), the EIA must provide the competent authority with the information as required

for that assessment. An EIA cannot substitute the need for an appropriate assessment, although it is likely in most cases to inform the assessment. Where an offshore wind farm project requires an appropriate assessment it may be decided to incorporate the appropriate assessment within the EIA. If so, the ES prepared during the EIA, should include a specific section under the heading; *‘the likely significant effects on the internationally important habitats and/or species’* to aid the appropriate assessment process.

The consents process for marine works under FEPA and CPA involves extensive consultation,, including (but not limited to):

- Other Government Departments e.g. Department for Transport (DfT), Ministry of Defence (MoD);
- CEFAS for scientific advice on fisheries, benthos, sedimentary processes, hydrodynamics and coastal processes;
- English Nature (EN), Countryside Council for Wales (CCW) and Joint Nature Conservation Committee (JNCC) for statutory advice on species and sites of nature conservation importance e.g. Special Protection Areas SPA), Special Areas of Conservation (SAC), (Sites of Special Scientific Interest (SSSI), Marine Nature Reserves (MNR);
- Defra Sea Fisheries Inspectorate;
- Local Authority interests – for planning, amenity/leisure, environmental health;
- Port Authorities;
- The Crown Estate;
- Environment Agency – for water quality, migratory fish, coastal processes;
- Other interest groups and non-governmental organisations (NGO) e.g. National Federation of Fishermens Organisations, Royal Yachting Association etc.

## 2.2 Screening Opinion

The Directive and implementing Regulations provide a procedure that enables developers to apply to the competent authorities for an opinion (‘screening opinion’) on whether an EIA is needed. However, due to the size and nature of such projects and their potential to give rise to significant environmental effects all offshore wind farm developments will require an EIA.

## 2.3 Scoping Opinion

The developer is responsible for preparing the ES that must be submitted with the application for FEPA and CPA consents. A developer may ask the competent authority for its formal opinion (‘scoping opinion’) on the data to be included in an ES. Developers are recommended to submit a draft outline of the ES (a ‘scoping document’ or ‘scoping report’) that sets out the main issues envisaged by the developer to be, and proposes relevant studies, as a focus for the competent authorities and the Statutory Consultees to consider. New procedures have been implemented for Round 2 where **all** EIA scoping requests should be sent to DTI (copied to MCEU) who will then co-ordinate the comments and advice from those

consultees listed in section 2.1. A flow diagram of this procedure is provided in the Appendix to this Guidance note.

## 2.4 Habitats Directive and Birds Directive

The principal aim of the **Habitats Directive 92/43/EEC** on the conservation of natural habitats and of wild fauna and flora is to sustain biodiversity through the conservation of natural habitats and wild fauna and flora in the territory of European Member States. These targets are principally being met through the establishment of Special Areas of Conservation (SACs).

There is a need for measures applied under the directive to be designed to:

- *maintain or restore certain habitats and species at a favourable conservation status, and*
- *take account of economic, social, and cultural requirements and regional and local characteristics*

It is also necessary to comply with the species provisions of the Habitats Directive. It is an offence to deliberately kill, capture or disturb European protected species or to damage or destroy their breeding sites or resting places.

The Directive requires that any activities, plans, or projects whether inside or outside a ‘Natura 2000’ Site, that are likely to have a significant effect on the conservation status of the site’s features shall be subject to assessment.

Therefore, where a proposed offshore wind farm site is located within, or would be likely to significantly affect, a designated, proposed, or candidate ‘Natura 2000’ Site (SAC and/or Special Protection Areas (SPA)), *consenting authorities* must ensure an **Appropriate Assessment** is carried out under the Directive. Advice on whether an appropriate assessment may be required for a development (and on the scope of such an assessment) should be sought during the Scoping stage for the EIA by the developer and consenting authority from English Nature, Countryside Council for Wales and from JNCC for projects beyond territorial waters.

Where a proposed project does not fall within the boundaries of a European Site an appropriate assessment will only be required if it is considered (and fully justified) that a significant effect on the site is likely. It is the responsibility of the competent authority, with advice from the conservation agencies to determine whether a proposed project is likely to have a significant effect on a European Site.

Generally, a project may only proceed once it has been ascertained that it will not adversely affect the integrity of the site’s features. In the event that the development of a wind farm may result in some adverse impact on a European site, the scheme would only be granted consent if the Secretary of State is satisfied that there are:

- appropriate grounds of imperative overriding public interest;
- that there is no alternative solution available and
- that suitable compensating habitat can be identified for the loss to that site.

Further guidance on ‘determination of likely significant effect’ and ‘appropriate assessment’ are available in the EN guidance notes; ‘Habitat Regulations Guidance Notes’ HRGN1 and HRGN3.

The purpose of the **Birds Directive 79/409/EEC** is to protect birds, their eggs, nests and habitats in the EU. This is to be achieved by the protection of the birds’ potential habitats, through the preservation, maintenance or restoration of a sufficient diversity and area of habitats essential to the conservation of all species of birds. These targets are principally being met through the establishment of *SPAs*.

Complete listings of SPA and SAC sites are available to view on the Joint Nature Conservation Committee (JNCC) website: <http://www.jncc.gov.uk/idt/>. For further information about Natura 2000 sites see “Managing Natura 2000 sites. Guidance on the provisions of Article 6 of the Habitats Directive 92/43/EEC”, published by the European Commission in 2000.

New guidance from the Joint Nature Conservation Agencies (EN, CCW and JNCC) for offshore wind farms will be available shortly. The Joint Agency Guidance provides much more detail on the above issues and should be read and applied in conjunction with this note on FEPA and CPA (Joint Nature Conservation Agency Guidance on Offshore Wind Farm Developments (*In prep*)).

## **2.5 Data for inclusion in the Environmental Statement**

The requirements of the EIA procedure and the information to be included in an ES are set out within the EIA Directive, and also in the document - ‘Environmental Impact Assessment – A Guide to Procedures’, produced by the Department of Transport, Local Government and the Regions (DTLR),<sup>2</sup> and in guidance on assessments under s.36 and s.37 of the Electricity Act 1989<sup>3</sup>. However, over and above these basic requirements, each EIA must be both project and site specific. Furthermore, the marine environment raises issues that are unique to it, for example, the impact of sediment re-suspension as a consequence of the project works.

Gathering of data at an early stage of any proposal is prudent. However, unless these data are gathered in a way that meets the standards required in order to inform an assessment then much time, effort and money could be wasted.

The aim of this document is therefore, to provide scientific guidance at the earliest stages of the EIA process on the potential impacts below Mean High Water Springs (MHWS) in order to ensure that all data gathering and modeling undertaken is both pertinent and of a high standard. The EIA may also need to consider other environmental impacts, such as seascape and visual impacts, but these are outside the scope of this document. However, more detail on these issues and on specific nature conservation requirements can be found in the Joint Nature Conservation Agency guidance. Early consultation with the Nature Conservation Agencies is highly recommended.

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<sup>2</sup> [http://www.odpm.gov.uk/stellent/groups/odpm\\_planning/documents/page/odpm\\_plan\\_026667.hcsp](http://www.odpm.gov.uk/stellent/groups/odpm_planning/documents/page/odpm_plan_026667.hcsp)

<sup>3</sup> [http://www.dti.gov.uk/energy/leg\\_and\\_reg/consents/guidancenotes\\_en.pdf](http://www.dti.gov.uk/energy/leg_and_reg/consents/guidancenotes_en.pdf)

Notwithstanding the information provided within this document, CEFAS recommends that the developer and their environmental consultants should give thought to the nature and scale of any potential impacts associated with their project. This is essential in order to plan a work programme detailing what data requirements they perceive necessary, and how they intend to gather the baseline information sufficient for them to adequately assess these environmental impacts. Such plans should be supported with a clear rationale for the choice of techniques, data, survey area, sample number & locations, models etc, i.e. what the issues are and how can they be addressed. All surveys and models utilised should be fit for purpose and correctly validated.

The following sections outline the information required in order to make an assessment under FEPA and CPA applications. Each section sets out in broad terms those aspects that will need to be addressed.

This Guidance Note provides the skeleton for the EIA; the onus is on the developer to describe the framework for adding the flesh at the scoping stage where the site specifics are identified. The full detailed work should be presented in the Environmental Statement.

### 3 Coastal & Sedimentary Processes

#### 3.1 Aims & Scope

All developments should be assessed according to the following:

- on a **site-specific** basis,
- to include **direct impacts** on hydrodynamics and sediment dynamics, and
- to include **indirect impacts** of these on other disciplines (e.g. benthos, fisheries, coastal protection, water quality, sediment quality, conservation-designated sites).

For any wind farm proposal it is necessary to assess the magnitude, and significance of change, caused directly to the following:

- **Sediments** (e.g. composition, geochemical properties, contaminants, particle size) – sample collection may usefully be combined with the benthic sampling programme.
- **Hydrodynamics** (e.g. waves, tidal flows) – using surface and/or seabed-mounted buoys, ADCP. [*Note: It is important that all field data provide information on seasonal variations such as calm and storm events; therefore deployment may be for weeks or months at a time.*]
- **Sedimentary environment** (e.g. sediment re-suspension, sediment transport pathways, patterns and rates, and sediment deposition) – using charts, bathymetry, side scan sonar. [*Note: The large-scale sediment transport patterns in many of the Round 2 offshore wind farm sites have not been traditionally monitored, and may therefore be relatively unknown, which means that new field studies are essential*

*to provide both baseline understanding and validation of any numerical modeling studies.]*

- **Sedimentary structures** (e.g. channels, banks, large-scale bedforms, bioturbation, depth of mixed layers).
- **Suspended sediment concentrations** (SSCs) – using adequately calibrated instrumentation.

Consideration of the above issues should be made with respect to the following **spatial scales**:

- Near-field (i.e. the area within the immediate vicinity of the turbine grid)
- Far-field (e.g. the coastline, sites of scientific and conservation interest)

Consideration of the above issues should be made with respect to the following **periods and timescales**:

- Baseline conditions.
- Development “construction” phase.
- Development “post-construction” phase.
- Sedimentary “recovery” phase, or period during which a new equilibrium position is attained with the wind array in place.
- Long-term “lifetime” of the wind array.
- Development “post-decommissioning” phase, with wind array no longer in place.

### **3.2 Baseline Assessment**

In order to assess potential impacts the developer must first fully understand the natural physical environment of their site and the surrounding area, including:

- Identification of processes maintaining the system, reasons for any past changes, and sensitivity of the system to changes in the controlling processes.
- Identification and quantification of the relative importance of high-energy, low frequency (“episodic” events), versus low-energy, high frequency processes.
- Identification of the processes controlling temporal and spatial morphological change (e.g. longevity and stability of bedforms), which may require review of hydrographic records and admiralty charts.
- Identification of sediment sources, pathways and sinks, and quantification of transport fluxes. [*Note: Any numerical models should be validated and calibrated, and should present field-data in support of site conditions, boundary conditions, complex bathymetry, flows and sediments, to include measurements of hydrodynamics, and suspended sediment, in order to demonstrate accuracy of model performance, and should include sensitivity analysis or estimate of errors in order to enable confidence levels to be applied to model results.*]
- Identification of the inherited geological, geophysical, geotechnical and geochemical properties of the sediments at the site, and the depth of any sediment strata. [*Note: A sediment sampling campaign (including surface samples and cores) should have far-field spatial coverage and include the range of sedimentary environments, with consideration of the controlling hydrodynamic flows, sediment pathways and sites of particular interest.*]

### 3.3 Impact Assessment

With knowledge of the site and its surroundings, informed by the above baseline assessment, the magnitude and significance of the impact of the development may be quantitatively and qualitatively assessed using hypothesis-driven investigation.

This assessment should specifically include an assessment of the following:

- Scour around turbine structures and the justification and requirements, if any, for scour protection material.
- Scour around any supply cables overlying the sediment surface and the resulting potential for higher SSCs, and the development of “free-spans” in the cable.
- Spatial design of the turbine grid array and the subsequent effect on the spatial distribution of wave patterns, tidal flows, and sedimentation (within the near-field), and additionally on wave direction and wave energy (at far-field and coastal sites).
- Non-linear interaction of waves and currents and the subsequent quantification of the extent to which bed sediment is mobilised.
- Sediment mobility and the natural variability of sediment depth within the near-field and the effect on turbine strength/ stability, choice of foundation material and turbine structure, and burial depth for any cables.
- Effect of cable laying procedure on local levels of SSCs.
- Assessment of the scales and magnitudes of processes controlling sediment transport rates and pathways. This may also include mixed seabeds (silts, sands and gravels), and therefore any interpretations from numerical model output should acknowledge and assess the effect of any differences in sediments (between model and actual), particularly when assessing the significance of transport fluxes.
- Assessment of the impacts of climate change on the sedimentary processes, e.g. changes in wave height, direction, and frequency of occurrence.

CEFAS and the Environment Agency can advise on site specific issues and help to identify data sources. A useful starting point for CEFAS data is <http://www.cefass.co.uk/data.htm>

### 3.4 Survey Design

Survey specifications should be submitted to the MCEU who will seek scientific and nature conservation advice (from CEFAS, Environment Agency and the Conservation Agencies) to ensure that data and analyses are adequate to meet the regulatory requirements. However, the onus is on the developer and their environmental

consultants to design the plan of works. The developers and their consultants should therefore only contact MCEU once they have devised a plan of works (including the collection of new data and computer modeling) to address the issues identified in this section. At the scoping discussions, MCEU (in consultation with CEFAS) will comment on whether or not the proposed tools are fit for purpose to ensure that the data are of sufficient quality to be used to assess the potential environmental impacts.

Any computer modeling must be calibrated (and subsequently validated) with site specific data to assess the potential impacts of:

- Presence / absence of the wind farm
- Effects of different numbers of turbines and layouts
- Seasonal differences including storm events
- Wave diffraction (including effects of wind forcing)

These survey specifications must clearly state the issues to be investigated, set hypotheses concerning the potential environmental impacts of the development to inform a detailed rationale to explain the choice of techniques to be utilised. They should describe in detail:

- Data collection techniques
- Data standards
- Analytical techniques
- Statistical techniques
- Quality control

Although not produced for the offshore wind industry the document ‘Guidelines for the conduct of benthic studies at aggregate dredging sites, DTLR May 2002’ provides a useful insight into the techniques, equipment and design of marine seabed and oceanographic surveys. This document can be downloaded at <http://www.cefas.co.uk/publications/files/02dpl001.pdf>

### **3.5 Mitigating Actions**

Where there may be sedimentary concerns regarding issues documented within the ES, particularly with results of any predictive modeling studies, a requirement for monitoring, both during, and following construction may be incorporated into the conditions of the FEPA licence.

### **3.6 Monitoring**

The Environmental Statement must include recommendations for future monitoring of the identified potential impacts of the wind farm, these proposals must be hypothesis driven with measurable outputs.

## 4 Benthos

### 4.1 Introduction

This section provides a framework for the design and conduct of environmental assessment programmes targeted at the marine benthos. It is recognised that, in applying this framework, due allowance must also be made for adaptations to meet site-specific circumstances which may vary greatly around the UK coastline. CEFAS and the Conservation Agencies will be able to provide further guidance on these matters.

In the absence of knowledge arising from the operation of large-scale wind farms in UK waters, marine survey designs should continue to reflect a precautionary stance. However, as a result of CEFAS advice to date, the effort devoted to the conduct of baseline and initial monitoring of installations has not, in scale or intensity, exceeded that devoted to other man-made activities such as marine aggregate extraction or dredged material disposal.

There are several publications available that cover general approaches to benthic sampling, as well as more specialised texts dealing with the monitoring and assessment of man-made activities (see reference list at the end of this section). Although none of these address the specific issue of wind farm developments, they provide extensive coverage of the principles underlying the investigative approach, as well as sampling and analytical practices, and hence are valuable sources of information in the planning of survey work associated with the installation of new structures.

Since the publication of the original guidance note in November 2001, guidelines for the conduct of surveys at marine aggregate extraction sites have been published (Boyd 2002; this document can be downloaded at <http://www.cefas.co.uk/publications/files/02dpl001.pdf>). Although clearly not tailored to the specific issue of wind farm developments, this publication is a useful source of up-to-date information on relevant monitoring approaches, since a number of analogies may be drawn between the two activities. Examples include concerns over the re-distribution of fine particulates, the localised consequences of gross sediment disturbance/removal and the tendency for developments to be associated with high-energy environments. Similarly, the wide scope of the guidance provided by Davies *et al* (2001), with the emphasis on monitoring of sites of marine conservation interest, also represents a useful recent source of guidance for UK habitats.

### 4.2 Foreseeable effects

Identification of the range of foreseeable effects arising from wind farm development is a pre-requisite for the effective planning of benthic surveys. These effects may include:

- Those arising from construction activities (especially the installation of foundations and cable laying), for example, direct effects due to physical disturbance of seabed substrata and alterations to the local habitat, and indirect

effects arising from the re-distribution of fines. At some locations, the potential for adverse effects arising from the re-mobilisation of sediment-bound contaminants may also need to be addressed.

Those arising from scour around turbines following installation. Their importance will clearly depend on the extent of scour, if any, and the necessity for ameliorative action.

- Colonisation of structures and associated events. The prospect of locally enhanced biodiversity and increased food availability or shelter for commercial fish/shellfish may provide the developer with the opportunity to present an aspect of the operation in a positive light although, clearly, local circumstances must be considered in evaluating the net environmental benefits and costs.
- Interaction with other man-made activities impinging on the benthic biota, *i.e.*, 'cumulative' or 'in-combination' effects.

### **4.3 Targets for investigation**

For soft sediments, these will generally include both the macrobenthic infauna sampled by grabs or cores and the epifauna sampled by trawls or dredges, accompanied by the sub-sampling of sediments for analyses of particle size distributions and (depending on location) contaminant concentrations. In advance of such work, acoustic or photographic surveillance of the target environment may provide valuable information on the spatial distribution of sediments in the wider area encompassing the wind farm site, thereby facilitating the planning of effective survey designs for the collection of samples by conventional means.

For very coarse or rocky terrain, or for new structures, the colonising fauna and flora may be evaluated using underwater photography, deployed remotely or by diver, and diver observation and sampling.

If present within the area of study, habitats and species of high nature conservation importance, such as *Sabellaria spinulosa* reefs or *Modiolus* beds, require special care in sampling as these are sensitive to damage from towed gear. In such cases, reference should be made to the Joint Nature Conservation Agency Guidance on Offshore Wind Farm Developments (*In prep*) and sampling approaches agreed with the Conservation Agencies beforehand.

### **4.4 Design and conduct of surveys**

Attention must be directed at the following:

#### **4.4.1 Sound sampling design.**

This will apply to the pre-operational 'baseline' survey, monitoring activities during the operational phase (the extent of which may vary according to location), and post-operational 'recovery' studies. Desk-based evaluation of all relevant information (*e.g.*, on local hydrography, the distribution of sea-bed sediments and the associated benthic

fauna and other man-made activities) will be an essential pre-cursor accompanied, if necessary, by a pilot survey to fill gaps in knowledge. Such information, along with any associated modeling of sediment transport processes (see below), will allow the derivation of impact hypotheses for testing against the outcome of sampling programmes. The design will typically encompass representative locations at which turbines are to be sited and, more importantly, wider-area sampling to determine the spatial extent of any environmental consequences during the operational phase and, following cessation of the activity, the progress towards recovery to conditions comparable with those prevailing pre-operationally (recent guidance on approaches to the planning and design of sampling programmes is given in Boyd 2002).

CEFAS continue to advocate an examination of the maximum tidal excursion from the site boundaries as an initial basis for determining the minimum sphere of likely impact arising from the short-term re-distribution of fines disturbed as a result of wind farm developments. This is a crucial consideration in the placement of baseline and monitoring stations. If available, outputs from validated models of sediment transport and other local information on sedimentary processes (section 3) may be an important additional means to derive impact hypotheses for subsequent testing against the outcome of data analyses. Additional factors such as the location of dredged material disposal or aggregate extraction sites, or sites of known or perceived environmental sensitivity, must be taken into account in adapting survey designs to local circumstances.

CEFAS also continue to advocate the need for representative rather than exhaustive sampling at or near to the point of installation of each turbine. This gives emphasis in post-installation monitoring to the wind farm as an entity relative to the surrounding environment. We consider that any effects on benthic communities arising from interactions between turbine locations (which we cannot entirely dismiss at this stage) would still be identifiable by this means. Finally, in our advice on baseline (pre-operational) surveys, we have encouraged extra effort at representative stations in anticipation of the need for statistical evaluations of changes in space and over time during the operational phase (therefore a minimum of 3 replicates per station is recommended).

The survey designs proposed by the developer or sub-contractor will be subject to agreement with the regulator, before execution (see 4.7, below).

#### **4.4.2 Sampling frequency.**

This may be influenced by factors such as the size of the proposed development, and the perceived ecological sensitivity of the local environment. In general, sampling to meet ongoing monitoring objectives would be more frequent in the early stages following installation. This would be, at most, annually (and at the same time of year); only exceptionally would there be a requirement for seasonal sampling. If hypotheses concerning limitation of adverse effects are confirmed by ongoing surveys, then the frequency and scope of sampling may be reduced and ultimately ceased, although there may, however, be benefits to maintaining a residual ‘watching brief’ in order to cover for any unanticipated changes occurring in the longer term. Such effects may also serve the important purpose of providing re-assurance about the minimisation of adverse effects as a result of sound management practices.

#### **4.4.3 Effective sampling practices.**

Sampling at sea will typically be conducted by a specialist sub-contractor acting on behalf of the developer. It will require the selection of appropriate sampling gear to meet site-specific needs, followed by its safe and efficient deployment according to Standard Operating Procedures. The same considerations will apply to the processing and preservation of samples at sea, prior to later laboratory analyses (see, for example, Boyd, 2002; Rees, 2004). Specification of approaches to the planned work, including QA/AQC procedures, should be included in the scoping study, and CEFAS (on behalf of the regulator) will advise on its adequacy: see 4.7, below.

#### **4.5 Laboratory processing of samples**

This work will typically be conducted by a specialist sub-contractor appointed by the developer. Analyses of biological samples should be conducted to a demonstrably acceptable standard as laid down in Standard Operating Procedures, and agreed in advance of commissioning of the work (see, for example, Boyd, 2002; Rees, 2004). Specification of approaches to the planned work, including Quality Assurance (QA) / Analytical Quality Control (AQC) procedures, should be included in the scoping study, and CEFAS (on behalf of the regulator) will advise on its adequacy: see 4.7, below.

#### **4.6 Analyses/reporting of data**

This work will typically be conducted by a specialist sub-contractor appointed by the developer, and will provide the information necessary for inclusion, in summary form, in the Environmental Statement. Patterns and trends in the data should be investigated using accepted tools for uni- and multi-variate analyses. Recent guidance is provided by Boyd (2002) and Davies *et al* (2001).

The outcomes should be reported comprehensively, and tables of raw data and all relevant details of QA/AQC procedures adopted at sea and in the laboratory should be included as Appendices (see Boyd, 2002 for further guidance).

#### **4.7 Submission of sampling/analytical plans for regulatory approval**

Survey specifications should be submitted to the MCEU who will seek scientific and nature conservation advice (from CEFAS and the Conservation Agencies) to ensure that sampling activities and data analyses will be adequate to meet the regulatory requirements. However, the onus is on the developer and their environmental consultants to produce a detailed plan of the proposed work. The developers and their consultants should therefore only contact MCEU once they have devised such a plan to address the issues identified in this section. The submission must include comprehensive information on proposed QA/AQC procedures covering each stage of the programme, *i.e.*, including sampling, laboratory and data analyses and reporting of

outcomes (Rees, 2004). At the scoping discussions, MCEU (in consultation with CEFAS and the Conservation Agencies) will comment on whether or not the proposed programme is fit for the intended purpose of yielding reliable assessments of the potential environmental impacts.

#### **4.8 Collaborative Work**

In view of the extent of environmental monitoring that is likely to be conducted around wind farm developments in the coming years, there would be strategic benefits to periodic assessments at a national level, preferably under combined regulatory and industry auspices (**such as the Regional Groups**). CEFAS would, therefore, encourage the development of an industry overview on environmental issues by means that do not prejudice individual commercial interests. As operations expand, this would allow a co-ordinated approach to the refinement of monitoring practices and ensure that resources are properly targeted at issues of real concern. For example, evidence from multiple sources might lead to a shift in emphasis towards an examination of the near-field consequences for benthic communities and, taking a longer view, the information would facilitate the development of a consensus on cost-effective procedures for post-operational ‘recovery’ studies. At a more local level, there is already scope for greater collaboration in addressing environmental concerns in areas where multiple wind farm developments by different companies are planned.

Finally, in the majority of cases it is evident that the industry has been assiduous in appointing environmental consultants who are competent in the planning, conduct and reporting of marine surveys to acceptable standards, and we have been content in our dealings with these. *We would urge that the industry continues to be sensitive to this need, in order to ensure that progress is not hindered by a lack of appreciation of the regulatory need for a quality-assured product, i.e., encompassing all elements from survey planning to report production.*

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## **5 Fish Resources**

### **5.1 Introduction**

There is potential for the construction, development and use of wind farms to adversely affect fish and shellfish resources, including spawning, overwintering, nursery and feeding grounds, and migratory pathways.

Information should be collected to describe local fish and shellfish resources both at the site and in the surrounding area. The presence and relative importance of fish resources will need to be described and assessed. Important fish resources should include:

- The major species of fish and shellfish in the area that are of significant importance in commercial and recreational fisheries,
- Those species of fish in the area that are of conservation importance,
- Elasmobranch fish (which are often also of commercial and recreational importance) may be susceptible to the effects of electro-magnetic fields, hence special mention of these species ought to be made,
- Species that have a restricted geographical distribution and are locally abundant in the area.

For these fish and shellfish resources, the following aspects of their ecology should be considered:

- Spawning grounds
- Nursery grounds
- Feeding grounds
- Overwintering areas for crustaceans (e.g. lobster and crab)

- Migration routes

An EIA will need to determine the extent of the interaction between the planned activity and the resources found at the site. It will need to judge the importance of this interaction in terms of the viability of the population at risk, and be able to recommend suitable mitigation measures where appropriate.

It should also address cumulative impacts, from nearby wind farm sites and other human activities in the area. Hence, co-ordination of data collection activities with other consultants operating in the marine environment, especially with other wind farm developers, is strongly encouraged. This will help to ensure a more standardised approach to fish and fisheries data collection, facilitate comparison between sites, and contribute to any coordinated post-construction monitoring programmes. Collaboration between developers will also help the production of broad scale regional overviews of fisheries, and contribute to Strategic Assessment.

A considerable quantity of information for the UK coastal zone is available in published documents and reports, and it is recommended that these sources of information are used to determine the presence, distribution and seasonality of the fish and shellfish resources. In those areas where insufficient information is available, it may be necessary to undertake specific site surveys for fish resources. Such surveys must be designed carefully and the EIA must describe precisely how and why the work was undertaken. As indicated above, an early appraisal of the most important fisheries resource issues at the site, and subsequent data collection either from existing sources or using new surveys, will be an important part of survey design.

- Some fisheries data for coastal waters are already available, and whenever possible existing sources of data should be used.
- When new surveys need to be designed, it will be necessary to select sampling methods that are most appropriate for the issues on site, as entire fish communities cannot be sampled with a single type of sampling gear.
- In determining which survey gear and protocol to use, the developer must be clear about which questions they want to answer.
- If commercial species are of concern then gear and techniques employed by the local fishing industry should be mirrored in the survey design.
- Where possible, the involvement of local fishermen in survey design and data collection is strongly recommended.
- Survey design must include sufficient replication and coverage to take account of the mobile nature of fish populations.
- A detailed assessment of the commercial fishing activity at the site is also very important. This should include reference both to existing broad-scale datasets, as well as site-specific fishing intensity studies (see also Section 6 Commercial Fisheries).

Detailed proposals for these studies should be submitted to the MCEU who will seek scientific advice (from CEFAS) to ensure that data and analyses are adequate to meet the regulatory requirements. However, the onus is on the developer and their environmental consultants to design the plan of works. The developers and their consultants should therefore only contact MCEU once they have devised a plan of works (including the collection of new data and computer modeling) to address the

issues identified in this section. At the scoping discussions, MCEU (in consultation with CEFAS) will comment on whether or not the proposed tools are sufficient to ensure that the type and quality of the data are suitable to assess the potential environmental impacts.

## **5.2 Important fish resources**

### ***5.2.1 Commercial fish and shellfish***

The identification of commercially exploited fish resources should be undertaken by:

- (1) The examination of landings data. Such data are available from Defra, with more regional data available from ICES and local data from the local Defra offices and Sea Fisheries Committees, and
- (2) Liaison with commercial and recreational fishermen, and fishing organizations operating in the vicinity of the proposed sites. For wind farms operating offshore, charter boats are likely to constitute the dominant recreational fishery.

It is recommended that at least 5 years worth of landings data for the period prior to the date of construction be examined. Defra landings data should be treated with caution and EIAs should recognise that these data often represent an under-estimation of the true landings made within a fishery, as data from vessels under 10m are not usually included. Local knowledge (from the local Sea Fisheries Committees and local fishermen and fishing organisations) will be able to provide additional information.

It is essential that consultation with the fishing industry is undertaken as early as possible, and this will address fisheries issues (see Section 6) as well as providing information relevant to fishery resources. Key representatives should be kept informed of progress of the project, so as to build a good working relationship with trust and co-operation.

The contractor should provide evidence of the major commercial fish and shellfish species in the area, stating which fisheries target these species and during which times of the year (see Section 6). The relative importance of the wind farm site as nursery, spawning, feeding and over-wintering grounds, and as migratory corridors should be assessed for these species.

### ***5.2.2 Fish of conservation importance and locally important species***

There is increased concern over the conservation status of estuarine and marine fish species, and the major species of conservation importance that are likely to occur in the vicinity of wind farm sites are given in Table 5.1. Data for such species are usually sparse, although the Environment Agency may have data for estuarine and diadromous species (diadromous species are those species that move between fresh and marine environments during their life cycle; these may be ‘anadromous’ (i.e. species of fish that typically live in the marine environment as adults, and migrate up rivers to breed) or ‘catadromous’ (i.e. species of fish that typically live in fresh water as adults, and migrate to the sea to breed)).

**Table 5.1:** Species of marine and estuarine fish of conservation importance

Species	Habitat	Thames	Greater Wash	Eastern Irish Sea
River lamprey	Anadromous	High	High	High
Sea lamprey	Anadromous	High	High	High
Common skate	Marine	Medium	Medium	Medium
Angel shark	Marine	Medium	Medium	Medium
Basking shark	Marine	Medium	Medium	High
Sturgeon	Marine and estuarine	Medium	Medium	Medium
Seahorses	Marine	Medium	n/a	n/a
Shad (Allis/Twaite)	Anadromous	High	High	Medium
Salmon	Anadromous	High	High	High
Smelt	Estuarine	High	High	Medium

*High:* Species present in the area and need to be considered

*Medium:* Those species that were historically present in the area although they may not be present now, and those species that may only occasionally occur in the area. These species may need to be considered, but data are likely to be scant

*n/a:* Species not normally in this area, and need not be considered

### 5.3 Important aspects of fish habitat and fish biology

#### 5.3.1 Introduction

The construction and operation of wind farms can have several potential effects on fish resources, for example:

- Pre-construction acoustic surveys (e.g. seismic surveys) may disrupt the behaviour of spawning fish
- Placement of the turbines, piling and scour protection at the site, and cable laying operations may disrupt (a) the behaviour of spawning fish and (b) the sediments associated with spawning and overwintering grounds, (c) nursery grounds for juvenile fish and (d) migration routes for diadromous fish (especially inshore sites near estuaries) and other migratory species
- The electromagnetic fields and noise associated with turbines and associated cables may affect the behaviour of fish
- Fish may be attracted to the rock used as scour protection at some offshore wind farm turbines. This may not indicate increased productivity, but merely a spatial shift in the fish resource (i.e. they are acting as “Fish Aggregating Devices”, FADs). Whether such “artificial reefs” increase productivity in the long-term is controversial, and such structures should not automatically be assumed to be beneficial.

#### 5.3.2 Spawning and overwintering grounds

Most species of fish are broadcast spawners, and so changes to the seabed and the placement of turbines associated with the development of wind farms may not have

severe long-term implications. However, disruption to the spawning periods of certain species in certain areas may need to be avoided during the construction phase. An atlas of spawning areas and seasons is available (Coull et al., 1998; see: <http://map2.cefasdirect.co.uk/isea/>) and should be consulted. In the absence of data regarding the importance of sites for spawning, studies may be required to determine whether mature fish in spawning condition are present in the area during the spawning season and/or whether there are eggs and larval stages present.

Those species of fish that deposit eggs on the sea floor are more likely to be affected by changes to the sedimentary environment. The primary species of concern is herring *Clupea harengus*, although other egg-laying or nest building species, including rays (Rajidae), wolf-fish *Anarhichas lupus*, and black sea bream *Spondyllosoma cantharus* may be locally important. The peak egg-laying/spawning seasons should be avoided during construction and cable laying, and work should ensure that those aspects of the sedimentary environment required for spawning are maintained in the development site and adjacent areas. Herring spawning grounds, for example, are typically comprised of coarse sand, coarse shelly sand, gravel, and large unbroken shell fragments overlying gravel, and such habitats should retain their physical integrity. Edible crab also require coarse sediment in which to bury, and avoiding sedimentation at key sites should be considered.

The EIA should examine the spatial and temporal aspects of spawning, identify protocols to minimize the disruption to spawning activity/behaviour (including construction and any pre-construction surveys, such as seismic surveys) and identify the measures to be undertaken so that spawning grounds for egg-laying species will not be affected adversely. The possible effects of noise disturbance on the behaviour of spawning fish are unclear, and may need to be considered to address local concerns.

### **5.3.3 Nursery grounds**

Those grounds favoured by juvenile fish are also important habitats, although in many instances such habitats may be widespread. If the wind farm construction site is in an important nursery ground, then the relative importance of the site to that region should be assessed, including the assessment of cumulative impacts (other wind farms and offshore activities). If the development covers a significant proportion of the likely nursery ground, it should be established whether the physical aspects of the nursery ground (e.g. sediment type and topography) would be enhanced or damaged by the development.

### **5.3.4 Feeding grounds**

Fish are relatively opportunistic predators, and many do not have well defined feeding areas. Nevertheless, some species of fish may congregate in certain areas at given times of the year to feed on particular prey species. Hence, developers should investigate this, and construction activities should attempt to minimize disruption to such sites. Local fishermen would be a potential source of such information.

### 5.3.5 Migratory pathways

For wind farm sites in inshore waters, especially those in close proximity to estuaries; there may be the possibility of negative impacts on the migration routes of diadromous fishes (e.g. salmon, lampreys, shad) and other migratory species. Whereas the physical presence of the wind farm turbines themselves are not likely to have a major adverse effect, the EIA should examine the location of the wind farm site in relation to other developments and human activities in the area, and the construction phase may need to minimize disturbance during the timings of peak migration. A general indication of when anadromous fishes undertake their migrations is given in Table 5.2, although it is stressed that there can be local differences, and information for specific areas should be examined where possible. The possible effects of electromagnetic fields and noise disturbance on the behaviour of migrating fish are unclear, and may need to be considered to address local concerns.

**Table 5.2:** Timings of migration for anadromous and catadromous fish species (note these are generalized times and peak timing of the upstream migration may vary regionally)

Species	Timing of upstream migration
Sea lamprey	Move from the sea to estuaries in April/May <sup>(2)</sup> , spawning in May/June <sup>(1,2)</sup>
Salmon	Spawn late October to early January <sup>(1,2)</sup>
Sea trout	Spawn October/February <sup>(1)</sup>
Allis shad	Move into estuaries in late spring <sup>(2)</sup> , spawning during April-May <sup>(1)</sup>
Twaite shad	Start upstream migration in April/May <sup>(2)</sup> , spawning in May/June <sup>(1,2)</sup>
Common eel	Elvers migrate upstream from January to June, with a peak in May <sup>(2)</sup>
References: <sup>(1)</sup> Wheeler (1969); <sup>(2)</sup> Maitland and Campbell (1992)	

### 5.3.6 Habitats of locally abundant populations

Any species of fish that has a highly restricted geographical distribution, and is locally abundant at a site should be considered at a population level.

## 5.4 Fish surveys

### 5.4.1 Introduction

Once the important fish and shellfish species present at or near to a site have been identified, those aspects of its biology that may be affected by the development of the wind farm (nursery grounds etc.) can be determined.

In many instances such data may be available in a variety of reports or scientific publications, and a desk study may be all that is required. Field sampling will not always be necessary.

For some sites, however, there may be either a lack of information, or an issue that is of local concern, and in such cases some field sampling may be required. If there are serious issues relating to the possible impacts of a wind farm development, then a monitoring programme may also be required.

The following section details the protocols for fishing surveys.

#### **5.4.2 Gear**

For collecting data on adult fish and shellfish, the gear used should mirror that used in local commercial fisheries. It is also strongly suggested that surveys for adult fish should involve chartering commercial fishing vessels, as the local knowledge thus gained would be valuable.

In general otter trawls are suitable for groundfish (cod, whiting etc.), and such gear will also catch some pelagic fish (herring, sprat etc.) and some flatfish (plaice, sole). If flatfish are the primary target species, then the use of a large beam trawl (4m+) should be considered. If juvenile flatfish are to be sampled (e.g. on a nursery ground), these may be better sampled by small (2m) beam trawl or shrimp trawl. For shellfish, an appropriate trawl or potting gear should be used.

Note: Applicants must apply for a dispensation from the provisions of the fisheries conservation measures where small mesh nets are to be used, or specimens below the minimum legal size are retained during the course of any survey work. Applicants can apply for a dispensation from the Sea Fish Conservation Division of Defra (Whitehall Place East, London, SW1 2HH).

The EIA should include a full gear description for all fishing gear used, including information on the length of the headline, length and type of the ground gear, mesh sizes along the net, mesh size of the cod-end liner (if used), length of sweeps and bridles and type of doors.

The use of other gears (e.g. pots, fixed nets) may be more appropriate for sampling some species of interest. For pots, the number and design of pots should be stated, and for the various types of fixed nets, the mesh-size and length of the net should be stated.

The identification of herring spawning grounds can be achieved using grab sampling and/or underwater camera/video.

### **5.4.3 Sampling protocol**

Sampling should be undertaken in daylight hours only, as fish behaviour varies between day and night. The EIA should give full details of the sampling protocol, including the following information for all trawl samples:

- Start (shot): Time, latitude, longitude, depth
- Finish (hauling): Time, latitude, longitude, depth
- General: Headline height and door/wing spread (where possible), trawl speed, trawl direction

Tows of commercial gear should be of 30-60 minutes duration, and all tows should be of a similar duration. Sampling with shrimp trawls or 2m beam trawls should be 5-15 minutes duration, depending on the quantities of fish in the area. It is recommended that the use of small trawls for juvenile fish be conducted either in parallel with the main fishing survey or during a survey of the epibenthos.

If catches are small, then the entire catch should be processed, with species counted and measured to the centimeter below. The sex and maturity of a suitable sample of the main target species should also be recorded.

In those cases where the catch is large, it should be fully sorted so that all the target species can be identified and an appropriate sample taken to record length distribution and maturity. For the remainder, all species should be sorted and an appropriate sample taken for length-frequency analysis (ca. 50 fish).

The recommended identification guides for UK marine fishes are Wheeler (1969, 1978) and Whitehead *et al.* (1984).

For the purposes of sampling, a minimum of five tows should be undertaken in the site of the proposed wind farm, but preferably more, pending on the size of the area. The samples should include the location of the proposed development and the immediate vicinity.

In general, many fish spawn in the spring, and so useful data may be collected during February/March. Seasonal fisheries in an area may also necessitate additional sampling in summer and/or winter as well. If a monitoring programme is proposed in the EIA, then at least three surveys post-construction (one during the spawning season and two at other times of year, depending on the seasonality of the major fisheries) and equivalent post-construction surveys are recommended.

If a monitoring programme is required, then the protocol above should be conducted for several years post-construction.

### **5.4.4 Data analysis**

Trends in the relative abundance (catch per unit effort, given as number of fish per hour) of fish in trawl surveys are highly variable, and any data analysis should use extreme caution. Variance can be reduced by increasing the number of samples, and the frequency of sampling during a season. If fishing surveys are undertaken,

therefore, they should focus on determining whether the appropriate life-history stages of the species of concern are present in the area.

## 5.5 Summary

In general, the issues relating to fish and shellfish resources should be addressed from the perspectives of (a) the commercial and recreational fisheries (see Section 6) and (b) the biology and ecology of the major commercial fish and shellfish species and species of conservation importance.

Considerable quantities of data for fish and shellfish distributions in inshore waters already exist. These sources should be investigated, and detailed consultations undertaken, **before** field sampling programmes are designed.

- What species of fish and shellfish are present at the site and surrounding area?
  - ↪ Which of these species are of high importance in commercial and/or recreational fisheries?
  - ↪ Which of these species are of high conservation importance?
  - ↪ Are there any other species that are locally abundant in the area?
  
- For those species of commercial and recreational importance
  - ↪ Are there locally important spawning grounds?
  - ↪ Are there locally important nursery grounds?
  - ↪ Are there locally important feeding grounds?
  - ↪ Do their migration routes pass through the area?
  
- For those species of conservation importance:
  - ↪ Are they present in the area, and if so how abundant are they?
  - ↪ Do they have any critical habitat in the area, or are they occasional vagrants?
  
- If a species has spawning grounds in the area:
  - ↪ When does the species spawn?
  - ↪ Will construction affect the physical habitat used by egg-laying species?
  - ↪ How will construction activities least impact on spawning behaviour and the physical nature of spawning grounds?
  
- If a species has a nursery ground in the area:
  - ↪ What is the relative importance of the habitat for the region as a whole?
  - ↪ Will turbine construction reduce available habitat or enhance the habitat?
  
- If a wind farm site is in close proximity to an estuary:
  - ↪ What is the status of diadromous fishes in the area?
  - ↪ Will the site pose a serious threat to the migratory pathway of diadromous fishes, taking other estuarine and coastal developments into consideration?
  - ↪ What are the timings of migrations through the site?

## 5.6 Selected Fisheries Resource References

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Maitland, P.S. and Campbell, R.N. (1992). Freshwater fishes. Harper Collins Publishers, 368pp.

Wheeler, A. (1969). The fishes of the British Isles and North West Europe. Michigan State University Press, 613pp.

Wheeler, A. (1978). Key to the Fishes of Northern Europe. Frederick Warne, London. 380pp.

Whitehead, P.J.P., Bauchot, M.L., Hureau, J.-C., Nielsen, J. and Tortonese, E. (Eds.) (1984). Fishes of the North-eastern Atlantic and the Mediterranean, Vol. 1-3. UNESCO, Paris, 1473pp.

## **6 Commercial Fisheries**

### **6.1 Introduction**

It is likely that the presence of a wind farm in relatively shallow coastal waters will interfere with the commercial fishing activity that takes place in the area. There are two issues that need to be considered. The first is the possibility that the wind farm will cause an adverse impact to the fish or shellfish population, and resulting in their subsequent decline in abundance (guidance on this is given in Section 5). It is also possible that the location of the wind farm, and the turbines themselves, will provide a physical obstruction to the normal activity of inshore fishing boats.

It is crucial that, at an early stage, local fishing industry representatives (individuals, organizations and charter boat skippers) are contacted for information concerning the scale and seasonality of fishing in the vicinity of the planned wind farm, and for their opinion as to the potential harm it may cause.

The following aspects will need to be examined

- Implications for fisheries during the construction phase
- Implications for fisheries when the development is completed
- Adverse impact on commercially exploited fish and shellfish populations
- Adverse impact on recreational fish populations
- Complete loss or restricted access to traditional fishing grounds
- Safety issues for fishing vessels (see Section 7)
- Interference with fisheries activities
- Increased steaming times to fishing grounds
- Removal of obstacles on the sea bed post-construction to ensure vessel safety
- Any other concerns raised by local fishermen and fishing organisations

The EIA must

- Provide evidence of the major commercial fish and shellfish species in the area, stating which fisheries target these species and during which times of the year
- Assess the potential commercial loss to local fisheries
- Evaluate the significance of this economic impact
- Suggest effective mitigation measures, where appropriate. This will be especially important at those sites where an exclusion zone has been planned, and in this case full justification must be provided.
- Incorporate cumulative impacts, by examining the implications of the proposed development in conjunction with other wind farm developments and other human activities

## 6.2 Data collection

It is suggested that the following information is collated for the site and surrounding area:

- Description of the fisheries in the area. Some summary information is available (e.g. Pawson *et al*, 2002), although consultation with local fishermen (e.g. commercial and recreational fishermen, fishing organizations such as the National Federation of Fishermen's Organisations, and fish merchants) and local fisheries managers (e.g. Sea Fisheries Committees, local Defra Sea Fisheries Inspectorate offices) are critical to understanding the composition of the fleet, its general activities (seasonality, gear used etc.) and broad areas that are of greatest importance as fisheries grounds. It should be noted that not all fishermen will belong to organisations, and therefore, consultations with individual fishermen are of great importance. It is therefore recommended that the developer contact the above organisations at the earliest opportunity in order to establish and maintain good relations and liaison.
- Landings data (e.g. from ICES, Defra, local Sea Fisheries Committees), remembering the caveats associated with such data (e.g. discards are not included, some species are landed at a higher taxonomic level than species, landings from the inshore fleet (<10 m) may not be included). It is suggested that at least 5 years of data (pre-construction) are examined. These data should be viewed in context with any qualitative data or descriptive information obtained from local fishermen.
- Effort data (e.g. from Defra, local Sea Fisheries Committees) to identify those areas within the region that are most important for fishing activities. These data should be viewed in context with any qualitative data or descriptive information obtained from local fishermen. Effort data should examine annual and seasonal patterns in the spatial distribution of effort for the major gear used in the area.
- Given that the data for fisheries is often regional, and given that cumulative impacts are critical to evaluating the impacts on the fishing industry it is strongly recommended that developers and their consultants work with other consultants operating in the same region. This will help to ensure a more standardised approach to fish and fisheries data collection, facilitate comparison between sites,

and contribute to any coordinated post-construction monitoring programmes. Collaboration between developers will also help the production of broad scale regional overviews of fisheries, and contribute to Strategic Assessment

- The use of GIS to illustrate areas of human activities, bathymetry, sediment, fishing effort and biological resources is strongly encouraged. Such figures should be made available for the site and at a more regional level.
- The UK Cable Protection Committee may be able to offer advice to wind farm developers on cable laying operations.

### **6.3 Selected Commercial Fisheries References**

Pawson, M.J., Pickett, G.D. and Walker P (2002). The coastal fisheries of England and Wales, Part IV: A review of their status 1999-2001. *Science Series Technical Report*, CEFAS, Lowestoft 116, 83pp.

## **7 Marine navigation**

The Maritime and Coastguard Agency (MCA) are responsible for the safe navigation of all vessel types and its HM Coastguard branch for all search and rescue activities. The MCA has circulated guidelines aiding offshore wind farm developers in assessing the full navigational impact of offshore wind farms. These are now contained in a version addressing all types of offshore renewable energy installations. They can be accessed via the MCA website at <http://www.mcga.gov.uk> or by contacting MCA at the address given on page 37.

Additional information must be obtained from:

- Port and Harbour Authorities
- Trinity House Lighthouse Service
- The Royal Yachting Association
- The National Federation of Fishermans Organisations

Although these organisations will be formally consulted during the consents process it is in the developers interests to initiate their own consultations. To ensure that the marine navigational issues for your site are identified and incorporated into the EIA these organisations must be consulted at the earliest opportunity.

## **8 Archaeology and other historical uses of the seabed**

Any sites of archaeological interest/significance should be identified and described, as should the sites of known war graves. Advice on such matters can be obtained in the

first instance from the Crown Estate, the Receiver of Wrecks, CADW (Welsh Historic Monuments) and English Heritage.

Applicants should be aware of the UK Government's Planning Policy Guidance note no. 16 "Archaeology and Planning" and also the Code of Practice for Seabed Developers produced by the Joint Nautical Archaeology Policy Committee –1995, available from the National Monuments Record Centre.

## **9 Marine Mammals**

Marine mammals may use either the general area in which the wind farm is proposed or the site specifically. The following aspects will need to be examined.

- Species in the area
- Number, distribution and/or location of sightings
- Known routes and movements in/around or through the site
- Relative importance of the site to each species
- Specific uses of the site including temporal and spatial use. For example: haul out areas, pupping areas, feeding and breeding grounds

Although there may be site specific issues needing investigation, generally the following aspects will need to be examined.

Disturbance caused by

- Noise
- Vibration
- Physical intrusion
- Visual intrusion
- Interruption of known used routes
- Disturbance due to maintenance access during operation
- Potential barrier effects

It is recommended that in the first instance EN, CCW and the JNCC are contacted for advice and guidance on this issue.

Developers should refer to the Joint Nature Conservation Agency Guidance on Offshore Wind Farm Development (in Prep) for more information on EIA requirements for marine mammals.

## **10 Birds**

It is expected that many issues concerning the potential impacts of a wind farm site on birds will be covered under the Nature Conservation assessment. However, certain aspects may not, for example, the potential impact on migratory routes. It is,

therefore, recommended that in the first instance EN and CCW and the JNCC outside 12 nm, are contacted for advice and guidance on this issue. Following discussions with the Conservation Agencies consultation with the RSPB is also advisable.

Developers should refer to the Joint Nature Conservation Agency Guidance on Offshore Wind Farm Development (in Prep) for more information on EIA requirements for marine birds.

## **11 Designated Sites and other Nature Conservation Interests**

There are a large number of sites in the coastal waters of the UK which are protected under a range of nature conservation legislation. These include intertidal and coastal SSSIs, SPAs for birds and SACs, Ramsar and Biodiversity Action Plan species (BAP) for a range of other habitats and species of international importance. The Conservation Agencies should be consulted for further information on the location of these sites in England (EN), Wales (CCW) and beyond 12 nm (JNCC).

Early contact should be sought, as should advice on whether an Appropriate Assessment is likely to be requested under The Conservation (Natural Habitats, &c.) Regulations 1994. An Appropriate Assessment may require further work over and above that provided in the EIA.

Applicants should also be aware of and refer to "Wind farm development and nature conservation. A guidance document for nature conservation organisations and developers when consulting over wind farm proposals in England." EN, RSPB, WWF-UK and the British Wind Energy Association, March 2001.

The new guidance from the Conservation Agencies for offshore wind farm developments is in preparation and **all** EIAs must be produced in line with its recommendation for Nature Conservation. The Joint Agency Guidance should be read and applied in conjunction with this FEPA/CPA Guidance Note.

Early contact should therefore be made with EN, CCW and JNCC as appropriate.

## **12 Cumulative impacts**

The need to consider cumulative impacts is a requirement of the EIA process. Projects to be incorporated in such an assessment must include those in the past, present and foreseeable future.

Projects to be incorporated in such an assessment must include not only other potential wind farms but also other types of projects taking place in the marine environment or onshore so that all elements of the infrastructure are assessed.

At the time of writing the EIA Directive does not legally apply to FEPA, but is applied in principle. During 2004, The Deposits in the Sea (Environmental Impact Assessment and Conservation of Natural Habitats etc.) Regulations will be brought into force. This will require Round 2 applications to adequately meet the requirements of the EIA and Habitats Regulations. Nevertheless, the assessment of cumulative impacts does have a legal base under the Harbour Works (Environmental Impact Assessment) Regulations 1999; (that applies the EIA Directive to CPA) and other regulations. The wording in each of these Regulations in this respect is very similar, requiring that the characteristics of projects that require an EIA must have regard to the cumulative impacts of the project with impacts from other developments. The revised regulations amending FEPA will also require consideration of the cumulative impacts.

Round 2 developments differ from Round 1 developments in several key areas, primarily spatial extent, increased proximity to each other and potential for broader scale impacts. This makes the assessment of cumulative impacts a much more significant issue in Round 2. All aspects of the individual EIAs will, therefore, need to assess the environmental impacts of the offshore wind farm in question on its own and cumulatively with all possible combinations of other proposed and actual wind farms and other developments in the vicinity. In practice this will mean that all modeling and data collection must be to comparable standards and investigate the impacts of the offshore wind farm:

- On its own.
- Cumulatively with all adjacent wind farm consented and proposed sites (Round 1 and Round 2).
- Cumulatively with any combination of the consented and proposed wind farm sites (Round 1 and Round 2) within the same SEA area.
- Cumulatively with any combination of all the above with other existing or proposed offshore developments.

Such an approach will require a substantial multiplication of effort and cost for the individual developers **if** they decide to assess cumulative impacts independently. The recommendation is, therefore, that developers with adjacent sites collaborate in the collection and assessment of certain data sets to ensure that cumulative impacts are investigated in the most efficient and cost-effective way.

The data sets that would appear most likely to benefit from a collaborative approach are:

- Birds
- Cetaceans
- Fisheries Resource and Commercial Fisheries
- Other mobile species (e.g. sharks and rays)
- Navigation
- Visual Impacts
- Sedimentary Processes
- Other Users of the Sea

i.e. those issues that do not occupy discrete spatial and temporal areas. The level and nature of the collaboration and cooperation will vary between each subject and

detailed guidance on specific sites will be provided by the relevant organisations at the EIA scoping stages.

### **13 Decommissioning**

Decommissioning arrangements will need to be outlined within the EIA. The decommissioned site will need to be left in a state that will no longer interfere with other uses of the sea or have any adverse impacts on the marine environment. Decommissioning is outside the requirements of FEPA but the risks to navigation from vessels and equipment involved in such activities will require CPA consent. The most pertinent source for information on decommissioning is the DTI Guidance “Offshore Wind Farms Consents Process”.

### **14 Summary**

This guidance note has described the information required within an EIA with regard to FEPA and CPA applications only.

It has set out areas of study that will require impact assessment under the two licence applications. Individual applications will vary greatly and the generic nature of this guidance note cannot accommodate all circumstances. If the potential applicant or consultant requires further assistance in areas covered by this document then CEFAS can be contacted directly.

For policy, regulatory or procedural guidance the potential applicant or consultant should contact the relevant regulatory body. Information on the controls on marine works, including FEPA licence charges, can be found in Defra's Marine Consents and Environment Unit (MCEU) Guidance Notes.

## **15 Contacts**

**In the first instance please direct any scientific enquiries to the**

Regulatory Assessment Team  
CEFAS  
Burnham Laboratory  
Remembrance Ave  
Burnham on Crouch  
Essex  
CMO 8HA  
Tel 01621 787200  
Fax 01621 784138

**For enquiries regarding commercial fisheries please contact in the first instance**

Sea Fisheries Inspectorate  
Defra, Nobel House  
17 Smith Square  
London  
SW1P 3JR  
Tel 020 7238 5801  
Fax 020 7238 5814

**For enquiries regarding dispensation for fisheries surveys please contact**

Sea Fish Conservation Division  
Defra, Nobel House  
17 Smith Square  
London  
SW1P 3JR  
Tel 020 7238 5923  
Fax 020 7238 5721

**For enquiries regarding navigation please contact**

**Maritime and Coastguard Agency**  
Hydrography, Meteorology and Ports Branch

Spring Place  
105 Commercial Road  
SOUTHAMPTON  
SO15 1EG  
Tel 023 80329138  
Fax 023 80329204

**For nature conservation enquiries please contact** the relevant **English Nature** Local Team office. Addresses for local team offices can be found on EN's website: [www.english-nature.org.uk](http://www.english-nature.org.uk).

And/or

**The Countryside Council for Wales**

Maes y Ffynnon  
Ffordd Penrhos  
Bangor  
Gwynedd LL57 2DW  
Tel: 01248 385500

And

**Joint Nature Conservation Committee**

Dunnet House  
7 Thistle Place  
Aberdeen AB10 1UZ  
Tel: 01224 655704

**Licensing and Policy enquiries should be directed to:**

**Department for Environment, Food & Rural Affairs**

Marine Consents & Environment Unit  
Eastbury House  
30-34 Albert Embankment  
London SE1 7TL

Email: [marine.consents@mceu.gsi.gov.uk](mailto:marine.consents@mceu.gsi.gov.uk)

Tel: 020 7238 3000

Fax: 020 7238 1258

**Department for Transport - Ports Division**

(for detailed queries relating to the requirements of the Coast Protection Act 1949, and other Harbours legislation)

Great Minster House  
76 Marsham Street  
London  
SW1P 4DR

Tel: 020 7944 5105

Fax: 020 7944 2188

## **Department of Trade & Industry**

(for co-ordination of policy and applications for offshore wind farm consents)

Offshore Renewables Consents Unit  
1 Victoria Street  
London  
SW1H 0ET

Tel: 020 7215 6122 or 020 7215 0478

Fax: 020 7215 2601

## **Other useful contacts**

### **National Monuments Record Centre**

Kemble Drive  
Swindon  
SN2 2GZ

### **RSPB**

The Lodge  
Sandy  
Bedfordshire  
SG19 2DL  
Tel 01767 683355

### **NERC Sea Mammal Research Unit (SMRU)**

University of St Andrews  
Fife  
KY16 8LB  
Tel 01334 462630

### **UK Cable Protection Committee**

Level 3 Communications Limited  
Level 3 House  
66 Prescott Street  
London  
E1 8HG  
Tel 020 7954 2575

### **Association of Sea Fisheries Committees**

6 Ashmeadow Rd  
Arnside  
Via Carnforth  
Lancashire  
LA5 0AE  
Tel: 01524 761 616

### **National Federation of Fishermens Organisations**

Marsden Road  
Fish Docks  
Grimsby  
South Humberside  
DN31 3SG  
01472 352141  
e-mail: [nffo@org.uk](mailto:nffo@org.uk)

**The Crown Estate**  
16 Carlton House Terrace  
London  
SW1Y 5AH  
Tel 020 7210 4377

**Receiver of Wrecks**  
Maritime Coastguard Agency  
Spring Place  
105 Commercial Road  
Southampton  
SO15 1EG  
Tel 02380 329474

## 16 References

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Boyd, S. E. [Ed.] (in prep.) Guidelines for the conduct of benthic studies at aggregate dredging sites. Report to the Department of Transport, Local Government and The Regions.

Davies, J., Baxter, J., Bradley, M., Connor, M., Kahn, D., Murray, J., Sanderson, B., Turnbull, C. and Vincent, M., [Eds] (2000). A report to U.K. Marine SACs project on behalf of the Marine Monitoring Group. Marine Monitoring Handbook: March 2000. Joint Nature Conservation Committee, Peterborough. Draft Report.

Holme, N. A. and McIntyre, A. D., (1984). Methods for the study of marine benthos. 2<sup>nd</sup> Edition. Oxford, Blackwell, 387pp.

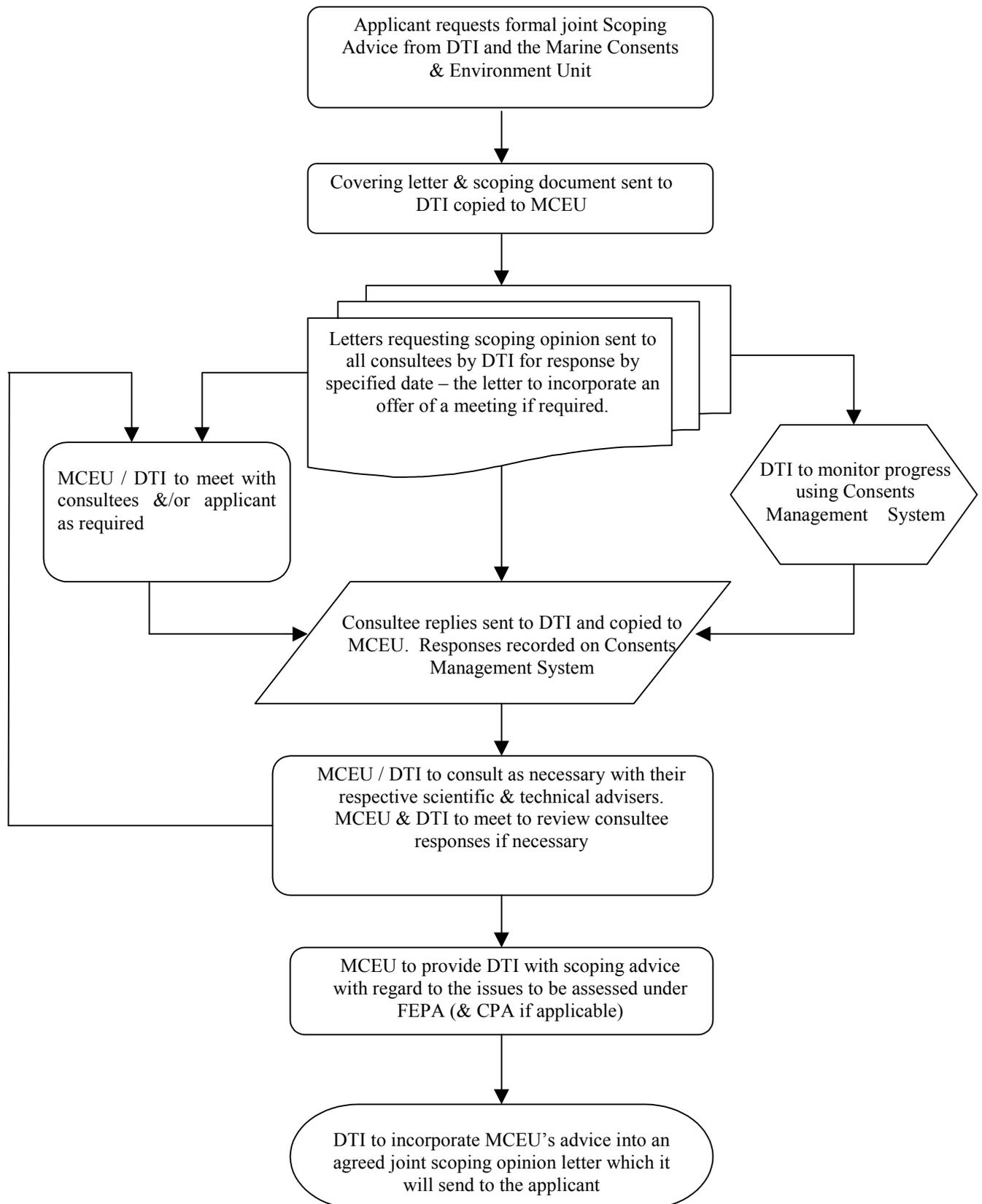
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Rees, H. L., Heip, C., Vincx, M. and Parker, M. M. (1991). Benthic communities: use in monitoring point-source discharges. Techniques in marine environmental sciences No. 16 International Council for the Exploration of the Sea, Copenhagen, 70pp.

Rumohr, H., (1999). Soft bottom macrofauna: Collection. Treatment and quality of samples. No. 27. ICES Tech. Mar. Environ. Sci. ICES Copenhagen., pp 1-19.

## Round 2 Offshore Wind farm Consents - Joint Formal EIA Scoping Opinion



**Notes:** i) Joint Scoping advice is to be provided in respect of the Electricity Act 1989; the Food & Environment Protection Act 1985 and the Coast Protection Act 1949 (if applicable)  
 ii) No screening opinions required since all windfarms exceed the 1 MW threshold beyond which an EIA is mandatory

## Useful Information on Marine EIA

### **General Information**

Boyd, S.E. (compiler 2002). Guidelines for the conduct of benthic studies at aggregate extraction sites. London: Department for Transport, Local Government and the Regions, 2002.

<http://www.cefas.co.uk/publications/>

Canadian Environmental Assessment Agency. Reference Guidance: Addressing Environmental Effects.

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Wyn, G., Brazier, P. & McMath, M. 2000. CCW Handbook for Marine Intertidal Phase 1 Survey and Mapping. CCW Marine Science Report No. 00/06/01.

### ***Windfarm Specific Information***

#### ***EIA***

BWEA. 2002. Consultation for Offshore Wind Energy Developments: Best Practice Guidelines.

<http://www.offshorewindfarms.co.uk/reports/bweabpgcons.pdf>

CEFAS. 2002. Guidance notes for Environmental Impact Assessment in respect of FEPA/CPA requirements. (Under review new document to published soon)

<http://www.cefasc.co.uk/publications/files/windfarm-guidance.pdf>

DTI. 2000. Guidance on Electricity Works (EIA) Regulations, 2000.

[http://www.dti.gov.uk/energy/leg\\_and\\_reg/consents/guidancenotes\\_en.pdf](http://www.dti.gov.uk/energy/leg_and_reg/consents/guidancenotes_en.pdf)

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#### ***Health and Safety – Navigation***

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#### ***Research and development***

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