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GUIDANCE ON THE ASSESSMENT OF THE IMPACT OF OFFSHORE WIND FARMS:

Seascape and Visual Impact Report

IN ASSOCIATION WITH

The Countryside Agency
Landscape Access Recreation

Cyngor Cefn Gwlad Cymru
Countryside Council for Wales

SCOTTISH NATURAL HERITAGE

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The Seascape and Visual Impact Assessment Guidance for Offshore Wind Farm Developers were prepared by Enviros Consulting Ltd for the Department of Trade and Industry (DTI). The study team comprised Angela Wratten (DTI Project Manager), Simon Martin (Enviros Project Manager), Jean Welstead (Enviros Project Director) and Julie Martin (Technical Director), Simon Myers, Helen Davies and Gill Hobson. The preparation of this guidance has been supported by a steering group comprising John Briggs and Sarah Wood of the Countryside Council for Wales (CCW), Andrew Wharton and Jacky Martel of the Countryside Agency, Victoria Copley of English Nature, Jenny Simmonds of Scottish Natural Heritage (SNH) and Georgia Markwell on behalf of the British Wind Energy Association (BWEA). We are indebted to input from this steering group, and the many practitioners who contributed helpful comments and ideas on the Guidance.

EXECUTIVE SUMMARY

Offshore wind energy is expected to be a major contributor towards the Government's 2010 target for 10 per cent of the UK's electricity to be supplied from renewable energy sources. The coastline and 'seascape', of England and Wales is, however, an important resource for many reasons. As such, it is important that offshore wind farms should be developed in harmony with the landscape and the needs of other users of the seascape resource. Such consideration can best be given through an understanding of the character and values attributable to the relevant seascapes and by developing a consistent approach to the prediction, mitigation and evaluation of the impacts of offshore wind farm development on the seascape resource.

Experience with land-based wind farm developments in the UK has demonstrated that landscape and visual issues are often the most prominent reason for public objection. If developers address this issue thoroughly in the Environmental Impact Assessment (EIA), they are better able to address public concerns and any related inquiry.

In order to address this issue thoroughly, developers need to follow a logical sequence of work stages, initially gathering the appropriate evidence baseline on which to make judgements, then introducing siting and design factors specific to the development that need fitting into that baseline context, from which an assessment of sensitivity and the magnitude of change can inform the evaluation of the significance of impacts.

When carrying out the baseline study, the focus should be robust and detailed, but a rationalisation process should be undertaken to focus the direction and content of the baseline assessment to meet the needs of the development proposal and to the subsequent evaluation of seascape and visual impacts which have potential to be of significance.

A seascape characterisation and baseline visual analysis should be undertaken to define the area of seascape units, their characteristics, activities, visibility and views. Regional seascape units are the most appropriate scale for Seascape and Visual Impact Assessment (SVIA) of offshore wind energy developments.

Assessing the sensitivity of the seascape resource to change caused by offshore wind farm development is the critical assessment to be made to inform the impact evaluation. It is increasingly being recognised that value and capacity are also important elements to consider. All assessments of sensitivity and capacity inevitably rely on professional judgements, although wherever possible they should also include inputs from stakeholders and public attitude information.

Siting, layout and design offer scope for integrating offshore wind farms into the seascape and to prevent, reduce and mitigate seascape and visual effects. Seascape needs to be considered at the outset of the layout and design process to have the desired effect. Other (non seascape) issues should be considered alongside, meaning inter-disciplinary team working is essential and the seascape assessor needs to take all constraints into account before being satisfied that the best available option has been achieved.

Potential effects on the character and qualities of seascape units, available views and visual amenity, as a result of offshore wind farm development, should be predicted using visibility studies and viewpoint assessments. The extent of potential visibility of the development should be shown using a Zone of Theoretical Visual influence (ZTV) derived from computer modelling. The nature of predicted views should be illustrated using photographs, wireframes and photomontages. The use of virtual 3D modelling techniques should be considered for SVIAs of Round 2 offshore wind farms.

At the end of the impact prediction stage, the magnitude of change to both the identified seascape receptors (such as seascape units and designated landscapes) and visual receptors (such as viewpoints) should be assessed in a standardised way. Magnitude of change should be determined using a range of criteria, in a structured manner and classified according to size.

The two principal criteria determining significance are the ***sensitivity of the receptor*** and the ***magnitude of change***. Reasoned judgements should be made on the overall significance of the seascape and visual effect, by systematically combining information on levels of sensitivity and impact magnitude for each seascape and visual receptor. The significance of any identified seascape or visual effect should be assessed on a clearly defined scale. It is important that the process used to arrive at levels of significance is clear, transparent and as objective as possible, with well reasoned descriptions on how conclusions have been reached.

Cumulative effects are those which may occur as a result of more than one wind farm project being constructed. The SVIA should describe, visually represent and assess the ways in which the proposal would have additional impacts when considered together with other existing, consented or proposed wind farms. The degree of cumulative impact is a product of the number of and distance between individual offshore wind farms, the inter-relationship between their Zones of Theoretical Visual Influence (ZTV), the overall character of the seascape and its sensitivity to wind farms, and the siting and design of the offshore wind farms themselves.

The presentation of the SVIA is often key to successfully communicating the baseline seascape and visual environment, and the subsequent effects on it as a result of the proposed development. The assessment should be rigorously documented and explained, and presented in a logical, clear and well structured manner.

The best practice to aim for is to build up experience of seascape and visual impacts of offshore wind farms from monitoring public attitudes towards seascapes and offshore wind farms, both before and after they have been developed, and comparing differences, so future prediction can be more refined.

1. INTRODUCTION

1.1 Background

The UK has a large offshore wind potential, with relatively shallow waters and a strong wind resource extending over its surrounding seas. Offshore wind energy is expected to be a major contributor towards the Government's 2010 target for 10 per cent of the UK's electricity to be supplied from renewable energy sources. As a result, the offshore wind industry and associated development activity in England and Wales has grown substantially and will continue to do so over the coming years. The first large scale offshore wind farm in the UK, North Hoyle, was commissioned in November 2003 and the second, Scroby Sands, was commissioned in March 2005. The future growth potential of the industry is considerable - there are 12 offshore wind farm sites with planning consent from Round 1 (1 GW) and a further 15 larger Round 2 offshore wind farm projects (7.2 GW) are in the process of preparing consent applications.

The coastline and 'seascape', of England and Wales is, however, an important resource for many reasons. It is a crucial element in these nations' sense of identity and culture, having played an important role in their history and development. It is an economic asset which attracts visitors for holidays and recreation, and a valued resource which contributes to the quality of life of people living near the coast. Coastal landscapes and seascapes are also valued resources for nature conservation, hosting many important plant and animal species and habitats, often recognised through statutory landscape and nature conservation designation.

As such, it is important that offshore wind farms should be developed in harmony with the landscape and the needs of other users of the seascape resource. Such consideration can best be given through an understanding of the character and values attributable to the relevant seascapes and by developing a consistent approach to the prediction, mitigation and evaluation of the impacts of offshore wind farm development on the seascape resource. This Guidance comes at a time when numerous offshore wind farms are proposed around the coastal waters of England and Wales. Developers' decisions on location and project design will reflect a wide range of factors including seabed topography, environmental receptors such as birds, and navigational safety issues. Developers also have to assess seascape and visual impacts of their offshore wind farm projects and this Guidance has been prepared to assist in this process and to inform their Environmental Impact Assessments (EIAs). **This guidance makes recommendations on how to assess and deal with the Seascape and Visual Impact Assessment (SVIA) element of an EIA for an offshore wind farm development**.

The requirement for an EIA, of which SVIA is an essential component, became a statutory part of the planning process within the European Union through Council Directive 85/337/EEC. In 1997, Directive 97/11/EC, which amends the 1985 Directive, extended the range of qualifying development to which the Directive applies and makes a number of changes to the way that EIA should be carried out. In relation to offshore wind farm development, this directive has been transposed into UK legislation via the Electricity Works (EIA) Regulations 2000 (SI 2000/1927). Under these regulations, wind farm development is listed as a Schedule 2 project. Due to the project scale and turbine size, for all Round 1 and Two offshore wind farms, there is a defined requirement to carry out an EIA. The terminology of the EC Directive has been adopted in this Guidance; thus impact assessment refers to the process of SVIA, while the changes resulting from the development assessed are referred to as effects. The Regulations also require that an Environmental Statement (ES) should include:

- A description of the development comprising information on the site, design and size of the development;
- A description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects (mitigation measures);
- The data required to identify and assess the main effects which the development is likely to have on the environment;
- An outline of the main alternative studies by the applicant or appellant, if such a process has been undertaken, and an indication of the main reasons for this choice taking into account environmental effects; and
- A non technical summary of the above.

The DTI is the focal point for offshore wind farm applications in England and Wales. The development of an offshore wind farm requires consent under Section 36 of the Electricity Act 1989 from the Secretary of State (DTI). Developers can apply alternatively under the Transport and Works Act 1992 which for projects in Welsh territorial waters would be considered by the Welsh Assembly Government. A summary of the consents process for offshore wind farms is provided in Appendix 1, and full guidance can be found in DTI guidance notes[1]. The second round of offshore wind farm development was announced in December 2003. As the successful developers are now preparing their EIAs and applications for consent, the DTI identified the need to produce practical guidance for Round 2 offshore wind farm developers on seascape impacts for the work they undertake in EIA when they apply for their consents.

1.2 Strategic Environmental Assessment (SEA)

A strategic seascape study was carried out as part of the DTI funded Offshore Wind SEA Environment Report[2]. The main objective was to identify levels of sensitivity of seascape units to offshore wind farms in three SEA areas - the Thames Estuary, the Greater Wash and North West. This was based on a series of factors such as land use, the presence of landscape designations and recreational activities. Possible minor/medium and major effects of offshore wind farms were identified at varying distances. According to Table 21 in the report, for highly sensitive seascapes there would be possible minor or no effects at 24km and further offshore; possible medium effects at 13-24km offshore and possible major effects at less than 13km offshore, based on a notional turbine height of 100 to 150metres (to tip of blade). Although it is noted in the SEA that these distance thresholds are not prescriptive, they were assumed to indicate the distance thresholds within which such levels of effects may occur, for the purpose of defining, at a broad-brush level, which parts of our seascape might be more or less able to accommodate offshore wind farms according to the identified coastal sensitivities.

Experience to date suggests that we cannot give an exact assurance on these distances, as the prominence or noticability of the visual effects varies considerably with changing lighting and weather conditions, and whether the turbines are seen in the focus of a key view i.e. more sensitive (e.g. in close visual proximity to a headland or island), or the opposite i.e. less sensitive, (e.g. perpendicular to coastline, out at sea, seen as being visually well away from land or existing focus points in key views), or from a high or low elevation viewpoint. The SEA study itself was too broad-brush to factor in such details. Whilst a set of distances proved helpful to inform the SEA study, it should not be implied that it would be appropriate to build any wind farm, or any amount of turbines, of any height, based only on the distance and effects thresholds presented in the SEA report. These need to be assessed on a case by case basis for each offshore wind farm proposal.

For each development proposal, a more detailed and sensitive consideration is required that takes into account the specifics of the location and setting, and the numbers and height of turbines. It is worth noting that a study commissioned by the Welsh Assembly Government, 'Facilitating Planning for Renewable Energy' (ARUP/WHITE consultants), has recently recommended greater minimum distances of 15 km from a designated coast and 10 km for other coast.

The consequence of the SEA, in terms of seascape and visual interests, was that a coastal strip would be excluded from all three strategic areas. This excluded coastal strip has a minimum width of 8km, based on the major effects threshold for low sensitivity seascape units identified in the SEA report, but also extends to 13km in areas of high sensitivity, such as around the North Norfolk coast, parts of the North Wales coast and the Lake District. This exclusion zone was imposed not just because of potential visual impacts, but also due to shallow water feeding areas for birds, potential impacts on local fisheries and areas of high tourism and recreation. The three SEA areas - the Thames Estuary, the Greater Wash and North West, and excluded regions are shown in Figure A6 in Appendix 1.

1.3 Why are Seascape and Visual Impacts Important to Assess when Siting and Designing Offshore Wind Farms?

Experience with land-based wind farm developments in the UK has demonstrated that landscape and visual issues are often the most prominent reason for public objection. If developers address this issue thoroughly in the EIA, they are better able to address public concerns and any related inquiry. Yet it is also the case that landscape and visual issues are often misunderstood. Objectors may cloud their essentially visual arguments in other reasoning, whilst proponents may dismiss the issue as subjective and one limited to the aesthetic appeal of the turbines themselves.

1 Offshore Wind Farm Consents Process - Guidance Notes (DTI, March 2004)

2 Environmental Report: Offshore Wind SEA (BMT Cordah for DTI, July 2003)

Now that an offshore wind energy industry is evolving in the UK, there is an opportunity to site wind farms away from sensitive landscapes and views. However siting them out at sea is not proving to be out of sight or out of mind. Largely due to the size of the structures, their colour, movement, and their locations being open and easily visible from land, the examples erected to date may be clearly visible from land. As great scenic or other landscape value is attached to many parts of our coastline (e.g. over 75% of the Welsh coastline is designated in various ways that recognise this), a sensitive location and design process is still required. SVIA is needed to demonstrate this.

Part of the spatial planning process prior to the awarding of offshore wind farm development sites will have taken seascape and visual issues into account, but only in a broad-brush, regional sense. It is the role of the developer to consider where and how, if at all, a development can be accommodated in a particular seascape area and take into account seascape and visual sensitivities.

1.4 The Nature of Seascape and Visual Effects

The everyday meaning of **seascape** is a 'picture or view of the sea' (in Wales the term for this is "Morlluniau"), however this guidance broadens the concept to mean a term for:

"***the coastal landscape and adjoining areas of open water, including views from land to sea, from sea to land and along the coastline***", and describes "***the effect on landscape at the confluence of sea and land***". In Wales this distinction is already understood through the term "Morweddau".

Thus, for the purpose of this guidance, we have chosen to define 'seascape' as a discrete area within which there is shared inter-visibility between land and sea (a single visual envelope). Every seascape therefore has 3 defined components:

- an **area of sea** (the seaward component);
- a **length of coastline** (the coastline component); and
- an **area of land** (the landward component).

Figure 1: Components of seascape

Source: CCW © Countryside Council for Wales. All Rights Reserved.

By contrast, 'Landscape' starts at the coastline, and includes all areas inland, even where there are no views or direct experience of the sea. In most situations the landward component of a seascape will play a significant part in seascapes, and it is largely the character of the land and coastline, rather than the sea itself, which defines the basic character of seascapes. Seascape units are defined by using visibility analysis in conjunction with character assessment.

Seascape effects are the changes in the character and quality of the seascape as a result of development. Hence seascape assessment is concerned with direct and indirect effects upon specific seascape elements and features; more subtle effects on seascape character; and effects upon acknowledged special interests such as designated landscapes for their scenery, wildness or tranquillity. With offshore wind farms, the majority of the development is not on a landscape, so consideration should be given to the indirect visual effects on the setting or perception of coastal landscapes as a result of offshore development, as well as the landscape effects arising from the land based development components such as substations and grid connections.

Seascape is a development of the concept of **landscape**, which is defined as

"... the relationship between people and place. It provides the setting for our day-to-day lives. The term does not mean just special or designated landscapes and it does not only apply to the countryside. Landscape can mean a small patch of urban wasteland as much as a mountain range, and an urban park as much as an expanse of lowland plain. It results from the way that different components of our environment - both

natural (the influences of geology, soils, climate flora and fauna) and cultural (the historical and current impact of land use, settlement, enclosure and other human interventions) - interact together and are perceived by us. People's perceptions turn land into the concept of landscape[3]".

Visual effects result from changes in the landscape or seascape, and are defined as changes in the appearance of the landscape or seascape, and the effects of those changes on people. Hence visual impact assessment is concerned with the impacts of the development on views of the landscape through intrusion, obstruction or changing the content and focus of views, the reactions (attitudes and behaviours) of the viewers who may be affected, and the overall change in visual amenity.

The definitions of key terms used in this guidance are shown in Appendix 3. Note that where possible, definitions have been closely based on those already established for landscape and visual impact assessment, to encourage consistency. However, some new terms are inevitable. Although assessments will be scrutinised by authorities familiar with this language, community and non-specialist audiences may also need to access and understand the assessment too. Assessments should therefore ensure the key messages are also highlighted in 'Plain English'.

In the case of seascape and visual effects of offshore wind farms, the key issues covered by this report, include:

- Direct effects or physical change to seascape for example through development on the coastal edge or construction of onshore grid connection;
- Indirect effects on the character and quality of the seascape, for example through the development of offshore turbines, substations and masts causing changes in the perception of the seascape;
- Direct effects on the visual amenity of visual receptors, for example changes in available views of the sea and their content, for residents and visitors caused by the development of offshore wind farms; and
- Indirect effects of visual receptors in different places, for example an altered visual perception leading to changes in public attitude, behaviour and how they value or use a place (Quality of Life Assessment).

The Guidance places an emphasis on site selection as the most effective way of preventing significant seascape and visual effects, and encourages appropriate siting and consideration of alternatives as the first priority in any mitigation strategy. It is important to note that seascape and visual effects of offshore wind farms need not be negative and are likely to be reversible.

1.5 Issues of Concern

The growth expected in the offshore wind farm industry in England and Wales has the potential to change the seascape and visual amenity of coastal landscapes. Existing information, experience and issues of concern about seascape and visual assessment, and of offshore wind farms, are not necessarily in the public domain or documented within existing guidance and environmental statements. As such, an initial consultation was carried out with various organisations, authorities, developers and consultants with experience in commissioning, preparing or making judgements on seascape and visual assessments of offshore wind farms. A questionnaire was issued to over 150 consultees, (see Appendix 5) which aimed to identify any major issues and concerns to be considered in the guidance. This initial consultation indicated that consultees felt strongest that the following issues should be addressed in the guidance:

- Expanding existing seascape guidelines for offshore wind farms;
- Standardisation of the methodology for SVIA;
- Effects upon unspoilt landscapes and seascapes;
- Effects upon designated and valued landscapes/seascapes;
- Effects on visual amenity;
- Mitigation;
- Cumulative effects of offshore wind farm developments; and
- Visibility and relationship with marine and navigational safety.

These issues have been taken on board in the production of this guidance, together with a range of additional comments which were made by consultees. Further advice on how to tackle each of these issues is presented in later sections of the Guidance.

[3] Scottish Natural Heritage and The Countryside Agency (2002) p.2. Landscape Character Assessment - Guidance for England and Scotland

1.6 Aims and Objectives of the Guidance

The specific objective for the Guidance is to offer advice on how to assess and manage the seascape and visual impact of offshore wind farm developments, and to encourage consistency and good practice in SVIA. It aims to offer practical guidance for offshore wind farm developers and their landscape consultants preparing SVIAs, but also to those involved from both regulatory organisations and NGOs who will be reading, forming opinions and making decisions based on EIAs.

This Guidance standardises the approach being offered to developers by government agencies in England and Wales. Feedback from regulatory agencies who are making decisions based on landscape and visual impact assessments, indicates that there can be a great deal of variation in the way that this issue is dealt with in EIA. The Guidance does not address the other environmental, economic or social issues raised by offshore wind generation.

As such, the Guidance (which is advisory and not a legal protocol) is intended for use by:

- Offshore wind farm developers and operators when planning the development of new sites, for the work they undertake in EIA when they apply for their consents;
- Landscape consultants, commissioned by developers to undertake SVIAs;
- Regulatory organisations who will be reading, forming opinions and making decisions based on EIAs; and
- Amenity organisations and interest groups that have an interest in seascape.

The Guidance attempts to build on existing guidance and provide some standardisation to SVIA of offshore wind farms. It is a resource which can be consulted for guidance on specific areas or topics, or for guidance on how to complete a whole SVIA in a rigorous manner. The guidance is not intended to be restrictive and encourages practitioners to explore original ideas and continue moving forward the practice of SVIA.

This guidance focuses on those installations with the potential to cause seascape, landscape and visual effects, in the form of above-water offshore wind farm, structures or facilities and their associated onshore development.

1.7 How to Use this Document

This document presents technical advice on how to undertake a SVIA of an offshore wind farm. It details the process of SVIA from scoping through baseline studies to impact prediction, mitigation, evaluation and monitoring. It also considers cumulative impacts, which may occur as a result of more than one wind farm project being constructed. The guidance is divided into 11 main sections and 6 appendices as follows:

SECTION 1: INTRODUCTION Provides an introduction to the report, the brief, and the aims and objectives of the Guidance.

SECTION 2: PRINCIPLES AND PROCESS Summarises the main stages that should be followed in an SVIA of an offshore wind farm and provides definitions of key terms used in the Guidance.

SECTION 3: SCOPING SEASCAPE AND VISUAL EFFECTS Summarises the main aims of the scoping stage, provides guidance on appropriate consultees and outputs of the scoping stage.

SECTION 4: BASELINE STUDIES OF EXISTING LANDSCAPE, SEASCAPE AND VISUAL RESOURCES Provides guidance on baseline information sources for seascape assessment and describes the methods for seascape characterisation and baseline visual analysis.

SECTION 5: ASSESSING SENSITIVITY Provides advice on the use of the character based approach for assessing sensitivity of the seascape, its value and capacity to accommodate change brought about by offshore wind farms.

SECTION 6: KEY CONSIDERATIONS IN SITING, LAYOUT AND DESIGN (MITIGATION) Provides key seascape and visual considerations to be considered when siting and designing offshore wind farm layouts in order to mitigate potential effects.

SECTION 7: PREDICTING IMPACTS AND ASSESSING THEIR MAGNITUDE Provides advice on the sources and identification of potential seascape and visual effects. Includes discussion on impact visualisation, such as visibility studies and photomontage techniques.

SECTION 8: EVALUATION OF SEASCAPE AND VISUAL IMPACTS - ASSESSING SIGNIFICANCE Discussion and guidance on making judgements as to the significance of the seascape and visual effects predicted to occur as a result of offshore wind farm development.

SECTION 9: CUMULATIVE IMPACT ASSESSMENT
Provides guidance on the nature of cumulative effects of offshore wind farms, when they should be taken into account, and recommended methods and tools for the assessment of cumulative effects.

SECTION 10: PRESENTATION OF FINDINGS
Provides advice on the presentation of SVIAs in the ES.

SECTION 11: MONITORING Provides recommendations and best practice for monitoring of seascape and visual effects, and examples of impact monitoring, such as before and after studies of Round 1 offshore wind farms.

Further information, as follows, is provided in the Appendices to the Guidance.

APPENDIX 1 Background Context - Provides an overview of the offshore wind industry in England and Wales and outlines the policy context and consents process relevant to offshore wind.

APPENDIX 2 Summary of Existing Guidance on Seascape, Landscape and Visual Assessment - Provides a summary of existing guidance on seascape, landscape and visual impact assessment.

APPENDIX 3 Glossary of Key Terms - Provides definitions of key terms used in the Guidance.

APPENDIX 4 Examples of Assessing Significance - Presents a number of worked examples of assessing significance of effects of Round 1 offshore wind farms.

APPENDIX 5 List of Project Consultees - Presents a list of the organisations consulted during the preparation of the Guidance.

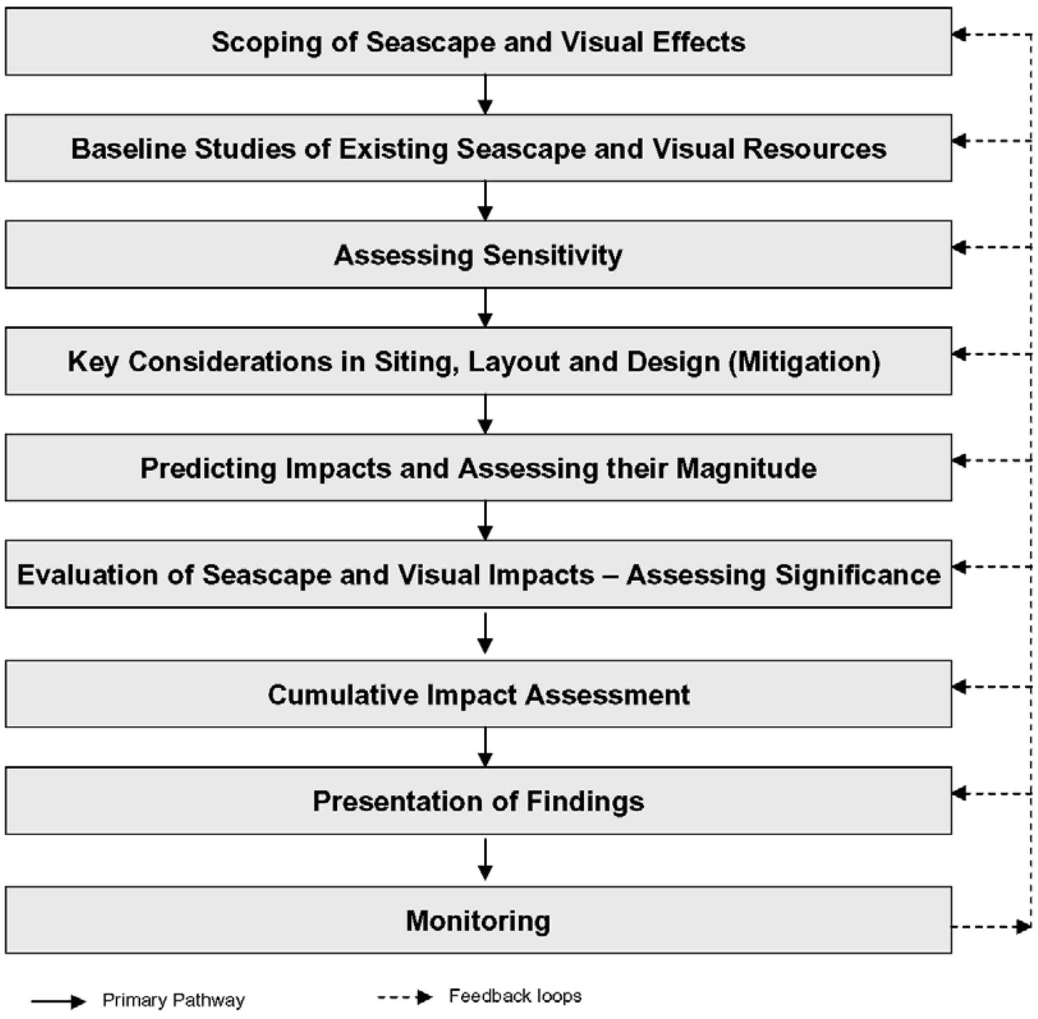
APPENDIX 6 References, Further Reading and Links - Summary of other sources of information on seascape, landscape and visual impact assessment and the offshore wind industry.

2. SEASCAPE AND VISUAL ASSESSMENT: PRINCIPLES AND PROCESS

2.1 Main Steps in the SVIA Process

When carrying out an SVIA, a logical sequence of work stages should take place (as illustrated by Figure 2), initially gathering the appropriate evidence baseline on which to make judgements, then introducing siting and design factors specific to the development that need fitting into that baseline context, from which an assessment of impacts can be made. Particular attention is drawn to the feedback loops. The siting and design process and the impact assessment stages should be iterative, as the Guidelines for Landscape and Visual Impact Assessment (GLVIA)[4] state, and take into account seascape and visual issues from the outset. There is little to be gained by leaving consideration of seascape and visual issues until a completed location and design has been reached where nothing can then be changed. The nature of this iterative process should be written up in the EIA to demonstrate to consenting and consulted bodies that even where siting and design is not ideal, a best fit has nevertheless been aimed for. Figure 2 summarises the main stages that should be followed in an SVIA of an offshore wind farm.

Figure 2: Stages in the Assessment of Seascape and Visual Impacts



Public consultation should feed in during the main stages of the SVIA, and will become increasingly required as the new Public Participation Directive is implemented into UK legislation[5].

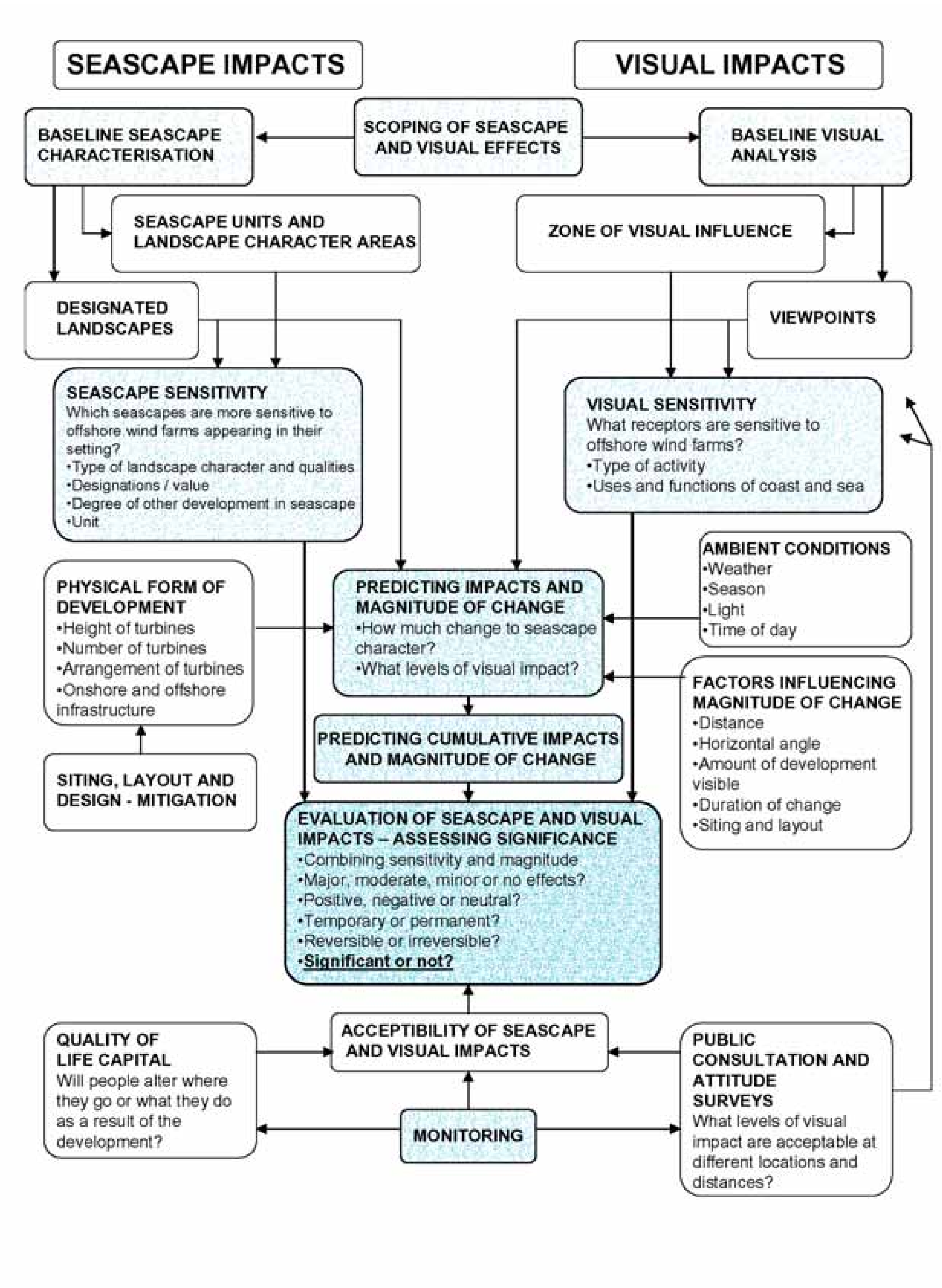
4 Guidelines for Landscape and Visual Impact Assessment, 2nd edition (The Landscape Institute and Institute of Environmental Assessment 2002)

5 Article 3 of European Directive 2003/35/ EC (known as 'the Public Participation Directive') is currently in consultation, which amends Council Directive 85/337/ EEC (known as the Environmental Impact Assessment or ' EIA' Directive) mainly with regard to public participation provisions.

2.2 Conceptual Model for the SVIA Process

The flow diagram in Figure 3 provides a conceptual model for the more detailed SVIA process. These issues are explored further in the Guidance.

Figure 3: Conceptual Model for the SVIA Process



3. SCOPING SEASCAPE AND VISUAL EFFECTS

Scoping is a key part of EIA in general. Developers are encouraged to conduct a scoping exercise as the first step in a SVIA as part of the wider EIA scoping. Whether undertaken as part of a legal process or as good practice in EIA, the main aims of the scoping stage are:

- To identify what key receptors, effects and project alternatives to consider;
- To identify what methodologies to use and who to consult;
- To ensure that resources and time are focused on important effects and receptors;
- To establish early communication between developer, consultants, statutory consultees and other interest groups; and
- To warn the developer of any constraints that may pose problems if not discovered until later in the EIA process.

The scoping exercise should provide a plan for subsequent steps by making a preliminary assessment of:

- The nature and extent of receptors and the development's potential effects, estimated from the project description;
- The impact area/zone within which effects are potentially significant;
- Possible mitigation measures;
- The methods and levels of study needed to obtain baseline information and predict and evaluate impacts.

The findings of the scoping exercise for the SVIA should be documented in a scoping report, together with the other EIA components, that is made available to the developer, participating consultants, and sent to consultees.

The developer should request that the competent authority (which in the case of offshore wind farms in England and Wales is the DTI, unless developers go through the TWA when it is WAG) provides a scoping opinion on the information supplied in the scoping report. The scoping opinion will identify any key issues and other matters to be considered in the SVIA in response to the submitted scoping report. In preparing the opinion, the DTI will consult with the necessary environmental authorities, including those that will be interested in the seascape and visual effects of the development by reason of their specific environmental responsibilities. The organisations which look after nature and landscape conservation are the Countryside Council for Wales (CCW) in Wales, while England currently retains two organisations: English Nature for conservation interests and the Countryside Agency for landscape interests[6].

Statutory consultees and advisors, who should be consulted as part of an offshore wind farm SVIA include:

- The Countryside Agency (in England) or Countryside Council for Wales (CCW);
- English Nature (in England);
- National Trust;
- English Heritage (in England) or Cadw (in Wales); and
- Local Authority(s).

Non-statutory consultees, who are relevant to consult as part of an offshore wind farm SVIA include:

- National Park Authorities;
- Association for Areas of Outstanding Natural Beauty (AONB) or local AONB unit;
- Heritage coast forums;
- Coastal and marine partnerships;
- Campaign to the Protect Rural England (CPRE) or Campaign for the Protection of Rural Wales (CPRW).
- Tourist boards;
- Land based recreational associations e.g. Ramblers Association;

6 The Rural Strategy 2004 announced the Government's plans to set up a single, independent public body - Natural England. This agency will cover all of English Nature; the access, recreation and landscape remit of the Countryside Agency; and the agri-environment part of the Rural Development Service. The aim is to launch the agency formally by the beginning of 2007. However, from 1 April 2005 the organisations, which will form Natural England, are working together in an ever- closer partnership to deliver joint outcomes.

- Sea based recreational associations e.g. Royal Yachting Association, National Federation of Sea Anglers, local yacht and diving clubs, marinas; and
- Local Wildlife Trusts and RSPB nature reserves.

Letter correspondence will generally be sufficient to engage consultees in the scoping process, but a scoping meeting may also be held with the Local Authority and the Countryside Agency (in England) or Countryside Council for Wales (CCW). It may be relevant to have scoping meetings with other stakeholders such as local AONB units, or National Park Authorities, depending on the location of the proposal.

By the end of the scoping exercise, there are several key issues which should have been agreed with consultees, in particular these are:

- The size of the study area for the SVIA;
- The methodology to be used for the SVIA;
- The viewpoints to be used in the visual assessment;
- Agreement on sensitive receptors to be considered in the assessment;
- Existing landscape character assessment(s) to be used, and any other relevant sources of information; and
- The cumulative wind farm sites to be assessed in the cumulative assessment.

A scoping checklist should be used to identify key receptors and potential impacts and ensure that nothing is overlooked. This should include other information such as data requirements, study area options, key questions to be answered and key themes from existing guidance.

Although scoping can be considered as a discrete stage in the SVIA process (which ends with the issue of a finalised scoping report confirming the scope of the assessment) the activity of scoping should continue throughout, so that the scope of work can be amended in light of new issues and information, and in order to maintain the dialogue with consultees, stakeholders and the competent authority. This is especially relevant in the offshore wind development scenario where the timeframe for the development and EIA process often extends over several months or years, and where there are both onshore and offshore components to assess.

4. BASELINE STUDIES OF EXISTING LANDSCAPE, SEASCAPE AND VISUAL RESOURCES

4.1 Introduction

The baseline studies component should review the existing seascape and visual resource of the study area. The baseline forms the basis against which to evaluate the significance of the predicted seascape and visual effects arising from the proposed offshore wind farm.

The baseline study has three elements, as follows:

- Defining and describing areas – the process of defining the extent of seascape units and collecting and presenting information about each of the 3 component parts in a systematic manner;
- Characterisation – the more analytical study of the relationships between the 3 components in a seascape unit that give it distinct and recognisable character, and also classifying seascapes into types if necessary too; and
- Assessment – the process of attributing a sensitivity or value to a given seascape or visual resource, by reference to specified criteria.

The study should be conducted in three interlinking stages: desk study, field survey and analysis.

When carrying out the baseline study, a rationalisation process should be undertaken to focus the direction and content of the baseline assessment, and reduce the need to do assessment work that ultimately has no bearing on the development proposal. As the nature of rationalisation may vary between one development and another, it is the role of the SVIA consultant to undertake this and focus the baseline assessment to meet the needs of the proposal and to the subsequent evaluation of seascape and visual impacts which have potential to be of significance. Baseline studies should be undertaken to an appropriate scale, which may, for example, be more broad brush for developments located very far out to sea than for those located nearer the shore, and the seascape characterisation may approximate seascape unit boundaries where fine adjustments are not likely to have a determining influence. Better communication of key issues may be achieved if the presentation of the study in the ES is refined to keep it simple and make the key issues that that will determine the development proposals accessible to the audience of the SVIA.

4.2 Baseline Information Sources for Seascape Assessment

The desk study should review existing map and written data about the site and environs. The study area for the SVIA should extend well beyond the development site. It is likely that a 30-40km radius study area will be required for SVIAs of Round 2 offshore wind farms, however this should be tailored to the specific circumstances of the project, the nature of the development and seascape being assessed, and agreed in consultation with statutory consultees.

In terms of information required for the baseline seascape assessment, the assessor should think first of the definition of the 3 components of seascape, namely **sea, coastline** and **land**. Sea and land are defined using inter-visibility criteria (see later discussion on ways of doing this). The coastline component is defined using landscape (rather than visibility) criteria. Baseline studies record primary (first hand survey) and secondary (taken from other studies) information about that site. In all, this should describe the various factors that combine to form seascape.

Baseline information for defining the **sea** and **land** component areas is therefore:

- The coastline (Mean High and Low Water) (available from Ordnance Survey);
- Contour modelling of the landscape (Ordnance Survey have a contour model at 10m vertical interval). The sea is assumed to be flat for the purpose of calculations; and
- An analysis of coastal inter-visibility.

Baseline information for the coastline component is more complex, and does not just include areas with land-sea inter-visibility. The definition of the coastline component includes:

- The inter-tidal area (but see 4.2.1 below);
- Landscape types that are closely related to the coastline in their evolution (whether due to natural or human processes) e.g. sand dune systems, holiday resort development;
- A notional strip of land, say within 500m of the coastline, where noise, smell and other exposure to the sea is assumed to be greatest.

Baseline information sources for offshore wind farm SVIA should include the following.

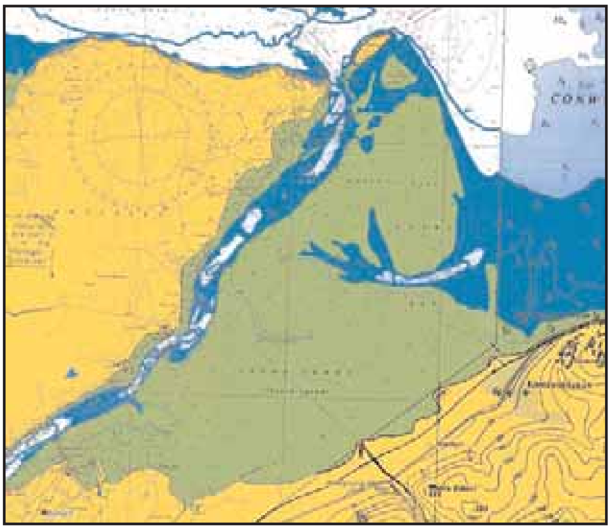
4.2.1 Admiralty Charts

The UK Hydrographic Office produce standard Navigational Charts at a range of scales to suit the requirements of professional, commercial and recreational navigators. Chart detail is governed by scale as follows:

- Large Scale - charts covering harbours, anchorages and navigational hazards.
- Medium Scale - charts for coastal navigation.
- Small Scale - charts for offshore navigation and passage planning.

This approximately coincides with the different levels of detail required for seascape assessment at Local, Regional and National scales respectively.

Figure 4: Admiralty Chart and OS Map comparison



Source: CCW © British Crown Copyright. This product has been derived, in part, from Admiralty charts and publications with the permission of the UK Hydrographic Office and the Controller of Her Majesty's Stationery Office. All Rights Reserved. NOT TO BE USED FOR NAVIGATION.

In addition, the detail on admiralty charts shows wrecks, submarine contours, light houses, buoys and any other fixed location objects in the water. They also show locations of tidal rapids and whirlpools. Locations of wrecks, although under water in many cases, can be sensitive historic locations to avoid disturbing[7], and Admiralty Charts show an indication, depending on scale, of visually prominent coastal landscape features of relevance to marine users, such as light houses and other prominent landscape features (e.g. church spires) that can be used for navigation. This allows some consideration in assessment of the subjects of sea to land views, without the need for boat hire. The charts also show the locations of slipways, areas where boats tend to moor, and boating facilities.

There are two crucial points to note on their use:

- They are projected differently to Ordnance Survey maps, so joining these to O.S. maps is difficult. Although computer GIS programmes can alter this projection to match O.S, there is typically some visually noticeable margin of error.
- The inter-tidal area shown on Admiralty Charts, which is shown as Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS), can differ considerably from what is shown on the Ordnance Survey, which is shown as Mean High Water (MHW) and Mean Low Water (MLW). It means, for example, that in areas with large sand flats, such as off Anglesey in North Wales, Puffin Island is apparently out in the sea on O.S. maps, but according to Admiralty Charts it is nearly joined to mainland Wales at low tide, as shown in Figure 4.

4.2.2 Current and Historical Ordnance Survey (OS) Maps

Given the size of the study areas for offshore wind farm SVIA, a range of OS map scales will be needed, ranging from 1:25,000 explorer, 1:50,000 landranger to 1:250,000 scale. Historical maps are available from Local Libraries, digital historical map archives on the web and suppliers such as Landmark information group. Landmark provide a series of historical Ordnance Survey maps (available at 1:10,560/1:10,000, 1:2,500 and 1:1,250 scales) dating back to the late 19th century, which can be compared and overlaid with the current National Grid so that historical map features can be accurately identified and located on the modern mapping.

7 (More detailed locations and information on historic features in the sea can be obtained from English Heritage or Cadw in Wales.

4.2.3 Aerial Photography

Aerial Photography shows much additional detail, particularly in relation to natural patterns of geology, coastal processes and vegetation, which Ordnance Survey maps may not show. Aerial photographs are available (taken in year 2000) at screen resolution to preview at standard scales from 1:5,000 to 1:200,000 at www.multimap.com, and facilities exist there to purchase higher resolution images, once preview selections have been made. Facilities for previewing and purchasing aerial photographs online are also available at www.emapsite.com. Aerial photographs show a remarkable amount of additional detail over the Ordnance Survey maps. For example they show colour, texture, sand banks, changing courses of river, internal workings of quarries and other places usually missed from maps, the patchwork of vegetation growth, direction of angle of incidence of braking waves, cloudy water plumes from outfalls and rivers, and encroachment of grass onto sand flats. They are also a completely accurate record of the area on the date photographed. However they do not usually show the lowest astronomic tide level. It is usually a matter of luck as to what tidal state is shown, and images at different tidal states may not easily join. To map the full tidal range it is necessary to consult Admiralty Charts instead (not Ordnance Survey maps).

Figure 5: FutureCoast Aerial Photograph Viewer

Screen shot of an oblique aerial photograph from the Futurecoast aerial photograph viewer © DEFRA

A continuous digital aerial video of the coast was collected, in April 2001 as part of the FutureCoast survey, to provide a baseline understanding of the current form of the coastline. In order to make this data set readily accessible, a map-based viewing system was used. Geo-referenced still images were extracted from the digital video at approximately 3-second intervals (ensuring an overlap between adjacent images), which were then linked to interactive mapping. The images can be accessed via overview and detailed mapping (as shown in Figure 5) and an animated sequence can be activated. This system allows ready viewing of any part of the England and Wales coastline, providing an invaluable tool for all consultants carrying out seascape and visual assessment.

Existing landscape character assessments provide desk information on coastal landscape forms, elements and features, views and qualities. The Countryside Character Network provides a searchable database of Landscape Character Assessments (LCA) in England. The database can be found at www.ccnetwork.org.uk/db/index.htm and contains both map and text-based search facilities, allowing exploration of the extent of LCA coverage across the whole of England. In Wales LANDMAP is the national information system, devised by the Countryside Council for Wales, for taking landscape into account in decision-making. It separates the landscape into five Aspects - geological landscape, landscape habitats, visual and sensory, historic landscape and cultural landscape. LANDMAP studies are undertaken by County or National Park throughout Wales. The five evaluated aspects, which comprise the full set of LANDMAP Information, are complete for 20 of the 25 Unitary and National Park Authorities. The Visual and Sensory Aspect may be the most relevant or 'lead' aspect to inform a seascape assessment as it is about the landscape as perceived. It is broadly equivalent to a mid-scale English county LCA. LANDMAP information for the baseline study component of the SVIA can be downloaded from www.ccw.gov.uk/landmap.

When existing landscape assessment information has been gathered, it is likely that it will not contain all the information necessary for a seascape assessment. In particular, the following information is unlikely to be included, and will need fresh collection:

- Coastal geometry of the seascape unit;
- Coastline form or classification;
- Information on the inter-tidal areas;
- Information about offshore islands, rocks, reefs, currents, tidal streams, anchorages, wrecks, lighthouses, shipping lanes and activities and functions of the sea component, such as dredging;
- Key views along and across the coastline, from land to sea and sea to land, and the degree of enclosure or openness of sea/sky horizon;
- Relative information about the level of development, remoteness and intactness of the natural and historic coastline environment; and

- Information on the exposure of different parts of the sea, in terms of how this has affected the character of the coastline.

Further guidance on collecting seascape information is given in Section 4.3 - seascape characterisation and baseline visual analysis.

Box 1: Using baseline information from existing landscape assessments in seascape assessment

There is little point re-collecting landscape baseline information already collected by others. Although its evaluation and analysis may be tailored to the needs of others, and may not be relevant for seascape assessment, baseline information, as matters of fact, should be just as valid. A seascape assessor should ensure the information being used is relevant, of an acceptable standard, and not out of date. The assessor must ensure that the supplied information is of an appropriate level of detail and focus, and at sufficient resolution to use in the seascape assessment.

If existing information does not pass this test, then fresh or "top-up" site survey will be needed. Referring to definitions of the 3 components of seascape, existing landscape character assessment information would be relevant in the coastline component, since the other two components are areas defined by inter-visibility between land and sea, and not by their character.

The seascape assessor should consider:

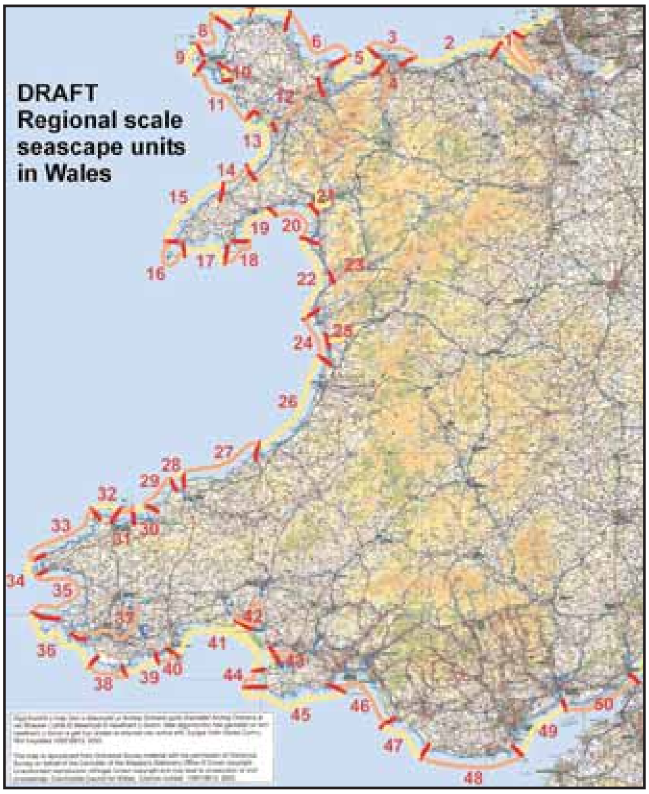
- Are there any existing landscape or seascape assessments available?
- Do they provide baseline survey information at sufficient detail to suit seascape needs (i.e. giving enough information about the landscape character of the coastline)?
- Are they reasonably up to date?
- Are they accurate and reliable enough for purpose? (Check with clients and users, or check samples on site, if necessary).
- For LANDMAP studies, have they been awarded Quality Assured Status? (a formal procedure for information accreditation).
- Do you have permission from the copyright owner to use the information?

Note that existing landscape assessments may just use the coastline as a boundary. The coastline itself may have very different character to the adjacent inland landscape. If an existing landscape assessment provides enough landscape detail, it may still lack coastline detail.

4.2.5 Existing Seascape Character Assessments

At present there are relatively few existing seascape assessments, although there are three pilot studies available in Wales for North Anglesey, Pembrokeshire and Swansea Bay[8, 9]. CCW has also estimated that the Welsh coastline could be split into 50 regional scale seascape units, and less than a dozen national units, as shown in Figure 6. It is recommended that these form the start point for boundaries of regional seascape units for offshore wind farm SVIAs in Wales. There are no similar draft seascape units for England at present.

Figure 6: Draft Regional Scale Seascape Units in Wales



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4.2.6 Inventories of Designated Landscapes

Inventories, management plans and datasets of statutory designated landscapes such as AONBs, National Parks and Heritage Coasts should be used to describe and map designated landscapes and seascapes with the study area. Datasets of boundaries are available for download from www.magic.gov.uk. AONB information is

8 Seascape Character Assessment Pilot Study: Swansea Bay and Pembrokeshire Coast (2000. Part of INTERREG Seascapes Project)

9 North Anglesey Seascape Character Assessment: Method, Trial and Recommendations (2001, Final Report to CCW by ECUS)

available from the National Association for AONBs www.aonb.org.uk and National Park information is available from the Council for National Parks www.cnp.org.uk

The Register of Parks and Gardens of special historic interest in England is maintained by English Heritage and published as a set of 46 county volumes. Copies of the relevant volume are held by the relevant local planning authority, and many Individual county volumes of the Register may be purchased from The National Monuments Record Centre. Further details on the register can be found on the English Heritage website at www.english-heritage.org.uk. Additionally in Wales there are the Registers of Historic landscapes, used as non-statutory material considerations in planning matters. They are available in 2 printed volumes or can be downloaded from http://www.ccw.gov.uk/ general info/index.cfm?Subject=Landscape&lang=en. In addition, CADW publish a guide to good practice in using the registers at www.cadw.wales.gov.uk/ default.asp?id=108. The guide contains a methodology for assessing the significance of the impacts of developments on historic landscapes (ASIDOHL) and should be used as part of the EIA process.

4.2.7 Development Plans

Local Plans, Structure Plans and/or Unitary Development plans for the area are available from the local authority, which show boundaries of non-statutory landscape designations and contain relevant land use planning policies for the coastline.

4.2.8 Non Statutory Planning Documents

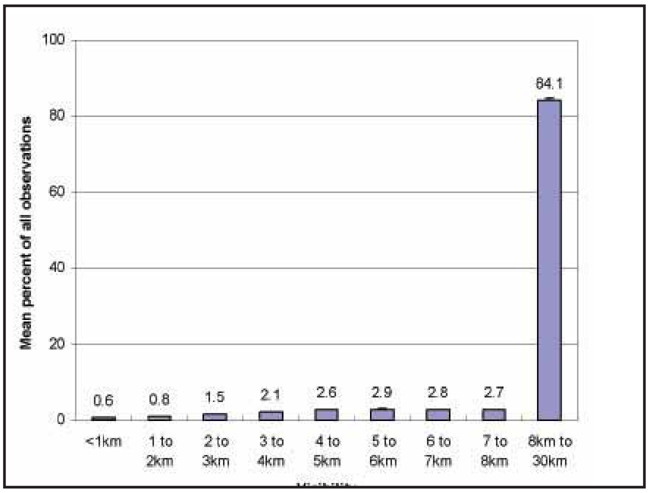
Landscape strategies, shoreline management plans (SMPs) and Integrated Coastal Zone Management Plans (ICZMs) such as those published by coastal partnerships and various coastal management groups.

4.2.9 Meteorological Office Data

Climatic and atmospheric conditions can affect visibility in a number of different ways, particularly in coastal situations. This has particular relevance when considering the likely visual effect of offshore wind farms. A suitable weather centre in the study area should be identified, and visibility data collected at that weather centre should be obtained from the Met Office. Visibility is assessed using a visiometer, which measures the transmissivity of a sample volume of air. This is converted into observational use into a visibility and reported in metres of kilometres. Data should be obtained for a 10 year period and visibility categorised into distance ranges, such as <1km, 1 to 2km, 2 to 4km etc. A frequency table can then be compiled revealing the total number of observations within each distance category at hourly intervals for each month.

This analysis should highlight trends in the visibility conditions of the study area, such as the distance category which has the most visibility observations recorded, and approximate number of viewing days lost to low visibility weather conditions. Visibility conditions may influence the duration of the effect of the offshore wind farm, and therefore the results of the visibility data should be used to inform the assessment of magnitude of change caused by the wind farm. An example of the raw visibility data available from the Met Office weather stations and a summary of visibility frequency interpreted from this data is shown in Figure 7.

Figure 7: Met Office Visibility Data



Source: Met Office

4.2.10 Other Sources

- Classifications of the inter-tidal area and natural processes - Various information on natural coastal forms and habitats, such as the directories of Coasts and Seas of the United Kingdom - Coastal Directories (available at www.jncc.gov.uk/communications/ pubcat /c_dirs.htm) and the CCW phase 1 intertidal survey work (available at http://www.ccw.gov.uk/ generalinfo/ index.cfm?Action=ResourceMore&ResourceID=62&Subject=Marine&lang=en);
- Activity surveys and tourist information;
- Historic and cultural guides;
- Conservation information. Archaeology, cultural heritage, buildings and other conservation interests; and
- Common land and Rights of Way and National Trail maps.

Baseline studies for seascape simply represent the extent and nature, and accepted values of the resource. They do not attempt to evaluate the resource, although where relevant they may record the values of others, e.g. from public surveys, or to record designations (such as National Park) which represent value that society attaches to a particular place for particular planning reasons. Presenting clear and impartial baseline information provides transparent reference for the later stages of the SVIA. Presenting baseline information is important to enable both public and professional scrutiny, and is necessary to demonstrate objectivity.

In addition, the baseline provides a starting point for anyone else to carry out their own analysis, using their own parameters. Sometimes a particular user will need a particular type of baseline information that has not been collected as core baseline information. It is important that consultation is carried out before the specification of the collection of baseline information is finalised, as it could be expensive to repeat site visits later, just to collect a small additional amount of information. Increasingly, remote sensing (e.g. taking information from maps, aerial photos and satellite images) is being used to efficiently and impartially collect and update various baseline data. This is discussed further in Section 4.3.3.

Baseline information collected should then be used in the process of seascape characterisation and baseline visual analysis.

4.3 Seascape Characterisation and Baseline Visual Analysis

The baseline study requires a variety of information on the landscape and seascape resource that exists in the study area. For development planning decisions, the competent authority needs to know what makes one coastal area similar, or different, or special when compared to another, so that judgements can be made on the location, design and acceptability of the proposed offshore wind farm development.

Seascape characterisation is the recommended method to provide a robust baseline from which to assess seascape and visual effects of proposed offshore wind farms. In seascape assessment it is possible to describe the perception of a place and explain why it is like that, in a value neutral way. If a preference for one resource or place when compared to another needs to be expressed, that is a separate and subsequent evaluation exercise as it involves attributing value judgements.

There are four main steps in the seascape characterisation process:

Stage 1: Define area of seascape unit;

Stage 2: Define characteristics of each seascape unit;

Stage 3: Define activities, visibility and views; and

Stage 4: Presentation of seascape characterisation and baseline visual analysis.

These four stages should be carried out within the study area identified for the SVIA. The method for carrying out a seascape character assessment is described under these four main stages as follows.

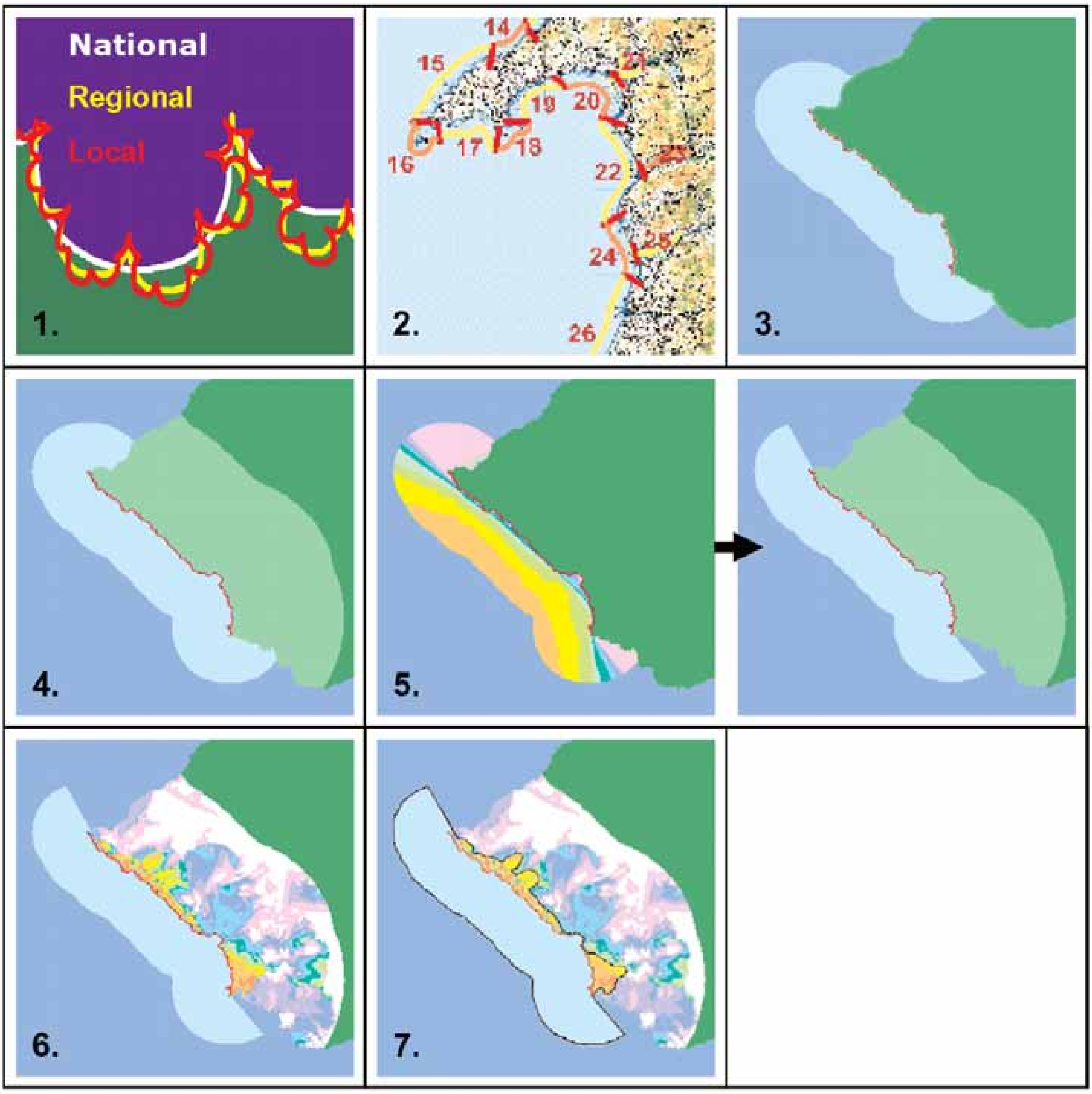
4.3.1 Stage 1: Define Area of Seascape Unit

The six main steps involved in defining the area of seascape units are as follows:

1. Define the scale for the project;
2. Mark the furthest extents of headlands at chosen scale;
3. Define a sea boundary that represents the 'limit of visual significance' out to sea;
4. Define a landward boundary that represents the 'limit of visual significance' in land;
5. Establish visibility splays at the edge of each unit - units defined by regional headlands;
6. Refine seascape unit by showing just those areas of land with inter-visibility of the sea inside the boundary lines; and
7. Produce final seascape unit boundary.

These are shown in Figure 8 and described as follows.

Figure 8: Seascape Characterisation Process



Source: Based on a method developed by Phil Marsh, at www.philmarsh.co.uk/temp/sscape_zvi.html

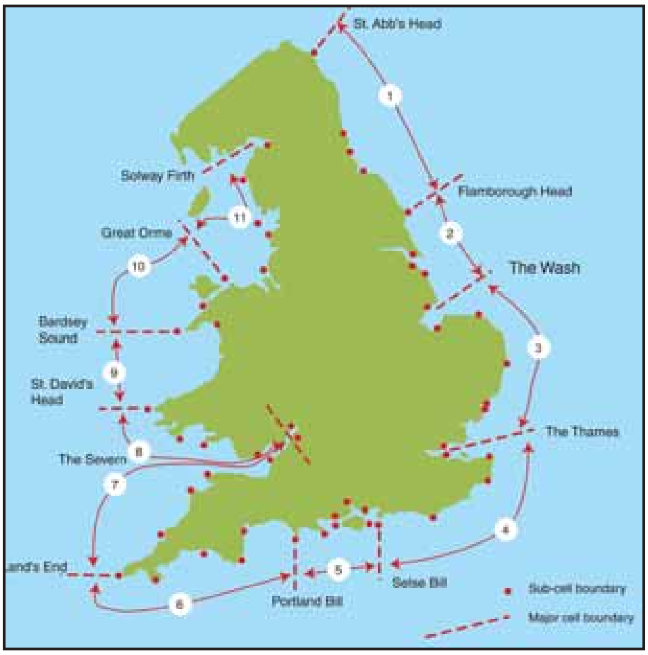
1. Define the scale for the project

The scale of the seascape characterisation should be defined, being either national (divisions between seascape units based on major headlands and peninsulas), regional (other prominent headlands) or local (many small bays and headlands). The GSA[10], is to date, the key work on the assessment of seascapes in the UK and advocates the following scales for seascape classification:

National Seascape Units

National seascape units are defined as "an extensive section of the coast with an overriding defining characteristic such as coastal orientation or landform, defined by major headlands of national significance". They can be in excess of 100km and will extend to 24km offshore. These national seascape units are based on major sediment cells for England and Wales, as shown in Figure 9.

Figure 9: Basis for National Units



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Regional Seascape Units

Regional seascape units are the most appropriate scale for SVIA of offshore wind energy developments. Regional seascape units are subdivisions of National Units defined by regional headlands, island or coastal features, such as those shown for Wales in Figure 6. For offshore wind farm SVIA, these regional seascape units can extend up to a 35km seaward limit and have a landward boundary of approximately 10km, determined by land-sea inter-visibility. This guidance focuses on the definition of regional seascape units, and the subsequent characterisation of the seaward, coastline and landward components.

Local Seascape Units

Local seascape units are much smaller divisions, extending 2-3km offshore and not usually appropriate for assessing large developments such as offshore wind farms. Local scale units nest within regional, and regional within national.

Classification of seascape units around the Scottish coast[11] largely adopted the GSA[12] methodology but with some important modifications due to the complexity of the Scottish seascapes. Seascape divisions were formed on the basis of a combination of factors, including landscape/seascape character, viewsheds, aspect, coastal geometry and orientation and sedimentation units.

2. Mark the furthest extents of headlands at chosen scale

Marking the furthest extents of headlands at the regional scale breaks the coast into a series of mutually exclusive and jointly exhaustive lengths. Marking the furthest extent of headlands on an Ordnance Survey base map can be done manually, taking the Mean High Water (MHW) line, as the reference for the coastline. This method may be supported by field survey analysis. The following illustration shows how headlands help to define the scale of seascape unit.

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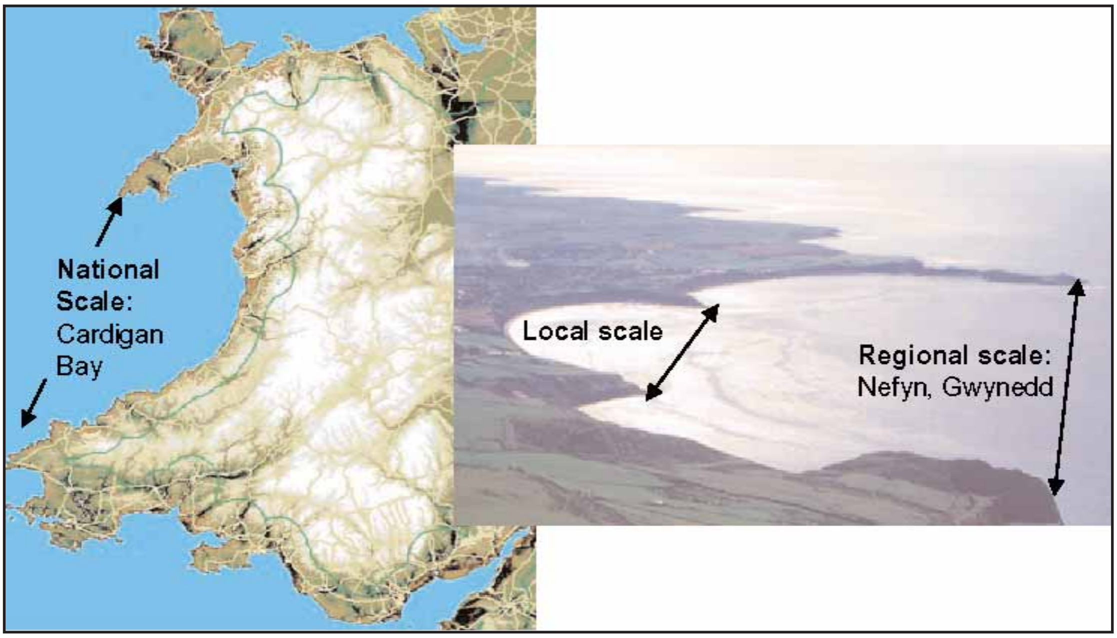
10 Hill, M., Briggs, J., Minto, P., Bagnall, D., Foley, K. & Williams, A. (2001). Guide to Best Practice in Seascape Assessment. Maritime Ireland / Wales INTERREG 1994 - 1999. Guide to Best Practice in Seascape Assessment (Countryside Council for Wales, Brady Shipman Martin and University College of Dublin, 2001)

11 An Assessment of the Sensitivity and Capacity of the Scottish Seascape in Relation to Offshore Windfarms (Final Report July 2004, SNH Commissioned Report niversity of Newcastle)

12 Hill, M., Briggs, J., Minto, P., Bagnall, D., Foley, K. & Williams, A. (2001). Guide to Best Practice in Seascape Assessment. Maritime Ireland/Wales INTERREG 1994 - 1999. Guide to Best Practice in Seascape Assessment (Countryside Council for Wales, Brady Shipman Martin and University College of Dublin, 2001)

Figure 10: Definition of Seascape Unit Scale by Headlands



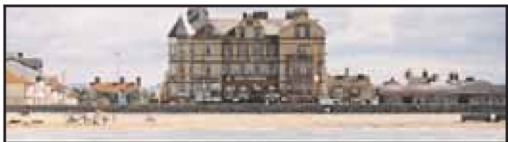
Source: CCW

3. Define a sea limit that represents the 'limit of visual significance' out to sea

Plot a distance out to sea that represents the 'limit of visual significance'. The main existing guidance on defining the limit of visual significance is contained in the GSA[13], with further information offered by CCW (notes by John Briggs, May 2003).

A suite of visual significance limits was proposed in the GSA to particularly apply to offshore wind farms. This was referenced from several studies based on how the discernible level of detail on a landscape diminishes with distance. Close to the shore, the immediate coastline and hinterland are visible, and the height of cliffs and coastal landforms can mask views of higher hills inland. However, at 15km out to sea, the perspective is somewhat flattened, and higher inland hills are seen above coastal landforms. These effects are illustrated in Figure 11 at Rhyl.

Figure 11: The Effects of Distance on Limits of Visual Significance at Sea

	Close to shore, coastline and edge dominates the view, masking views of what lies further inland.
	At about 1km from shore, coastline recedes revealing hills inland.
	Between 3 and 5km from shore, the details of the coastline itself have become small and indistinct except for landmarks.
	At 15km away the earth's curvature hides low lying land, leaving just the hills and showing little other detail.

Source: CCW

13 Hill, M., Briggs, J., Minto, P., Bagnall, D., Foley, K. & Williams, A. (2001). Guide to Best Practice in Seascape Assessment. Maritime Ireland/Wales INTERREG 1994 - 1999. Guide to Best Practice in Seascape Assessment (Countryside Council for Wales, Brady Shipman Martin and University College of Dublin, 2001)

When defining a limit of visual significance for the seaward boundary of a seascape unit, the limit of visual significance of the offshore wind farm should also be considered. The main existing guidance on significance limits for offshore wind farms is contained in the DTI funded Offshore Wind SEA Environment Report[14], and in the Assessment of Sensitivity and Capacity of the Scottish Seascape[15].

After having considered existing guidance on limits of visual significance of offshore wind turbines, the likely development scenarios for future offshore wind projects (the largest projects involve turbine numbers in excess of 200 turbines) and the effects of curvature of the earth on turbine visibility, it is recommended that a 35km seaward limit of visual significance is appropriate for regional seascape units in Round 2 offshore wind farm SVIAs. This is considered to be the outer limit of potentially significant effects. It does not imply that significant visual effects will necessarily occur at this distance as significant visual effects are more likely to occur much nearer the coast. The limit of visual significance should be assessed on a project by project basis depending on the number and dimensions (height) of turbines proposed.

4. Define a landward limit that represents the 'limit of visual significance' in land

Apply a landward limit, using a similar logic to that applied to the seaward line. The landward and seaward limits of the seascape unit may be set at different distances, although it is likely that the landward limit will be shorter than the seaward, for example a 10km landward limit was applied in the Scottish seascapes study[16]. The combination of a length of coastline, an area of sea and an area of land forms the broadest definition of a seascape unit. However, this broad definition should be further refined by establishing the visibility splay at the edge of each unit and showing just those areas of land with visibility of the sea inside the seascape unit limits.

5. Establish visibility splays at the edge of each unit - units defined by regional headlands

The visibility splay at the end of each seascape unit should be determined using inter-visibility analysis software in order to remove the chance of subjectivity. It is recommended that the extent of visibility splays should be defined by recording the numbers of land-sea views available. This is shown in Figure 8 using different colours. Small numbers of views are shown in pink, which coincide with those wrapping entirely round headlands. Due to their small number it can be argued that these are not representative, thus the remedy could be to ignore these when defining the limit of the splay as shown in Figure 8.

6. Refine seascape unit by showing just those areas of land with inter-visibility of the sea inside the seascape unit limit

The definition of the seascape unit shown in Figure 8 should be further refined by showing just those areas of land with inter-visibility of the sea inside the seascape unit limit. Having defined the sea area, it is possible to calculate its theoretical visual envelope on land. It is recommended that the inter-visibility calculation used includes all points of the sea area (not just sample of points or lines parallel to the shore). Areas with extensive sea views are highlighted (in red, orange and yellow in Figure 13) by an estimate of the proportion of the sea area that is visible on land. When defining the landward boundary contours will define those areas that look into each individual unit, although it is acknowledged that there will be inter-visibility between the two adjoining units.

There can be a very high degree of overlap between the visibility of one seascape unit and another, both landwards and seawards. Many coastal locations have land to sea views as part of more than one seascape unit, as shown in Figure 12. These are least likely to occur where short distance land-sea views are recorded, however at greater distances there is an increased occurrence of overlapping views between seascape units.

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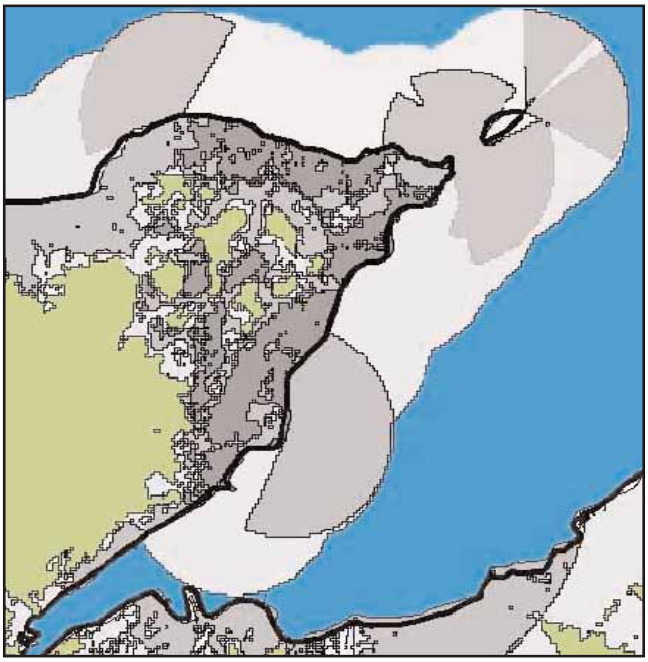
[14] Environmental Report: Offshore Wind SEA (BMT Cordah for DTI, July 2003)

[15] An Assessment of the Sensitivity and Capacity of the Scottish Seascape in Relation to Offshore Windfarms (Final Report July 2004, SNH Commissioned Report/University of Newcastle)

[16] An Assessment of the Sensitivity and Capacity of the Scottish Seascape in Relation to Offshore Windfarms (Final Report July 2004, SNH Commissioned Report/University of Newcastle)

Figure 12: Overlapping Visibility of Seascape Units



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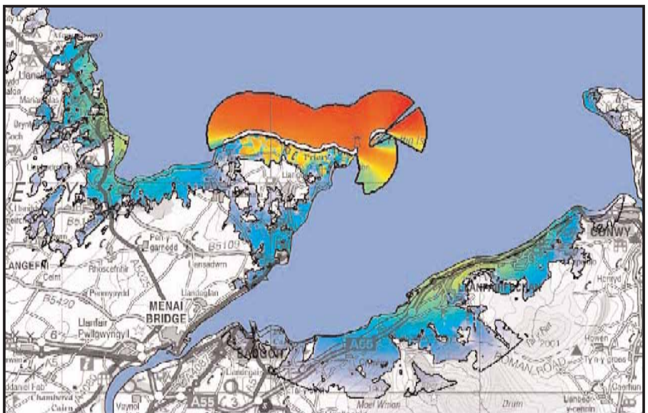
7. Produce final seascape unit boundary

In order to reduce the landward area of the seascape unit, and avoid the effect of visibility spill over wide areas, it is recommended that views available below a certain threshold should be ignored when forming the final boundary of the seascape unit. This is illustrated in Frame 7 of Figure 8, and Figure 13, which illustrates the areas with extensive sea views where greens and blues represent only a small amount of land-sea inter-visibility, whilst orange and reds represent most. The pattern of most inter-visibility being on land, closer to the sea component is therefore used to define the extent of the landward component.

Figure 13: Land - Sea Inter-visibility



NB - This illustration shows a local seascape unit. There will be an important scale difference in delineating the seaward limit of regional seascape units, but the principle of using the amount of land-sea inter-visibility to define the landward boundary may be applied in a similar manner.

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The severity of the cut off can be adjusted to suit, but it should be applied consistently to all seascape units once established. Some generalisation of the boundary lines may be appropriate in response to the prevailing landscape character, rather than necessarily following the exact boundary of an inter-visibility threshold.

4.3.2 Stage 2: Define Characteristics of Each Seascape Unit

Define seascape characteristics

Each seascape unit will have distinct seaward, coastline and landward components. Stage 2 is the characterisation stage, which defines and describes a seascape unit in a way that shows how one area is distinct from another. This is expressed visually through patterns of inter-visibility of land and sea components, but also through the landscape character of the coastline component. This can be expressed in part through conventional LCA techniques, guided by the LCA guidance[17] which places an emphasis on robust characterisation at the baseline stage in order to make judgements based on landscape character. However, with seascape characterisation, additional information is needed to account for the distinctiveness of the coastal edge. In particular, the patterns of coastal geometry, affected by natural processes, give rise to patterns of sea horizons, sheltered and exposed coastline, developed and undeveloped and so on.

Existing landscape character assessments should be used to help the description of the character of seascape units. Seascape distinctiveness centres on coastline character, plus a land and sea visual setting. It is possible that within a single seascape unit, there will be more than one landscape character area which often reflects variety, or part of a particular pattern within that seascape unit. The existing character assessment will need to be reviewed in light of the seascape unit boundaries defined during stage 1, and the key characteristics of the seascape unit extracted to inform the seascape unit character description. The boundaries of coastal landscape character types such as sand dune systems, cliffs and harbour towns should be defined and used to inform the description of the seascape unit.

Existing baseline information should be used to inform characterisation, but alone it does not constitute an adequate seascape characterisation exercise. Characterisation in seascape requires a

[17] Landscape Character Assessment: Guidance for England and Scotland (Countryside Agency and Scottish Natural Heritage 2002)

field work stage to record and describe the distinct seaward, coastline and landward components of the seascape unit. Each has a very different character in landscape terms, and so it is relevant to support statements about seascape character with information on the contribution of each of these components. The field survey should record observations on the tidal dynamics, range and features to assist with the description of the seaward component. It should record observations on the coastline component, such as coastal geometry, scale of coastal features and form, the nature of the shore and any notable physical features, including settlements and onshore/offshore installations. The physical form of the surrounding landward component should also be recorded in the field, noting the main land cover and land use. A standard field survey form for seascape assessment is provided in the GSA[18].

Historic and cultural issues relating to the marine environment are a fundamental aspect of seascape character. It is not always necessary to carry out historic landscape characterisation in the coastal zone, but any such existing studies might have useful baseline information that could be uplifted to inform the description. A historic/cultural heritage study may often be a separate study in itself as part of the wider EIA. The SVIA should use such studies to inform the baseline seascape characterisation and to establish potential interactions between the effects on seascape and the historic/cultural heritage. Definitions of the historic and cultural seascape are provided in Appendix 3.

Define visual characteristics

Recording visual qualities and characteristics, using the principles of visual perception, assists with describing the seascape unit and the perception of place (how we perceive it). For clarity and consistency a suite of principles has been developed to structure site survey work. The principles, as shown in Box 2, are based on those described as "principles of design", used in SNH Guidance[19] and in some Scottish landscape character assessments, so precedents for their use have already been set. This work can only be done effectively during field survey, and should be carried out during steps 1-4 of stage 2 at notable viewpoints with land-sea views, across sea to land and from sea to land. The following principles considered most relevant to SVIA, should guide site assessment visits. A full list of these principles can be found in the Skye and Lochalsh Landscape Assessment[20].

18 Hill, M., Briggs, J., Minto, P., Bagnall, D., Foley, K. & Williams, A. (2001). Guide to Best Practice in Seascape Assessment. Maritime Ireland/Wales INTERREG 1994 - 1999. Guide to Best Practice in Seascape Assessment (Countryside Council for Wales, Brady Shipman Martin and University College of Dublin, 2001)

19 Guidance on the Environmental Impacts of Wind farms and Small Scale Hydro-electric Projects (Scottish Natural Heritage 2001)

20 Skye and Lochalsh Landscape Assessment (Caroline Stanton for SNH, 1996)

Box 2: Principles of visual perception

1. Clarity and harmony
Clarity is our preference for an image to be clear of doubt or confusion. Harmony relates to our finding the composition of the image to be balanced. A balanced image is more attractive to us because there is more symmetry in it.

2. Colour and contrast
Colour has symbolic meaning as well as reinforcing sense of place, particularly in relation to culture, light, geology, vegetation and tradition of built structures. In the sea, where colours relate more to the sky, moderated by atmosphere, weather and light, it is hard to find one colour to suit all conditions.

3. Scalability
Where there is little or no indication of depth in a landscape or seascape, the properties of distance, scale and dimension may become less distinct. One of the fundamental qualities of the sea is that being devoid of "scaleable" features like buildings or trees, it is very difficult to judge distance to a point in the sea.

4. Form and shape
Form is the 3 dimensional surface and structure of something as distinguished from its substance or material. Shape is just the 2 dimensional outline of something as viewed from a particular place. So the shape may change with viewer location, but form will not.

5. Order
Order is a state in which elements and features are arranged in a logical, comprehensive or natural way. It is achieved when the visual forces in a landscape or seascape can be clearly discerned or when there is no doubt about the relationship of elements to each other.

6. Orientation
The visual composition of a landscape will affect how direction and location is indicated to a viewer, by the presence of landmarks and reference elements (features). In a seascape, the coastline landscape usually provides the features to enable orientation, but the undeveloped sea contrasts in being completely free of such indicators.

7. Points and lines
Points mark a position in space. They have no length, width or depth and are visually static, directionless and centralised.

A line indicates the path of a point in motion; it often links and intersects other visual elements, describes edges, or gives shape and articulation to the surface of planes.

In a seascape, the sea/sky, and land/sky horizon lines, and the coastline are often the most prominent lines, and the convergence of the three is often the most prominent point.

8. Scale and proportion
Scale alludes to the size of something compared to a reference standard, or to the size of something else. In contrast, proportion refers to the proper harmonious relation of one part to another, or to the whole; its relationship may be one of magnitude, but also of quantity or degree.

9. Visual Movement
Lines guide our visual movement and direction. By contrast points are static and disrupt this. Lines and points affect where we focus our attention in views - points being the subjects and lines being how we find the points. Points on lines can therefore appear more prominent by attracting our attention more easily. Visual movement can draw the eye down convex slopes and up concave ones, the strength of this depending on the scale and irregularity of the landform.

This list of principles is equally applicable to any environment, whether landscape or seascape, as it concerns what we perceive. However the importance of the individual visual qualities or characteristics as experienced will differ between environments. The sum of all these qualities should account for the "local distinctiveness". In that sense it represents the visual character of the place. This baseline will be useful in the design process when the effects on key views are considered.

4.3.3 Stage 3: Define Activities, Visibility and Views

This stage involves a visual analysis of the visibility in each seascape unit and identification of viewpoints and key views from land to sea, along the coastline and from sea to land. It is mainly a site based activity, although information should be collected in a structured way, marking up maps on site and recording observations in a survey record.

1. Record activities and functions in seascape unit

Recording activities and functions in seascape helps us to understand human pressures on seascape. It also tells us who uses the coastal zone and how. This helps us to understand user requirements and expectations of space, infrastructure and environment, and informs the identification of important visual receptors. Activities and functions of each seascape unit should be recorded using the standard field survey form and if appropriate mapped to show spatially theoretical zones in which it anticipated that such activities would concentrate. These activities and functions in seascape vary according to seascape component - sea, coastline and land.

Examples of activities and functions in the sea, coastline and land components generally fall under the headings shown in Table 1.

Table 1: Activities and functions in seascape

Activities and Functions in the Sea Component				
Recreation	**Shipping**	**Commercial**	**Fishing**	**Others**
Angling	Commercial shipping	Extractive oil or gas	Trawler	Military
Cruising	Ferry shipping	Extractive rock or sand/gravel	Net	
Wind surfing	Cruise shipping	Power - wind Power - wave	Fish farming	
Boat trips	Private	Testing/drilling	Mussel rafts/beds	
Jet skis, sail boards, kite boards	Research and marine monitoring	Waste and dumping		
Day sailing	Pilot, tug or rescue			
Water skiing				
Competitive sailing				
Surfing				
Canoeing				
Diving				
Activities and Functions in the Coastline Component				
Recreation	**Transport**	**Collecting materials** **Sand, shells and gravel**	**Fishing and food**	**Others**
Walking, jogging or cycling	Docking, harbouring, mooring, launching	Sand, shells and gravel	Fishing ports and associated activities	Military e.g. shooting ranges
Bathing or swimming	Boat maintenance	Turf (high quality)	Tidal netting and weirs	Tidal power production
Promenades and associated entertainments and shops	Roll-on/roll-off ferry ports and associated activities	Coastal rock quarrying	Gathering culinary plants and seaweed	Nuclear and other power plants
Rock climbing		Salt	Pier and jetty line fishing	Settlement lagoons (industrial)
Horse riding		Seaweed	Bate digging/cockling	Providing a physical barrier from the sea (function rather than activity)
Exploring/rock pooling/bird watching				
Kite flying				
Sunbathing				
Activities and Functions in the Land Component				
Recreation	**Transport**	**Farming**	**Industry**	**Settlement**
Walking/open land	Arterial/trunk roads	Arable	"Heavy" industrial	Residential
Public woodland	Distributor roads	Pasture	"Light" industrial	Retirement
Cycling	Access roads	Woodland	Pylons	Hotel/B&B/guest house
Car parking	Railways - passenger	Heath and moor	Waste land	Holiday homes
Horse riding	Railways - freight		Cooling towers or other large infrastructure	Caravan sites and camping
Nature/bird watching	Railway stations and yards, storage and distribution yards		Storage and distribution yards	Schools, colleges, universities and education
Go-kart or stock car racing	Cycle ways/Main footpath routes		Extractive industry	
Sports areas	Airports			
No access (e.g. military)	Ports and ferry terminals		Construction sites	

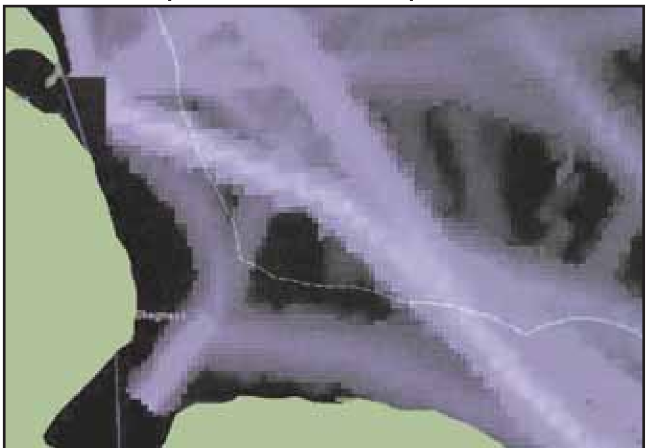
Activities and functions in the sea

Most activities in the sea are mobile, and as such the boundaries for such activities may be difficult to map. Activities are also transient, and may not be taking place at the time of a site visit, and in any case a single time snapshot will not show patterns of activity and movement. There are ways to overcome this by using the following methods of assessment:

- Remote sensing information, collected over a period of time;
- Spatial theories to represent the expected extent of different activity types;
- Site observation of indicators of activities;
- Desk based information on areas of the sea zoned to accommodate particular functions; and
- Marine vessel traffic survey database - current DTI project which is establishing a comprehensive marine traffic database of Round 2 strategic areas that can be readily linked to a Geographic Information System (GIS) and queried to provide both graphical and tabular information relating to the density, disposition, type and movement of vessels within a user-defined search area[21].

Using remote sensing information, maps may be created showing certain activities in a given seascape area over a period of time. These represent spatial zones in which it is anticipated that activities would concentrate. An example of a remote sensing map of activities in the sea component of seascape unit is shown Figure 14.

Figure 14: Remote Sensing Map of Activities in the Sea Component of a Seascape Unit



Images are taken from Satellites, recording the locations of boats in the sea, repeatedly over an extended period of time. Each dot that would represent a boat is multiplied many times, and at different locations across the map area, resulting in these patterns showing the main shipping lanes.

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21 Marine Vessel Traffic Survey Database (DTI) available at www.dti.gov.uk/renewables/renew_2.1.3.7.htm

An example of a theoretical spatial map to show the extent of different inshore recreational activities is shown in Figure 15.

Figure 15: Spatial Map of Inshore Recreational Activities

The information may not be completely accurate, but in the absence of better information this technique allows a spatial representation of activities. Such a map may be created in the knowledge that certain activities take place in this seascape unit, to represent spatial zones in which it is anticipated that such activities would concentrate. Assessments that fail to take account of such known activities, simply because of a lack of quantitative survey data, would risk missing important information.

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Activities and functions along the coastline

The coastline (including the inter-tidal area) is often a focus for recreational activity. Activities and functions on the coastline will depend heavily on accessibility and coastal form. Accessibility is influenced by the proximity of the coastline to towns, main roads and railways, coastal footpaths and car parking. Land ownership may also restrict access to the coastline. The status and water quality of beach, such as Blue Flag/Green Coast beaches, may encourage greater recreational activity at the coast. Activities and functions are also determined by the coastal form and topography. For example, sandy beaches encourage beach recreation whereas rocky cliffs prevent it, and shallow water encourages access to open water but restricts boat access.

Activities and functions of the landscape in the coastal zone

In seascape assessment, the land component is defined visually. The relationships between activities and functions of the sea will primarily fall within the coastline component. However there is also likely to be a strong link between the activities and functions and the sea in the wider visual setting of the coastline (the land component). In Wales, for example, most main towns and industrial areas are within 10km of the coastline, particularly concentrated along the lowland coastal strips of the north and south coasts. The coastal strip enables, in the main, easier transport routes and a milder climate than further inland. This means many people live within 10km of the coast, and the supporting shops, services and facilities that towns require often concentrate in this area.

Fortunately for seascape assessment, information on activities and functions in the landscape are already likely to be well documented, in land-use maps, aerial photographs, local plans and existing landscape assessments. It is the role of the assessor to pull out of these information sources the important elements relevant to seascape assessment.

2. Identify and describe views from land to sea

Having calculated the theoretical visual envelope of the sea on land during stage 1, and highlighted those areas with extensive and more important sea views, the next step should be to analyse the visibility and views of the sea in the field. These include fixed viewpoints such as hill tops, and tourist car parks, travelling views such as those from promenades, coastal roads and coastal footpaths, and views from certain general areas of ground such as publicly accessible hillsides, beaches and dune systems. Particular views, including sea, coastline and land, showing distinctive and unusual seascape character are especially important. Likewise, views from designated landscapes such as National Parks, AONBs or Heritage Coasts will be of particular importance. These viewpoints should be described and annotated on maps to assist with the description of seascape characteristics in stage 3 and to form the basis of the viewpoint list for the impact prediction and evaluation stage later on. The majority of the viewpoints for the viewpoint assessment of a proposed offshore wind farm should be from land to sea.

3. Identify and describe views from coast across sea to land

Where coastline is concave or where there are islands, views may be seen across sea to more land. These views can be analysed in terms of the shapes and levels of details seen as well as in terms of form and content.

4. Identify and describe distant views of the sea from landward component

When carrying out the analysis of visibility and viewpoints in the field survey, more detailed consideration should be given to the areas with a small number of sea views, beyond the landward boundary of the seascape unit. The sea may still be an important part in distant views from land, despite there being a relatively small number of views available overall. This may occur, for example, around a particularly distinctive topographic feature such as a mountain or ridgeline, which is not strictly part of the seascape unit due to its distance from the coast, yet offers important panorama views that include the coast. The view from further inland will be of a much larger area of sea, and therefore any objects within it are likely to be a much smaller element in the overall view, and so may be beyond the limit of visual significance, however this should be given due consideration in the SVIA.

5. Identify and describe views from sea to land

Views from the sea to land are important to record and experience in SVIA of offshore wind farms. The sea is the essential element in seascapes and in order to ensure completeness, visual analysis of the seascape unit from the sea should be undertaken. A boat excursion out to sea and along the coastline would be ideal, but weather and resources for SVIA of an offshore wind farm are likely to constrain access to the water, and programmes and budgets should be prepared to allow for these contingencies if possible. The benefits of carrying out visual surveys from the water cannot be overrated. On land a site visit to a proposed wind farm location would be undertaken as a matter of course. On the sea, it is more difficult to reach the site location, but it provides an appreciation of which parts of the land can be seen at different distances out to sea and informs the definition of limits of visual significance. Admiralty Charts also show land features prominent from sea, which are helpful where a boat trip is not possible. A cost / benefit analysis should be undertaken to evaluate whether going out to sea has sufficient benefit for the SVIA. The outcome is likely to depend on how far inshore the turbines are proposed and how surrounded the development site would be with other land and islands.

When close to shore the immediate coastline and hinterland is visible, however at 20km out to sea, the perspective is somewhat flattened, and higher inland hills are seen above coastal landforms. These effects are illustrated at Rhyl in Figure 8.

6. Identify and describe views from sea to sea

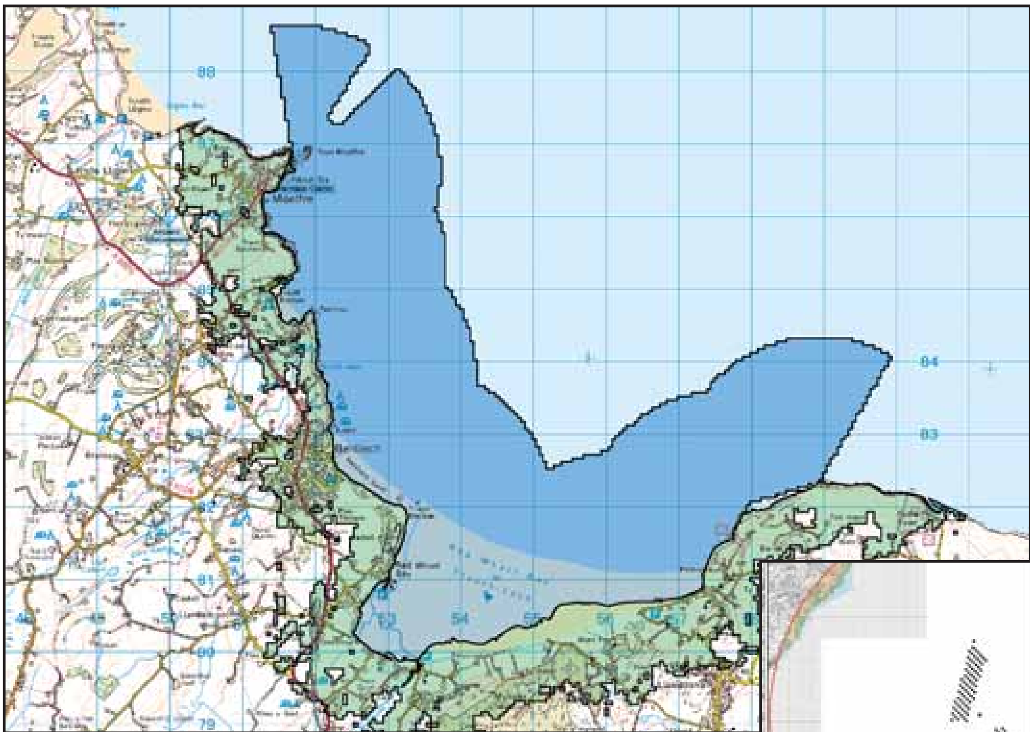
Views from the sea looking out to sea will, by nature, be uniform and simple in character, largely consisting of just two components - sea and sky, and the horizon line between them. Essentially all such sea to sea views are the same, and ubiquitous, and are unlikely to help with the seascape characterisation process, but they may be important to consider as viewpoints for sea based receptors engaged in commercial or recreational activities in close proximity to proposed offshore wind farms.

4.3.4 Stage 4: Presentation of Seascape Characterisation and Baseline Visual Analysis

The end product of the seascape characterisation and visual analysis is a map of one or more seascape units showing their subdivisions into areas of different seascape character, together with a written description of that character.

Regional seascape units should be presented on maps individually or together with adjacent seascape units within the study area at a suitable scale. A 1:250'000 scale may be most appropriate to fit the study area and regional seascape units onto an A3 page, supported by more detailed individual seascape unit maps using OS 1:50'000 base mapping. Illustrative examples of presenting seascape units are provided in Figures 16 and 17.

Figure 16: Red Wharf Bay Local Seascape Unit



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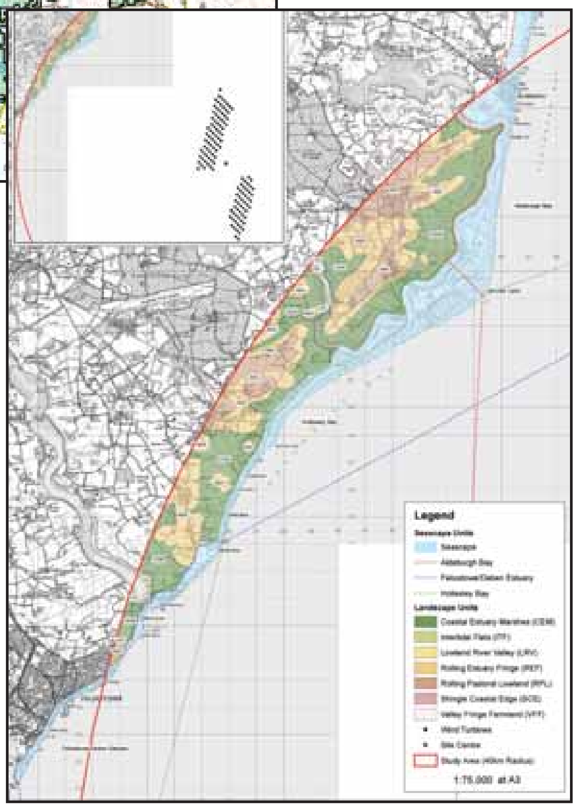


Figure 17: Greater Gabbard Offshore Wind Farm - Regional Seascape Units

Source: Greater Gabbard Offshore Wind Ltd

Baseline studies of existing landscape, seascape and visual resources: Summary

Baseline information sources for seascape assessment

- Admiralty Charts
- Current and Historical Ordnance Survey (OS) Maps
- Aerial Photography
- Existing Landscape Character Assessments
- Existing Seascape Character Assessments
- Inventories of Designated Landscapes
- Development Plans
- Non Statutory Planning Documents
- Meteorological Office Data
- Classifications of the inter-tidal area and natural processes
- Activity surveys and tourist information;
- Historic and cultural guides;
- Conservation information. Archaeology, cultural heritage, buildings and other conservation interests; and
- Common land and rights of way maps.

Seascape Characterisation and Baseline Visual Analysis

There are four main steps in the seascape characterisation process:

Stage 1: Define area of seascape unit;

- Define the scale for the project;
- Mark the furthest extents of headlands at chosen scale;
- Define a sea boundary that represents the 'limit of visual significance' out to sea;
- Define a landward boundary that represents the 'limit of visual significance' in land;
- Establish visibility splays at the edge of each unit - units defined by regional headlands;
- Refine seascape unit by showing just those areas of land with inter-visibility of the sea inside the boundary lines; and
- Produce final seascape unit boundary.

Stage 2: Define characteristics of each seascape unit;

- Define seascape characteristics; and
- Define visual characteristics;

Stage 3: Define activities, visibility and views

- Record activities and functions in seascape unit;
- Identify and describe views from land to sea;
- Identify and describe views from coast across sea to land;
- Identify and describe distant views of the sea from landward component;
- Identify and describe views from sea to land; and
- Identify and describe views from sea to sea.

Stage 4: Presentation of seascape characterisation and baseline visual analysis.

Baseline studies of existing landscape, seascape and visual resources: Key Guidance

- When carrying out the baseline study, a rationalisation process should be undertaken to focus the direction and content of the baseline assessment to meet the needs of the development proposal and to the subsequent evaluation of seascape and visual impacts which have potential to be of significance;
- Regional seascape units are the most appropriate scale for SVIA of offshore wind energy developments. This guidance focuses on the definition of regional seascape units, and the subsequent characterisation of the seaward, coastline and landward components;
- It is recommended that a 35km seaward limit of visual significance is appropriate for regional seascape units for Round 2 offshore wind farm SVIAs;
- A 10km landward limit is recommended, which should be refined to show just those areas of land with inter-visibility of the sea;
- Vast tracts of land may have sea views of the defined seaward component of the seascape unit. There can be a very high degree of overlap between the visibility of one seascape unit and another, both landwards and seawards;
- Computer analysis can determine visibility splays caused by headlands, and distinguish between mere inter-visibility and the main concentrations of views;
- Do not mistake this analysis of land-sea inter-visibility for a zone of theoretical visual influence (ZTV) of an offshore wind farm site, it is a stage in defining the landward visual setting of a section of coastline, not a ZTV;
- Do not mistake the concentrations of views as the places where visibility is most sensitive;
- Seascape unit boundary lines may be generalised according to inter-visibility patterns.
- Prevailing landscape character is a separate consideration that is better shown as a separate overlay, so as not to confuse ‘inter-visibility’ and ‘character’ based considerations;
- Existing landscape character assessments should be used to help the description of the character of seascape units, however characterisation in seascape requires a field work stage;
- The boundaries of coastal landscape character types should be defined and used to inform the description of seascape units;
- Recording visual qualities and characteristics, using the principles of visual perception, assists with describing the seascape unit and the perception of place;
- Activities and functions of each seascape unit should be recorded using the standard field survey form and mapped to show zones in which activities would concentrate; and
- The visibility and key views of the sea from the landward, coastline and seaward components of the seascape unit should be identified and analysed as part of the baseline study.

5. ASSESSING SENSITIVITY

Once the baseline data has been compiled, and the seascape characterisation and baseline visual analysis completed, the next step is to assess the sensitivity of the seascape to change, and to consider its value and capacity to accommodate change. This stage of making judgements based on seascape character is essential for the subsequent evaluation of the significance of predicted impacts.

The assessment of sensitivity is the point where the seascape assessment process moves from non-judgemental descriptions and analysis of what is there, to making judgements and taking decisions for planning and future change in seascape. Seascape assessment is a structured, criteria based way of making judgements to inform decision-making, based on robust baseline information, although a precautionary approach22 is advocated. The sensitivity of particular areas of seascape, coast or adjacent land should be identified and assessed. In SVIA reports, the assessment of sensitivity should be distinguished from the previous (non-judgemental descriptive) sections.

In a development scenario for offshore wind farms, assessing the sensitivity of the seascape resource is the critical assessment to be made at this stage to inform the impact evaluation. However, it is increasingly being recognised that value and capacity are important elements to consider. These recognise that how people value a place (where and why), is often closely linked with how people use a place, and therefore the capacity of seascapes to accommodate change without having unacceptable adverse effects on character, or the way that it is perceived, and without compromising the values attached to it.

In the process of assessing sensitivity of the seascape and visual resource for the purpose of EIA, it is necessary to assess quality, sensitivity, value and capacity in order to build a complete picture of sensitivity and inform the evaluation of seascape and visual impacts. The focus should be reasonably detailed, both in terms of the type and scale of development proposed, and the detail considered for the particular seascape units that may be affected.

5.1 Assessing 'Quality'

Assessing quality in seascape informs the assessment of sensitivity. Quality in seascape reflects the condition of the components or features that comprise a seascape. It also reflects the extent to which the character of the area is well defined, in the sense that features present are not fragmented, are in good condition, and the seascape unit is an integrated whole.

If all the essential elements of a character area or character type are present, and in a good state of repair or condition, then that is an indication of a better quality seascape. If there are some detractors, or elements out of place or conflicting with the underlying character, or if elements are fragmented, missing or in a poor state of repair or management, then this indicates a lower quality seascape. However, lower quality seascape does not, in itself, indicate low value. A low quality seascape area might be of low quality with respect to its features and integrity, but it might nevertheless be of a rare and highly valued type. Additional resources for conservation or restoration, or particular care over new development, would be indicated. Alternatively it may be of high quality but not as highly valued because it is common both locally and nationally.

The field survey should identify the physical condition of individual seascape elements. When combined with other studies, such as history, culture, and stakeholder consultation, the probability, nature and trend of future change may be established. The assessment of this should consider the importance attached to characteristic elements and the likelihood of either positive or negative change to them. It is helpful if field surveyors note seascape condition and intactness, the presence of detractors and so on, as these are useful aids to establishing the quality of different features, and the subsequent assessment of change caused by a proposed development.

The quality criteria shown in Box 3 will assist with this process.

22 "*Applying the precautionary principle*", Scottish Natural Heritage (undated). Existing environmental assessment procedures tend to assume that impacts can be quantified and hence outcomes evaluated. Uncertainty tends to be downplayed, with the onus on a developer to state likely impacts with a degree of definiteness. The precautionary principle, on the other hand, acknowledges the need to make decisions in situations of uncertainty, rather than pretend it is not there.

Box 3: Seascape condition and intactness

Intactness:

- Complete - Remnant
- What patterns are evident?
- Examples - sand dune hills, grand facade of a seaside resort, coastal rocks
- Do these patterns have sections missing? If so, to what extent?
- Examples - sand dunes having been eroded and patched up with rock armour on their seaward base, an old promenade facade broken by clearance sites, coastal rocks mined or quarried.

Condition:

- Maintained - Abandoned
- How well maintained are the elements that are essential for character?
- Examples - sea defences, sand dunes, beach, docks, resort frontages and gardens
- Are there particular elements that are not receiving appropriate maintenance?
- Examples - eroded defences, 'blown out' dunes, eroding beach without replenishment of sand, derelict docks, frontages in poor repair, and disused properties and buildings.

Detractors:

- None - Many
- Are there elements that are out of place?
- Examples - buildings not designed to fit into their surroundings, over standardisation of development, large warehouses in an otherwise historic harbour setting, large rock armour on a popular recreational beach.

While certain qualities may also be valued, it is important to judge quality and establish its value separately. Criteria should not be awarded numerical scores, as this may conceal issues, instead an overall judgement of quality should be attempted, with the linkage between judgement of individual components and the overall judgement made explicit and transparent. An overall judgement enables one seascape to be rated against another. This may not be directly related to its overall value although in practice there will often be a close correlation.

There are some advantages in judging the quality of components:

- Key qualities are highlighted in a 'value-neutral' way;
- The process can be carried out relatively quickly with minimum additional time and cost; and
- Assessing quality in seascape informs the assessment of sensitivity.

5.2 Assessing 'Sensitivity'

The inherent seascape sensitivity of a seascape unit refers to just the seascape, irrespective of the type of change that may be under consideration. This is likely to be most relevant in work at the strategic level, and of more relevance for this guidance is the seascape sensitivity to a specific type of change - in this case offshore wind farm development. The sensitivity of the seascape should be evaluated and defined in terms of the interactions between the seascape itself, the way it is perceived and the particular nature of the type of change associated with offshore wind farm development.

An overall profile of seascape sensitivity to a specific type of change can be defined as embracing a combination of:

- The sensitivity of the seascape and landscape resource (in terms of both its character as a whole and the individual elements contributing to character); and
- The visual sensitivity of the landscape, assessed in terms of a combination of factors such as views, visibility, the number and nature of people perceiving the landscape and the scope to mitigate visual effect.

Seascape sensitivity and visual sensitivity, and the process of combining the two to arrive at an overall judgement on sensitivity to change, are described as follows.

5.2.1 Seascape Sensitivity

In offshore wind farm SVIA, judgements must be made about the ability of the seascape to accommodate an offshore wind farm(s). In this development context, sensitivity and capacity have often been used interchangeably, but it is recommended that, in line with definitions set out above and in Appendix 3, sensitivity is the most appropriate criteria to assess in order to inform the impact evaluation stage. When judging how sensitive a seascape is to a specific type of change, it is essential to think in an integrated way about:

- The form and nature of the change that is proposed to take place; and
- The particular aspects of the seascape likely to be affected by the change, including aspects of both seascape character sensitivity and visual sensitivity.

Understanding the nature of the change comes from describing and understanding the development project. The focus should be on identifying the key aspects of the change that are likely to affect the seascape. Defining the particular features of the character of the seascape that are likely to be affected by a particular type of change requires careful analysis of the potential interactions. These might include: effects upon particular features of landscape character including landform, land cover and enclosure; and effects on aesthetic aspects such as scale, pattern, movement and complexity. The determination of the sensitivity of the seascape resource should be based upon an assessment of key elements and characteristics - natural factors, cultural factors, aesthetic factors and seascape quality. Many of the aesthetic criteria can be judged as either 'increasing sensitivity' or 'decreasing sensitivity', as shown in Table 2, however it is important to consider the interrelations between criteria and the overall context.

Table 2: Criteria for seascape sensitivity to offshore windfarms

Criteria	**Increases sensitivity**	**Decreases sensitivity**
Scale and openness	Small scale, enclosed, views to horizon limited by landform Introduction of an element of scale into previously un-scaled area Where scale is large and smaller elements (turbines) would detract Where openness is a key characteristic and introduction of built elements would compromise this.	Large scale, open views
Form	Intricate, complex, rugged forms Where simplicity is the key characteristic and introduction of vertical structures into very horizontal composition would compromise this.	Flat, horizontal or gently undulating Simple forms
Settlement	Small scale, traditional, historic settlements. Small clustered villages Lack of infrastructure	Linear settlements, urban form, larger scale infrastructure
Pattern and Foci	Complex or unified pattern which would be disrupted by turbines. Important focal points e.g. headlands, offshore islands, mountains peaks.	Simple pattern Lack of natural focal points
Movement	Where stillness is a key feature Where/when movement is highly natural, irregular or dramatic (on exposed coastlines, waves crashing) and regular mechanical movement of turbines would distract.	In busier areas where turbine movement relates to other forms of mechanical movement present e.g. cars, boats, aircraft.
Lighting	Where the area is unlit at night. Little impact of lights from sea and land traffic. Where lighting is from scattered small settlements, lighthouses etc and windfarm lighting would introduce a new, different scale	Area is already well lit at night Lights of sea and land traffic present
Aspect	Turbines would be seen against sunrises and particularly sunsets Where turbine colour is most often in strong contrast to their background, thereby increasing visibility.	Turbines away from sunrise and sunset positions Where turbine colour is most often close to that of their background in views
How experienced	From secluded coastline, intimate coastal roads and footpaths. From important viewpoints and elevated positions where the focus is the view and not the activity.	From main coastal, busy roads. Crowded beaches where focus is on beach activities.
Modification Naturalness Remoteness	Undeveloped seascape Highly natural, unmanaged Remote or isolated	Highly developed seascape Highly modified/managed Not remote
Exposure	Sheltered and calm seascapes Where seascape is extremely exposed that the perceived wild and elemental nature is a key characteristic and development would significantly change this perception.	Exposed, windy seascapes where exposure is not necessarily a key characteristic and development would be perceived as relating to windiness.

Source: An Assessment of the Sensitivity and Capacity of the Scottish Seascape in Relation to Offshore Windfarms (Final Report July 2004, SNH Commissioned Report / University of Newcastle).

The distinction between 'seascape sensitivity' and 'visual sensitivity' is that the former refers to the resource, whilst the latter refers to the sensitivity of the people viewing that resource, as described below.

5.2.2 Visual Sensitivity

The visual sensitivity of the seascape with respect to offshore wind farm development needs to be assessed in order to judge the overall seascape sensitivity of a seascape. This means that the potential visibility of the development must be considered, together with the number and type of receptors likely to see the development, as they will have differing expectations about what they should see. For example, those who visit or value a remote coastline (such as the Pembrokeshire National Park) may expect to see natural seascape, and will be sensitive to detractors such as caravan sites, whilst those who visit and value a resort (such as Skegness) may expect to see caravan sites and tourist accommodation, and therefore not be sensitive to their presence.

Visual sensitivity is therefore more dependent on the purpose of the receptors presence in relation to the proposed development type, than on the receptors as individuals. For example, the same individual may be more sensitive to detractors in a historic fishing harbour on a recreational walk than when concentrating on work in the same location. Overall visual sensitivity of an area depends on:

- The probability of change in the seascape being highly visible, based particularly on the nature of the landform, vegetative cover and building cover, which all have a major bearing on visibility;
- The numbers of people likely to perceive any changes and their reasons for being in the landscape, for example as residents living in the area, as tourists, as travellers passing though, as people engaged in recreation or as people working there; and
- The likelihood that the changed could be mitigated.

Examples of different visual receptor sensitivities are given in Box 4, but should be used only as a guide. The rationale behind visual receptor sensitivity levels should be described and justified in a transparent manner in each offshore wind SVIA according to the nature of the development proposed and the visual receptors present in the study area. The differences in sensitivity between receptor groups result from differences in the importance to which visual quality plays in their presence. The more sensitive observers will have a higher expectation of scenic value, and of distinct and high quality seascapes.

Box 4: Guide to visual receptor sensitivity

Land Based

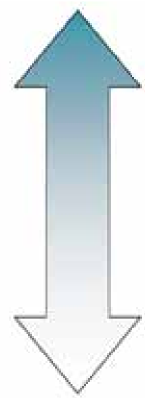
High

- Residents
- Visitors/tourists
- Footpaths, cycleways and bridleways
- Other outdoor recreation e.g. fishing, bird watching, golf, swimming, etc
- Coast road users
- Distributor (minor) road users
- Arterial/trunk roads users
- Rail passengers
- Military - e.g. firing ranges
- Industrial and commercial activities e.g. ports, power stations

Low

Marine Based

High



- Yachts and inshore recreational boating
- Water based recreation e.g. surfing, wind surfing, sea kayaking, sea angling
- Competitive or high speed watersports e.g. jet skiing, speed boating
- Passenger ferries and cruiseliners
- Commercial shipping and fishing vessels
- Extractive oil or gas

Low

Receptors visiting a traditional or notable view point in a remote or undeveloped area are assumed to be highly sensitive to visual change that is out of character with that place, to the point that if significantly affected they may change their behaviour, i.e. stop visiting. On the other hand, an example of less sensitive receptors would be if the purpose of visiting a place is unrelated to visual amenity of the landscape/seascape, such as delivering goods to a factory. Such visual receptors are assumed to be less sensitive to change since their behaviour is unlikely to change as a result of the proposed development. The highly sensitive receptor and less sensitive receptor can be one and the same person, but on different visiting occasions. In the middle ground, behaviour may not change but attitudes may change, such as road users driving past the proposed development. It is still important to consider these as changes in attitudes as they may ultimately lead to changes in behaviour, such as choosing to drive another way that they regard as more scenic.

5.2.3 Overall Seascape Unit Sensitivity

An overall assessment of sensitivity to offshore wind farm development requires that seascape character sensitivity considerations and visual sensitivity considerations are brought together so that the sensitivity of seascape units and landscape designations to this form of development can be judged and mapped. The types of factors that need to be considered when pulling together seascape character sensitivity and visual sensitivity for an overall rating of sensitivity for a seascape unit or landscape designation are summarised in Box 5.

Box 5: Types of factors which influence sensitivity

Sensitivity of seascape unit or landscape designation =

Seascape Character Sensitivity	+	Visual Sensitivity
Based on judgements about sensitivity of:		**General Visibility**
Natural Factors		Topography/landform influences
Coastal processes		Tree and woodland cover
Coastal ecology and vegetation		**Receptors**
Tree cover type/pattern		**Sea based**
Cultural Factors		Yachts and recreational boating
Land use		Water based recreation e.g. surfing, wind surfing, kayaking, sea angling
Settlement		Competitive or high speed watersports
Historic environment		Passenger ferries and cruiseliners
Aesthetic factors		Commercial shipping and fishing
Scale and openness		Extractive oil or gas
Form		**Land based**
Pattern and foci		Residents
Movement		Visitors/tourists
Lighting		Footpaths/cycleways/bridleways
Aspect		Other outdoor recreation
Modification		Road users
Naturalness		Rail passengers
Remoteness		Military - e.g. firing ranges
Exposure/enclosure		Industrial and commercial activities
Landscape Quality/Condition		**Mitigation potential**
Intactness		Scope for mitigating potential visual impacts
Representation of typical character		
State of repair of individual elements		
Detractors		

The output of the assessment of seascape sensitivity in relation to offshore wind farms should be a classification of each seascape unit and landscape designation presenting its level of sensitivity. These classifications should be broken down into five bands, such as very low, low, medium, high, very high. A map showing the spread of these different categories between seascape units in the study area should be presented to provide an overview of the areas where there is relatively low, and relatively high sensitivity to offshore wind farm development. In most cases, this should be a precursor to further evaluation about impact significance, when considered in relation to magnitude of change. Studies specifically of sensitivity of seascape to offshore wind farm development, without proceeding to a subsequent evaluation of significance of effects, are unlikely to be common.

5.3 Assessing 'Value'

The assessment of the sensitivity of different seascape units to the type of change in question should be combined with an assessment of the more subjective, experiential or perceptual aspects of the seascape and of the value attached to it in order to evaluate the capacity of a seascape unit to accommodate change.

Value in seascape reflects the relative degree of importance attached to a seascape feature, seascape character area or seascape type. Different value judgements are possible and can be based on quite different underlying aesthetic systems. Subjectivity can be limited, or at least made transparent, by the use of explicit criteria, for example rarity, fragility, integrity, diversity, tranquillity, and wildness value. In this sense, some of the issues may be expressed in terms of both their quality (e.g. an undeveloped seascape may still be tranquil) and value (e.g. visitors and residents attach great value to that seascape because of its tranquil quality). Regard should be had to consensus opinion, as expressed by statutory or local designations, or simply by the popularity of a seascape.

Value may be formally recognised through the application of some form of national landscape designation. Where this is this case the implications of the designation need to be taken into account. On the other hand, the absence of a designation does not mean that landscapes are not valued by different communities of interest. Other indicators of value need to be considered. Judgements about value in such cases may be informed in terms of the relative value attached to different seascapes by a range of different communities of interest. These include landscape quality and condition; perceptual aspects such as scenic beauty, tranquillity, rurality, remoteness or wildness; special cultural associations and the presence of conservation interests. Box 7 presents these criteria clues for assessing seascape value. Weighing up all these factors will allow the relative value of particular seascapes to be assessed as an input to judgements about capacity. Judgements about value may also be made by the Quality of Life Assessment approach, seeks to address the question of 'What matters and Why'. In this approach value will be judged in an integrated way, with considerations of landscape and sense of place set alongside other matters such as biodiversity, historic and cultural aspects, access and broader social, economic and environmental benefits. The importance of quality of life assessment is discussed in Section 5.3.3.

5.3.1 Values Attached to Seascape Through Landscape Designation

National or regionally designated landscapes provide an indication of values attached to seascape, whether through landscape, amenity or conservation, statutory or non-statutory, from National Park down to community open spaces.

A significant proportion of the land area in Great Britain is under the protection of conservation designations. Statutory designations broadly fall into three categories: landscape conservation, cultural heritage conservation and nature conservation designations, which protect landscape, cultural and wildlife aspects of the countryside respectively. The principle statutory designations in England and Wales are shown in Box 6.

Box 6: Principle statutory designations in England and Wales

Landscape Designations

- National Parks
- Areas of Outstanding Natural Beauty (AONB)
- Heritage Coasts

Cultural Heritage Designations

- World Heritage Sites
- Scheduled Monuments
- Registered Parks and Gardens
- Registers of Historic Landscapes (Wales only, and not statutory, but done on a national, not local basis, and important to consider in a SVIA)

Nature Conservation Designations

- Special Areas of Conservation (SAC) (including Marine SACs)
- Special Protection Areas (SPA)
- Sites of Special Scientific Interest (SSSI)
- Marine Nature Reserve (MNR)
- National Nature Reserves (NNR)
- Ramsar Sites
- Local Nature Reserves (LNR)

The SVIA should identify the extent of statutory landscape and cultural heritage designations within the study area for the proposed offshore wind farm, identify its key characteristics and the rationale for its designation, in order that judgements can be made about its value and sensitivity, and the seascape and visual effects of the offshore wind farm on the designation subsequently assessed. Nature conservation designations may usefully contribute to the assessment of sensitivity and value of the seascape, but the effects of the offshore wind farm on these designations should not need to be assessed as part of the SVIA.

There are more designations, both statutory and non-statutory which may be included in an SVIA, but those in Box 6 cover the main statutory designations which should be considered in an SVIA for an offshore wind farm. There are a number of non-statutory landscape designations, mostly designated by local authorities. These designations are not created on a national, or even regional level, and differ between local authorities. There is an inconsistency in the recognition of what value is placed on these areas, and in the explanation and justification of development plan policies for these designations. This partly reflects the local nature of what is being recognised. Non statutory designations allocated in the development plan by Local Authorities should be considered in the assessment of seascape value and impact evaluation in SVIAs for offshore wind farms. Such non-statutory, local landscape designations include:

- Special Landscape;
- Special Landscape Area;
- Area of Landscape Value/Merit/Significance;
- County Landscape;
- Great/Particular Landscape Value;
- Outstanding Landscape Area/Quality;
- Local Landscape Area;
- High Landscape Value;
- Historic Landscape;
- Landscape Conservation Area; and
- Landscape
- Protection/Merit/Feature/Significance.

Whilst such non statutory designations are recognised as important, National Parks and AONBs are afforded the highest level of protection on account of the national significance of their landscapes. However, such local designations provide specific clues as to which local landscapes might be most highly valued and in some cases these areas may actually be as sensitive to offshore wind farm developments as those within nationally designated areas.

Through the Draft Planning Policy Statement (PPS) 7 (for England only) the Government expresses the belief that local countryside designations are not necessary and considers that the policies set out in this PPS, when incorporated into development plans, should provide sufficient protection for the countryside. In reviewing their development plans, planning authorities are instructed to remove any existing local designations and instead adopt criteria-based policies in development plans for the location and design of rural development throughout their areas. This gives a clear indication that the role of local landscape designations in decision making is likely to diminish in future in England, and that the focus will be on more criteria-based policies when considering planning applications for developments such as wind farms.

5.3.2 Values Attached to Seascape by Communities of Interest

When assessing value, subjectivity can be limited, or at least made transparent, by the use of explicit criteria, such as those presented in Box 7. However, regard should also be had to consensus opinion, as expressed by statutory or local designations, or simply by the popularity of a seascape, its level and type of use, or obtained from public surveys.

In moving from character to value, it is vital to make transparent the basis on which each value is assessed, and to make the criteria explicit. Although it is possible to consider value under each individual characteristic and quality, it is simpler and more efficient to record overall values and reasons for them, as value to some may stem from intangible factors or complex interrelationships of qualities and characteristics. A set of criteria clues for assessment of seascape value in this manner is provided in the LCA guidance[23]. These are tailored for the seascape context in Box 7.

Box 7: Criteria clues for assessment of seascape value

In assessing the value of a particular landscape characteristic or overall landscape character the following criteria, offered by in the LCA guidance[15] may be used as 'clues' to its value.

Landscape quality - Quality in seascape reflects the condition of the components or features that comprise a seascape. It also reflects the extent to which the character of the area is well defined, in the sense that features present are not fragmented, are in good condition, and the seascape unit is an integrated whole.

Rarity - The presence of rare features and elements in the landscape, or the presence of a rare landscape character type.

Representativeness - Whether the landscape contains particular character; and/or features and elements, which is felt by stakeholders to be worthy of representing.

Conservation interests - The presence of features of particular wildlife, earth science or archaeological, historical and cultural interest can add to the value of a landscape as well as having value in their own right.

Wildness - The presence of wild (or relatively wild) character in the landscape which makes particular contribution to sense of place.

Associations - With particular people, artists, writers or other media, or events in history.

Designation - whether for landscape, amenity or conservation, statutory or non-statutory, from National Park down to community open spaces.

When judging seascape value, particular emphasis might be given to specific elements which are more prevalent in coastal locations, such as:

Remoteness and accessibility - How far a place is from main centres of population, coupled to an undeveloped character, the quality, number and type of access areas and routes, view points and interpretation.

Scenic quality - The term that is used to describe landscapes which appeal primarily to the visual senses.

Recreation, amenity and tourism uses - As designated, especially at a local level, what facilities are available, how these are managed and how much recreational satisfaction the seascape can offer.

Public attitudes - in terms of who values what, where and why, and how the development could affect these. This could be evidence on site (e.g. a popular tourist viewpoint), evidence in already established policies and official thinking (e.g. areas designated for their scenic importance) and evidence specific to the topic, or place, gathered by asking large numbers of people, such as in a questionnaire.

23 Landscape Character Assessment: Guidance for England and Scotland (Countryside Agency and Scottish Natural Heritage 2002)

If a value is to represent a common consensus and not just the assessor's own value system, then it is an option to identify and consult those groups and individuals with an interest (the 'stakeholders'), who are:

- Communities of interest - include professionals, developers, conservationists, government and local authorities; and
- Communities of place - include residents, weekenders, workers, and visitors.

There are clear advantages in involving stakeholders in the assessment process. Particular values can be placed on certain seascapes and communities are more likely to support the outcomes of the assessment if their opinions have been taken into account, or agree to changes to seascape if they have taken ownership of the decision-making process. A wider perspective, involving perception and cultural dimensions, should provide a fuller and more balanced assessment.

The seascape assessor should therefore consider including in a judgement of value:

- The opinions of those with an interest in seascape;
- Research into public preferences, trends and consensus;
- Research into historical and cultural traditions and associations of the area; and
- Professional experience.

Obtaining the opinions of stakeholders can be difficult and time consuming, with no guarantee that there will be a general consensus of opinion. The role of the assessor will be to ascertain and assemble the various opinions of stakeholders in as transparent and 'value-neutral' way as possible. Information may be gained from primary sources, asking communities themselves through focus groups or questionnaires, and secondary sources, by reviewing or commissioning historic and cultural studies. Community participation is not a single, set procedure and research into public perception of seascape is very limited. Where practically possible the SVIA should include input from stakeholders to inform the assessment of value, however this should be open to the assessor’s discretion and tailored to the requirements of the project.

SVIA assessors will nevertheless find it helpful in carrying out their SVIA to use existing available public attitude information. Studies of public attitudes towards offshore wind farm development in principle is very favourable, although negative attitudes towards specific development proposals can be great enough to trigger a public inquiry, as was the case at Scarweather Sands. Tourist Board Surveys are likely to be helpful where they refer to a specific area and specific places and activities, in establishing where people visit, what they do there, and what they value about those places. If developments can conserve those valued characteristics and qualities whilst still allowing some change though development, then the basis for objection may be less. Many methodological principles, of establishing who values what, where and why, have been developed in the Countryside Agency's "Quality of Life" approach, (functional rather than resouce based assessment) and aspects of that work may be helpful in structuring and presenting information in SVIA that relate to existing public surveys.

5.3.3 Values attached to seascape using Quality of Life Assessment

The impact of 'seascape and visual effects' is felt by people, and shown through their altered attitudes or behaviour in, or towards a place. These altered attitudes or behaviours are often what are actually cited by opponents of offshore wind farm developments as the reasons why the (visual impacts of the) development would not be acceptable. For example, they might claim that "if the turbines are built, the tourists will not come any more". Often, a development might potentially have different attitude and behaviour impacts on many different people in different parts of an area.

What this means for the assessment is that in addition to the essentially resource-based approach to SVIA described so far, there may also be a need to address the issues through a function-based assessment (what 'goods and services' does this seascape offer us, and what would alter if the development was built?).

In practice this can be addressed by the Quality of Life Assessment process (formerly known as Quality of Life Capital). This identifies who values what, why and where - working out what matters and why, particularly in respect of the close connection between how people value a place and how they use it. Within the approach, the different benefits and services are identified and can be assessed according to whether the offshore wind farm would impact on each of them. Locating different places for different benefits and services can help demonstrate where the effects would be felt, and direct the type of mitigation that would be appropriate (e.g. moving the development site further away from such places).

The full Quality of Life Assessment approach is available on the Countryside Agency website at www.countryside.gov.uk/LAR/Landscape/Quality/

index.asp. The full scope of the Quality of Life Assessment approach may not be needed as part of SVIA, and careful selection and adaptation of the relevant parts is necessary.

5.3.4 Making an Overall Judgement on Value

An overall judgement of value should be attempted, again with a transparent link between judgement on individual criteria and the overall judgement. This enables a hierarchy of units to be graded from 'low' to 'high' and can be undertaken at any of the nesting scales of seascape assessment.

An assessment of the value of a whole coastline will show which of the national seascape units should have highest priority for protection because they are the most highly valued. This will assist in attributing value that covers large areas, such as a National Park. The grading of regional seascape units, nested inside the national unit, would provide sufficient level of detail for a SVIA of an offshore wind farm.

5.4 Assessing Capacity to Accommodate Change

This term is used to describe the ability of a seascape to accommodate different amounts of change or development of a specific type. This should reflect:

- The overall sensitivity of the seascape to the particular type of development in question. This means that capacity will reflect both the sensitivity of the seascape resource and its visual sensitivity; and
- The value attached to the seascape or to specific elements in it.

In evaluating the capacity, the character of the area will be the most important factor, but it is also likely that the perceived value of a seascape will directly affect judgements about acceptable change. The concept of capacity to change is inseparable from consideration of the type of development proposed.

Evaluating the capacity of a seascape unit to accommodate change requires judgements to be made about the amount of change caused by an offshore wind farm that can be accommodated without having unacceptable adverse effects on the character of the landscape, or the way that it is perceived, and without compromising the values attached to it. The assessment should recognise that a valued landscape, whether designated or not, does not automatically have high sensitivity. Similarly, seascapes with high sensitivity do not automatically have no, or low capacity to accommodate change. Such a seascape may have some capacity to accommodate change if steps are taken in terms of the siting, layout and design of an offshore wind farm.

5.4.1 Seascape Character - Capacity in the Sea (Marine) Component

The sea component has a uniform but low capacity in itself. Yet its large scale can absorb some small change without affecting its overall character - especially where the change is far out to sea and well away from land based receptors. However, one prominent object will change an undeveloped character. The seascape unit should be judged as a whole and capacity in the sea component should take account of:

- Form, function and scale of possible changes;
- Distance from receptors; and
- Deference to capacity of coastline and land components.

5.4.2 Seascape Character - Capacity in the Coastline and Land Components

In the coastline and land components, capacity can be judged on the basis of the complexity of coastal shape and the topography and landscape structure of the hinterland.

The complexity of coastal shape

The more complex a coastline the less likely clear views are possible to a particular point at sea. With inter-visibility reduced the capacity of the seascape unit is increased, however other factors (such as scenic quality and value) may mean such areas are more sensitive. A highly indented coastline may, as a result of this characteristic, have a high capacity to accommodate a particular new development in a bay, since topography and coastal geometry would hide it from wider view. However, such coastline may also be highly valued for its scenery, making it also highly sensitive to development. However to date, off-shore wind farms in England and Wales have been sited well offshore, and not sheltered within bays.

Topography and landscape structure of the land component

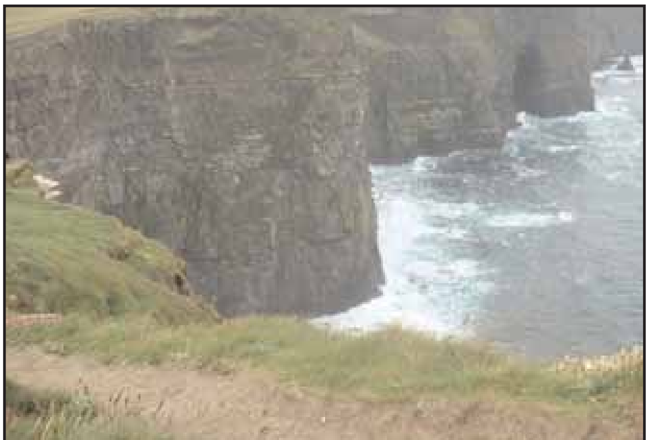
The topography and landscape of the hinterland can both contain and conceal change from sensitive receptors, and to provide a reference of elements that can be used in design to maintain or enhance character. Most viewers are land based and therefore the form of the land within the seascape unit will influence the visibility of the sea. Concave slopes (particularly around embayed coastline) allow maximum inter-visibility between sea and land reducing the capacity of the seascape unit. Conversely a level plateau or very steep land will limit views of the sea and thus has a higher capacity. This is illustrated in Figure 18.

Figure 18: Topography of the Land Component

Concave slopes with open visibility to sea

Source: CCW © Countryside Council for Wales. All Rights Reserved.

Level coastal plateau, limiting views of the sea from land



Steep coastal edge sloping inland, limiting views of the sea from areas further back from the edge

This combination of the complexity of the coastal shape and topography of the land component can be combined to inform capacity as shown in Box 8.

Box 8: Capacity in the coastline and land components

Measuring Seascape Capacity

Coastline shape of seascape unit (Simple → Complex)

Coastline shape of seascape unit			
Complex	Some Capacity	High Capacity	Highest Capacity
	Low Capacity	Some Capacity	High Capacity
Simple	Lowest Capacity	Low Capacity	Some Capacity

Elevation of land component: Many views, such as on a broad area sloping, to coast → Few views, such as on a level flat or plateau, to marine component

5.5 An Overall Profile

Dealing with such a wide range of factors requires a record of the judgements that are made to arrive at a conclusion or overall judgement. The first step in this process is to define the criteria that are to be used in making the judgement, and to provide a clear summary in the SVIA. For an offshore wind farm SVIA, a record should be made about:

- Seascape quality;
- Seascape sensitivity;
- Visual sensitivity;
- Value attached to the seascape; and
- Capacity to accommodate change.

The second step should be to design record sheets that allow the judgements that need to be made to be recorded in a clear and consistent manner, whether based on desk or field survey. The time and resources available will influence the level of detail of this record sheet, but the focus should be on recording judgements about sensitivity to change. An example record sheet for recording judgements on sensitivity to change is provided in Table 3.

Table 3: Record sheet for judging sensitivity to change

Sensitivity to change								**Notes**
Seascape character sensitivity								
Scale	Large						Small	
Form	Complex						Simple	
Settlement	Small scale						Urban	
Pattern and foci	Complex						Simple	
Movement	Still						Busy	
Lighting	Unlit at night						Well lit at night	
Aspect	Sunset						Sunrise	
Modification	Undeveloped seascape						Highly developed seascape	
Naturalness	Highly natural						Highly managed	
Remoteness	Remote						Crowded	
Quality	Very high						Very low	
Seascape character sensitivity	Very high						Very low	
Visual sensitivity								
Sea component								
Insert receptors identified in activity survey e.g. sea based recreation, passenger ferries etc	Very high						Very low	
Coastal and land component								
Insert receptors identified in activity survey e.g. walkers, visitors, residents etc	Very high						Very low	
Visual sensitivity	Very high						Very low	
Overall sensitivity to change	**Very high**						**Very low**	

Box 9: Seascape unit assessment record sheet example

TABLE 1 Vale of Clwyd to Mersey Estuary National Seascape Area Seascape Character Assessment

Evaluation - Quality								**Notes**
Intactness	complete			x			remnant	Beaches and dunes largely intact; fragmented coastal zone
Condition	maintained			x			abandoned	Eroding dunes; silting estuary; resort towns less well maintained
Detractors	none				x		many	Caravan parks; concrete defences ;low townscape quality;gas rigs
Typicality	representative		x				unusual	Typical coastal form; estuary good representative eg of type
Clarity	clear				x		muddled	Fragmented land use in coastal strip; clearer estuarine patterns
Fragility	delicate			x			robust	Dunes and remnant open space vulnerable to continued develop't
Summary	*high*			***x***			*poor*	*Moderate to poorquality of main coast; higher quality to estuary*
Evaluation - Value								
Landscape designations	many			x			few	Clwydian Range AONB; Special Landscape+ Conservation Areas
Rarity	rare				x		common	Common main seascape type ; estuary of regional rarity
Distinctiveness	bold				x		indistinct	Clwydian scarp slope; views to/from Wirral; West Wirral landform
Naturalness	natural			x			contrived	Beaches, dunes, pastoral hillsides and Wirral's wooded ridgeline
Remoteness	remote				x		crowded	Nowhere regionally remote but locally near Pt of Ayr+ West Wirral
Tranquility	calm				x		busy	Some tranquil spots on wide beaches, dune systems + hillsides
Sense of place	strong				x		weak	Pt of Ayr; hilltops; Hilbre Island; Leasowe Lthouse; Fort Perch Rk
Popularity	high	x					low	Resort towns on north coast; recreational N' + W' Wirral coastline
Accessibility to coast	easy		x				difficult	N' Wales difficult with poor ambience; easier on W' +esp N' Wirral
Recreation and amenity	high	x					low	Sandy beaches; on and offshore water sports; regional footpaths
History and culture	high					x	low	Fortifications on N' Wirral; no significant cultural associations
Tourism and economy	high			x			low	Resort towns imp't to local economy + recreation to W' + N' Wirral
Conservation desig's	many		x				few	SSSI's at Pt of Ayr; multiple designations to Dee Estuary
Summary	*high*			***x***			*low*	*Apart from Eastern Dee, mod to low value but higher leisure value*
Capacity to accommodate change								
Shape of coastline	simple		x				complex	Overall straight north coast with good sea views to north-west
Flatness of seascape	sloping				x		flat	Flat narrow coastal strip to N Wales; v' flat across all North Wirral
Elevation of land	high		x				low	Rising landward seascape to all units except N' Wirral
Type of slope	concave		x				convex	Mostly straight level slopes; concave to ridge of West Wirral
Receptors - residents	high			x			low	Some key views from W' Wirral and New Brighton; N' Wales low
- viewpoint users	high		x				low	Pt of Ayr; Hilbre Is'; Grange Mem'; Leasowe Lthouse; Ft Perch Rk
- walkers/ cyclists	high				x		low	N' Wirral Coastal Path main receptor; cyclepath no5 - some views
- travelling public	high					x	low	V' occasional views from road network; some views from railways
Summary	*low*			***x***			*high*	*N' Wales +W' Dee – fairly high; E' Dee – low; Wirral - moderate*

From Burbo Offshore Wind FarmSVIA\- courtesy Seascape Energy/Castella Stanger

Sensitivity, value and capacity should be judged on a simple scale with five points - very high, high, medium, low, very low for each seascape unit in the study area. These scales can easily be translated into shades or colours for graphic display and are well suited to use as layers within a GIS if required. The Countryside Agency/SNH Topic Paper 6 (Techniques for Judging Capacity and Sensitivity) illustrates how value and sensitivity may be combined using a matrix as a guide to correlating layers to judge capacity, and these may be applied for use in judging seascape capacity.

All assessments of sensitivity and capacity inevitably rely on professional judgements, although wherever possible they should also include inputs from stakeholders, particularly if a Quality of Life Assessment is needed. For offshore wind farm SVIAs it is likely that overall judgements will need to be made about the whole of a seascape unit, and emphasis should be on the overall judgement of sensitivity. In the offshore wind farm EIA context, sensitivity is the most critical assessment to make in order to inform the subsequent impact evaluation stage. Further guidance on evaluation of significance is provided in Section 8 of this Guidance. Judgements on sensitivity should be combined with an assessment of the more subjective, experiential or perceptual aspects of the seascape and of the value attached to it in order to evaluate the capacity of a seascape unit to accommodate change. It is important that the thinking that underpins these judgements is clearly presented, that records of judgements are kept in a consistent form to allow decisions to be easily explained to the audience of the ES.

Assessing Sensitivity: Key Guidance

- In a development scenario for offshore wind farms, assessing the sensitivity of the seascape resource is the critical assessment to be made at this stage to inform the impact evaluation;
- The focus should be reasonably detailed, both in terms of the type and scale of development proposed, and the detail considered for the particular seascape units that may be affected;
- In the process of assessing sensitivity of the seascape and visual resource for the purpose of EIA, it is necessary to assess quality, sensitivity, value and capacity in order to build a complete picture of sensitivity and inform the evaluation of seascape and visual impacts;
- The seascape sensitivity to a specific type of change should be assessed - in this case offshore wind farm development;
- An overall assessment of sensitivity to offshore wind farm development requires that seascape sensitivity considerations and visual sensitivity considerations are brought together;
- The output of the assessment of seascape sensitivity in relation to offshore wind farms should be a classification of each seascape unit and landscape designation presenting its level of sensitivity. These classifications should be broken down into five bands, such as very low, low, medium, high, very high;
- The SVIA should identify the extent of statutory landscape and cultural heritage designations within the study area for the proposed offshore wind farm, identify its key characteristics and the rationale for its designation, in order that judgements can be made about its value and sensitivity, and the seascape and visual effects of the offshore wind farm on the designation subsequently assessed;
- A set of criteria clues should be used for the assessment of seascape value;
- All assessments of sensitivity and capacity inevitably rely on professional judgements, although wherever possible they should also include inputs from stakeholders and public attitude information;
- Quality of Life Assessment should be used to identify who values what, why and where to assess the close connection between how people value a place and how they use it;
- Dealing with a wide range of factors requires a record of the judgements that are made to arrive at a conclusion or overall judgement. Record sheets should be used to record judgements in a clear and consistent manner;
- It is important that the thinking that underpins these judgements is clearly presented to allow decisions to be easily explained to the audience of the ES.

6. KEY CONSIDERATIONS IN SITING, LAYOUT AND DESIGN (MITIGATION)

6.1 Introduction

Offshore wind farms should respect the character and diversity of their seascape setting and help to sustain the qualities which lend a distinctive sense of place to English and Welsh coastal landscapes. Siting, layout and design offer scope for integrating offshore wind farms into the seascape and to prevent, reduce and mitigate seascape and visual effects. The scope to which layout and design can contribute meaningfully to mitigation will vary on a case by case basis, and is likely to vary according to the scale (size and number of turbines) being considered and the distance from shore. It is questionable how much design changes will mitigate the effects of, for example, a 200 turbine wind farm located over 25km offshore, placing great emphasis on good siting at an early stage in the development process as the primary means of mitigation. However, for a smaller wind farm, located nearer the shore, good layout design is likely to be more able to contribute to the mitigation of seascape and visual effects.

There should be a demonstration in the SVIA of the process by which potentially negative effects have been designed out (prevented), reduced or offset. The site selection and layout design process should consider the existing seascape and visual resource at the outset, so that an intelligent and demonstrable response to constraints and potentials can be made in the location and design of the development. Clearly reporting these considerations helps demonstrate to consenting bodies that the necessary iterative design and impact assessment process has taken place.

Many seascape and visual constraints can be shown on plan as areas of particular value or sensitivity. Overlaying these in GIS to produce a sieve analysis is especially useful to help decide on development locations. Specialists in regulatory authorities considering seascape and visual constraints should also be made aware of other technical and environmental constraints, giving their comments and feedback greater perspective and realism.

The ensuing design process needs to be iterative, considering the merits of different approaches and options, so that the final design put forward for EIA can be robustly justified as being the least damaging and most beneficial environmental option possible. Developers should demonstrate in the ES how they have taken account of good design in their development proposals. Design is a material consideration in determining applications for consent and planning applications. Consenting authorities are able to refuse an application solely on design grounds.

Between them, siting, layout and design offer scope for impact prevention, reduction and mitigation of potential seascape and visual effects. This advice assumes that it is desirable to reduce the seascape and visual effects of offshore wind farms as much as possible. The sea is always going to assume a flat empty surface. It means any objects that are placed on it, wind turbines included, are going to be in stark contrast to that character. The practical focus in both design and assessment should be on the wind farm location, layout and design in relation to the coastal landscape, and how it relates to those people that view it.

6.2 Siting

The siting, or choice of location, of an offshore wind farm is the single most important consideration when seeking to avoid adverse seascape and visual effects. Once a site has been chosen, the potential to mitigate effects progressively diminishes through the layout and detailed design stages. The site locations for Round 2 offshore wind farms were allocated through the awards for site options following the Crown Estate tender and SEA[24] of the Greater Wash, Thames Estuary and North West SEA areas. There were a number of factors which influenced the locations of these Round 2 offshore wind farms. High level consultation with Government departments during the assessment process considered whether there were particular insurmountable obstacles to development at certain locations, together with environmental considerations presented in the SEA16.

The sites awarded did not prejudge the consenting process and considerable opportunity remained for designing appropriate layouts during the EIA process which respond to technical, economic and environmental factors. The Crown Estate, in response to requests from Government departments, extended the relocation opportunities to developers on the basis of any

24 Environmental Report: Offshore Wind SEA (BMT Cordah for DTI, July 2003)

insurmountable obstacles coming to light in the first 12-18 months of site investigations.

The following sections consider siting and layout in relation to seascape and visual concerns and offer principles for good practice.

- Consider locating developments in lower sensitivity seascapes with higher capacities to accommodate change

Existing seascape and landscape capacity assessments should be used to guide locations of offshore wind farm developments. These studies, where available, provide a range of information on baseline character, sensitivity and capacity of seascapes to accommodate change and can help guide the location of offshore wind farms to appropriate areas of seascape. Those seascapes identified as having higher sensitivity, due to factors such as their scale, form, pattern, aspect and remoteness should generally be avoided in favour of areas of lower sensitivity, with more a open scale and developed, modified and simple characteristics. Similarly, those seascapes with a higher capacity due to their lower value combined with lower sensitivity would be more appropriate for offshore wind farm developments.

- Consider locating developments as far away from the coastline as possible

Locating offshore wind farms as far from the coast as possible maximises the distance from the viewer (a way of reducing visual effect) and reduces the proximity to coastal landscapes that are valued for their undeveloped character (a way of reducing effect on the setting of landscapes). The navigational implications of locating offshore wind farms further out to sea and the costs of transporting the electricity back to shore should be considered on a case by case basis.

In addition to the above issues which are essentially a response to visibility, the perception of that visibility can also be reduced by locating the wind farm away from the focus points in key views. If the wind farm is seen to be well out at sea, that may be deemed to be less of an issue than if the wind farm was seen to be visually next to a major headland or island. One of the most visually sensitive points in a seascape view is where land, sea and coastline meet, i.e. the point of the headland. The principle of visual design behind this is that of 'visual movement', a concept now well established in forestry location and design guidance[25].

[25] Forestry Commission forest design guidance publication series

- Consider locating developments particularly away from coastal landscape designations

Designated landscapes, such as National Parks and AONBs, as detailed in Box 6, indicate that value has been attached to a landscape and officially recognised for their natural beauty, with the primary statutory purpose of designation to conserve and enhance the natural beauty of the area. The concept of 'natural beauty' as defined in statute includes the protection of flora, fauna, geological and physiographical features however it is recognised that this should include reference to the cultural dimension of the landscape. The designation of such landscapes should be respected by locating well away from such areas. The act of such designation represents a large amount of work by designating authorities to recognise a consensus of opinion that these areas are special and valued. This does not imply that undesignated areas have little or low value, but that such value has not been formally recognised in terms of designation to date.

Although a development may not actually occur within a designated area, it can still affect the quality of the resource if the setting is affected. Settings may be represented by a simple standard distance of sensitivity around the designated area, or more areas appropriately for SVIA based on many factors, taking into account topography and visibility, and particular key views whose composition and focus is important to conserve, even where subjects in the view may lie outside the designated area.

- Consider using headlands and development siting to minimise visibility

Round 2 offshore wind farm developments will usually be large scale and located out of enclosed bays, further out to sea. Within this context, headlands and development siting flexibility should be used to limit the numbers of smaller (regional or local) seascape units that the proposed development affects.

- Consider locating developments in already industrialised and developed seascapes

In the case of renewable energy developments at sea, locating these in already developed seascapes (where the coastline is already industrialised) can consequentially take the development pressure off remoter, less developed seascapes. As a rule of thumb, developing in the context of other development could form a lesser net overall effect than introducing development into a previously undeveloped seascape.

However a possible counter factor is cumulative effect where existing development already exists. To date, there has often been a coincidence of suitably shallow sea and developed seascapes. Locating offshore wind farms near industrialised coastlines also increases the opportunity of mitigating onshore landscape and visual effects by siting onshore components such as substations near to, or refurbishing, existing onshore infrastructure. It is also likely to mitigate visual effects during the construction stage and when carrying out maintenance visits during the operational phase as the launching and faring of vessels from the shore should be able to take place from and be seen in the context of existing port facilities and activities.

- Consider the siting relationship with other existing offshore and onshore wind farms

Where the seascape already includes an offshore or onshore wind farm(s) as part of its baseline character, the sensitivity and capacity of an area to accommodate further offshore wind farm development should be considered when siting and designing the proposal. The degree to which siting new projects near existing offshore wind farms will depend upon the size and extent of the existing wind farm developments, the size of the proposed development and the capacity of the seascape to accommodate further change. It may be more appropriate to site new offshore wind farms well away from existing wind farms so that capacity is not exceeded and unacceptable levels of change to the character of the area do not to occur as a result of more than one wind farm development. A compromise will be needed, as locating offshore wind farms near other proposed or built offshore wind farms may not present a solution with regard to the cumulative and in-combination effects of adjacent developments, whereas in other situations, additional turbines next to an existing wind farm may be an acceptable level of change. Developments within the same area should be consistent in terms of their siting and layout where possible to prevent visual confusion - an existing built development will normally set a design precedent for following developments.

6.3 Layout and Design

6.3.1 Design in Response to Character

Offshore wind farm layouts may be designed in response to character through a study of the qualities and characteristics of a place. Natural patterns tend to appear complex since they are usually based on an intimate response to many site factors. On many occasions this complexity can give a first impression of randomness. By contrast, large scale, man-made patterns can appear as imposed, often because humans have adapted the site to suit an expedient standard design solution, often remotely designed without an intimate response to many site factors. This can give the appearance of a simple, sometimes formal or geometric pattern.

By recording patterns that exist already, both natural and man-made, as part of the survey of all seascape qualities, it may be possible to integrate the location, layout and design details of a development better. In short this can be regarded as responding to character, and that a study of the intrinsic qualities of a place provides the key to making that response. The design process can then be used to echo, compliment or contrast the kinds of patterns, colours and other qualities that will integrate the location(s), layout, details and materials with the site.

When placing a development in the sea, the complexity of the submarine environment is hidden. In terms of seascape and visual considerations, it then falls to relating the development to that of the character of the coastline, and the distribution and character of other objects in the sea. In the absence of strong patterns to relate to here, there may be justification in allowing the development to create new patterns.

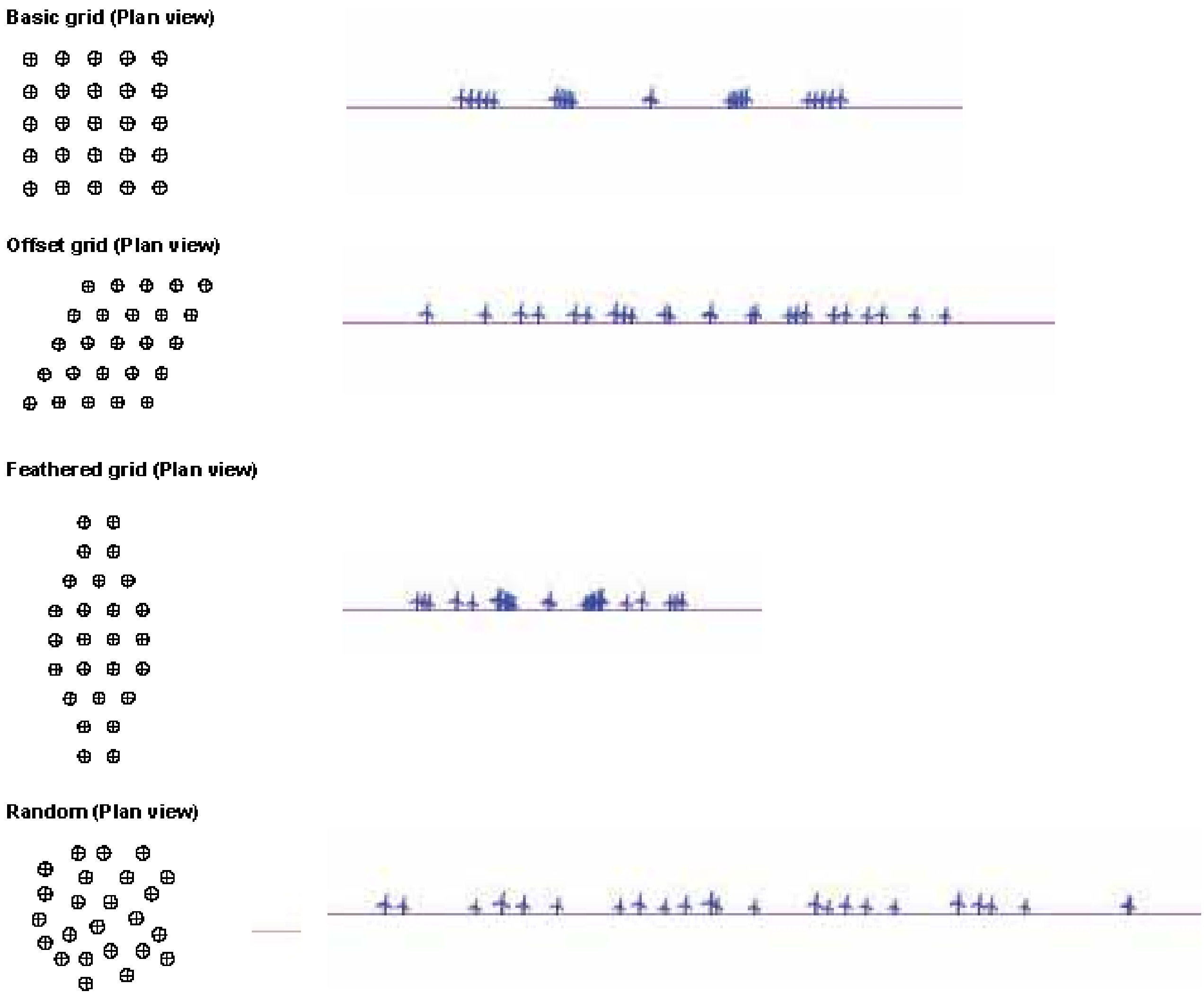
Some have argued that a simple formal layout of turbines at sea is more pleasing to the eye, whilst others have argued that a more complex (random looking) arrangement suggests a closer relationship to natural patterns, which rarely follow geometric layouts. To date, regulatory agencies with an interest in seascape and visual issues, have advocated that to the viewer, offshore wind farms should be seen with a more natural and random layout, although each case must be weighed up in the context of many other factors, such as marine navigation safety. The reality to date is that a geometric arrangement only appears so from certain angles, and that from the majority of points along a coastline, a grid layout appears more natural when viewed in 3D than it appears in plan view. Views of random turbine layouts are better when seen from (typically) irregularly laid out rural landscapes, whilst more formal, geometric views are better lined up to be seen from more formally laid out areas such as large towns and coastal resorts, and industrial areas. Particular sensitivity should be placed on formal views in designed historic landscapes, and the effect of development on their content and focus. It may be appropriate to place great emphasis on lining up with, or moving away development from the lines of such key views - each case assessed on its own merits.

6.3.2 Design in Response to Visual Receptors - Visual Optimisation

A policy of ongoing design iteration should be employed through the SVIA to modify the project design including location, pattern and numbers of turbines in response to the identified potential visual effects of the proposed development. This optimisation process should be used to avoid, minimise and mitigate the visual effects of offshore developments upon sensitive locations and receptors. This optimisation would respond to the findings of the seascape characterisation and baseline visual analysis, taking account of all other key constraints, such as economic (wind yield), technical and other environmental issues (e.g. marine ecology, birds etc) as necessary.

The layouts of offshore wind farms are generally a compromise between capturing the most wind (and therefore maximising energy yield), responding to technical constraints, such as water depth and navigational requirements, and responding to environmental constraints, such as bird flight paths, marine processes, ecology, archaeology and fisheries. The aim of creating a harmonious and positive visual effect should also play a significant role in the layout design process. There are several types of layout of offshore wind farms. The main ones are a basic grid, offset grid, feathered grid and random array. These are shown in Figure 19. These diagrams are for illustrative purposes only.

Figure 19: Main Offshore Wind Farm Layouts



In all wireframes shown above the viewer is placed at 90° to the wind farm layout

The basic grid layout, as opposed to a linear layout, means that the horizontal extent of the wind farm as seen from the coast is lessened. The offset grid may be more visually harmonious as it allows visibility to the horizon through avenues of turbines from more viewpoints than the straight grid. In reality either grid layout will appear ordered from only a set number of positions (aligned with the grid rows) and will instead appear random from the majority of viewpoints. A grid layout on plan is therefore not synonymous with a regular pattern when viewed in elevation. A feathered grid may look more natural from certain viewpoints, and have a narrower horizontal extent (if aligned 'end on' to the coast). Random turbine layouts are unlikely to be acceptable to marine navigation agencies and recent helicopter search and rescue trials at North Hoyle Offshore Wind Farm[26], confirmed that a random configuration for offshore wind farm layouts, would cause the greatest problems for helicopter radar search and rescue.

The layouts presented in Figure 19 are representative of the main types of layout, but an infinite number of layout configurations are possible. The key characteristics of the coastal landscape should be used for design inspiration for offshore wind farm layouts, and the design process should seek to reflect and acknowledge these key features. For example, an arced layout may reflect the geometry of the coast and provide a landmark feature. The design for Scarweather Sands Offshore Wind Farm, proposes a series of rows on a slight curve, which has a characteristic of appearing random in more angles of view than straight line options, and this type of layout may be appropriate where the turbines need to fit with a distinctive coastal geometry or characteristic. The Middelgrunden offshore wind farm in the strait of Øresund near Copenhagen originally consisted of 27 turbines placed in three rows, but after the public hearing in 1997, where this layout was criticised, the turbine layout was changed to a slightly curved line of 20 turbines, chosen in accordance with the historically developed Copenhagen defence system around the City.

In general, developers are encouraged to minimise the horizontal spread of the layout in key views, which is often one of the dominant factors in determining the magnitude of change in the view.

Based on the review of the baseline landscape, seascape and visual context, recommendations should be made in respect of the design and layout of the proposed offshore wind farm. An optimisation meeting should be held with the developer to contribute to the design optimisation for the wind farm. Wind farm design software, such as Windfarm (Resoft) or Windfarmer (Garrad Hassan) should be used to interactively optimise the layout. Alternative layouts should be reviewed with respect to landscape, seascape and visual considerations, normally from several key viewpoint locations and using a number of possible layout arrangements.

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[26] Offshore Wind Farm Helicopter Search and Rescue Trials Undertaken at the North Hoyle Wind Farm (Report written for the Maritime and Coastguard Agency by Colin Brown, MCA Contract MSA 10/6/239, May 2005)

Box 10: Robin Rigg offshore wind farm: Visual optimisation case study

In order to provide landscape and visual advice to the choice of layout for the proposed offshore wind farm at Robin Rigg (Solway Firth), a visual optimisation exercise was carried out, initially on four layouts, as follows:

- Layout A: Linear/basic grid
- Layout B: Offset grid
- Layout C: Offset grid 2
- Layout D: Random array based purely on maximum energy yield

14 key viewpoint locations were identified along both the English and Scottish sides of the Solway Coast and wireframes were produced for all four layouts at each of the viewpoints. Key viewpoints were visited in the field with wireframes of the layouts. Preferred layouts were indicated at each of the viewpoints by three landscape architects following analysis of the wireframes and field survey. A number of questions and criteria were used to assess layouts and inform the selection of a preferred layout, as follows:

- What are the main visual elements in the view? How does the layout relate to these main visual characteristics?
- What are the key landscape characteristics at this viewpoint? How does the layout relate to the landscape character?
- What is the relationship between the turbines?
- Will they be concentrated or widely distributed? Is there consistency in the layout and spacing?
- Will they appear as a distinct group separate from their surroundings?
- Will the wind farm have a consistent relationship with the landscape/seascape?
- Will it appear visually stable in the seascape?
- How does the layout relate to the backdrop of land mass, sea and sky?
- How will the windfarm appear in relation to the key visual elements of the landscape?
- What is the proportion of the field of view occupied by the development?
- What kind of image will the wind farm have in relation to the landscape? - Single isolated feature? Sprawled? Fitted to pattern? Fitted to landform?

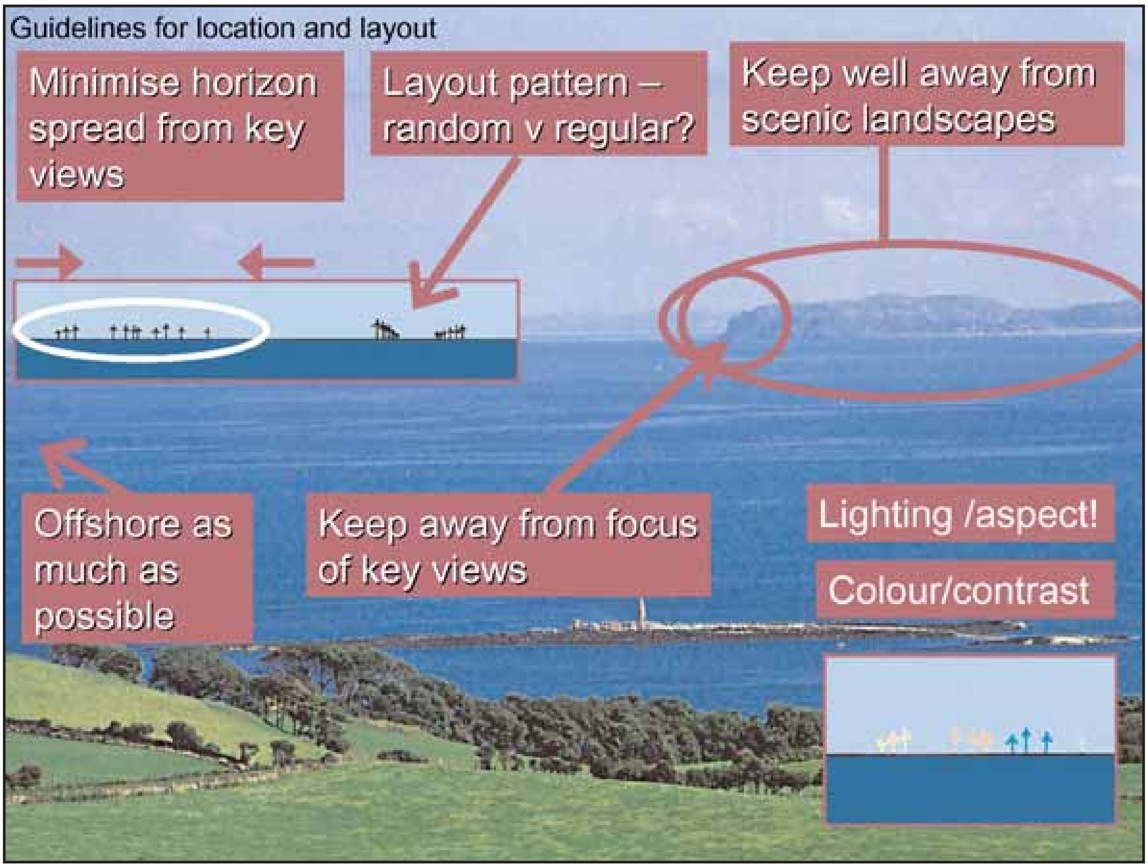
The review of the layouts showed a clear preference for Layout D, the offset grid. This layout was preferable because from the particular orientation of the coast around the Solway Firth, it had a clearly discernible pattern created by offset rows of turbines and a more compact layout, which reduced the horizontal extent of the turbines in views. The resulting order of the layout translated to a more balanced and harmonious composition of turbines in the seascape or when read against the land mass on the opposite side of the Solway Firth. It was considered that from the majority of locations, the legible pattern of offset rows of turbines, and the order of this pattern has a more satisfactory relationship with the seascape characteristics than the random array. The most dominant criteria in determining preference was the reduced horizontal extent of the turbines in the offset grid in views from the coastal locations assessed.

It is important to recognise that the scope for layout alteration may be restricted by other environmental, technical and economic constraints and these should be fed in during the optimisation. Where measures which result in reduction of landscape, seascape or visual negative effects can be accommodated within the overall proposal, and within the constraints arising from other environmental considerations, for example, coastal processes, marine ecology or fisheries, these should be incorporated into the proposed development, and reported in the ES. This optimisation process would be documented and reported in the ES together with illustrations showing the evolution of the site layout in response to the findings for incorporation into the LSVIA in the ES. The mapped constraints and iteration of layouts with supporting wireframes should be retained for inclusion in the ES as documentary evidence of the layout design process. For example, the changes in layout at Rhyl Flats were documented in a supplemental ES as way of showing the optimisation of the wind farm from a layout of 2 rows to a more compact design of 3 shorter rows, which reduced the spread of the wind farm on the horizon.

Photomontages and layout plans were provided in a supplemental ES which documented this layout design process. (note the original ES had two rows of 15 turbines, a supplemental ES gave other options and it was this which was later consented).

It is also important to design offshore wind farm layouts in response to the predominant visual receptors. Consideration should be given to high verses low angle views. The lower the angle of view, the more likely it is that a development in the sea will appear on the horizon. From sea level the horizon is only about 2km away at sea. Therefore a development with structures projecting from the sea is likely to appear on or about the horizon from about 1.5km distance to infinity. From a raised headland, the increased viewer altitude will mean that although the sea view may appear visually the same, the horizon distance may be much further away - say 20km, and that a development at 2km from the coastline would appear well below the horizon. It might also be perceived as closer (because it is below the horizon line) and therefore smaller, than when seen from near sea level.

Figure 20: Guidelines for Offshore Wind Farm Location and Layout



Source: CCW © Countryside Council for Wales. All Rights Reserved.

6.3.3 Design in Response to Weather, Light and Aspect

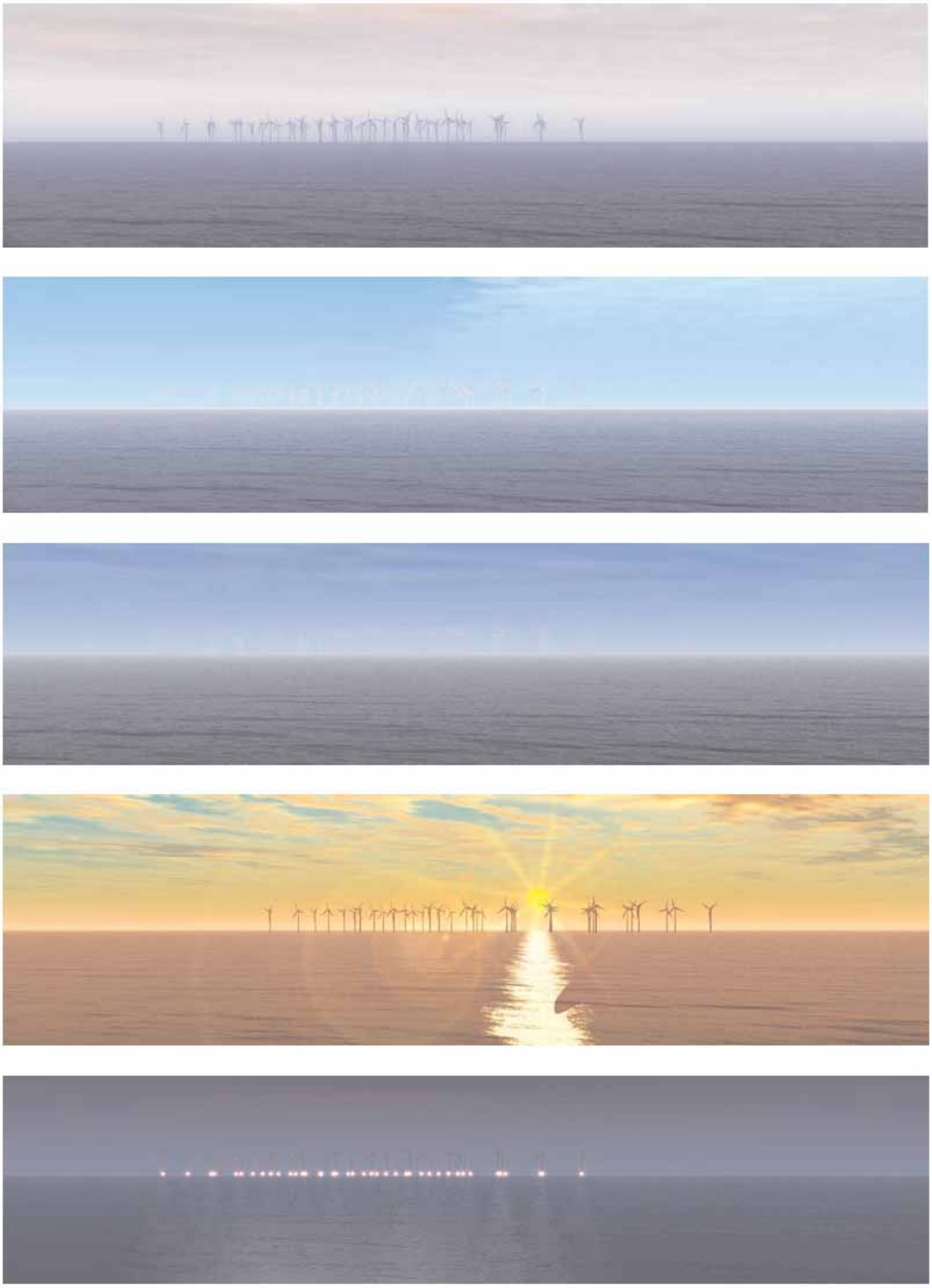
This guidance assumes that it is a good thing to minimise visibility of turbines as much as possible to reduce seascape and visual effects, but also recognises that this potentially comes into conflict with navigational safety, where the idea is that turbines should be as visible as possible to passing vessels and arranged in straight lines.

From a function perspective, offshore wind farms have to be situated in exposed areas open to available winds, having a strong layout design which relates to the form and function of the site. Given this need, there is opportunity for increasing the concealment of turbines through the use of appropriate colour tones on the turbines for the prevailing weather conditions of a particular geographic location. This has the potential to minimise the actual visibility of the wind farm and the magnitude of the resulting visual effect.

To conceal turbines in the sea against a background of permanence, such as the sky, it is distance that plays a major role, together with the range of colours, tones, and light conditions which change from one day to another under different weather conditions. The greater the distance from the observer to the object, and the greater the amount of diffused light, hazy or foggy weather, the greater the chance of concealment or invisibility. The effective tone i.e. the distance from the observer at which the different tones of an object and the background merge to form one overall tone, is much more likely to be occur at greater distances than short distances. Observations by CCW and others suggests that human perception of colour reduces with increased viewing distance (perhaps due to atmospheric haze), so a bright colour hue on a turbine may appear less bright when viewed several kilometres away, in the same lighting conditions. The high visibility yellow of a distant turbine base against the bluish sky or sea is not obvious at distance even though the luminance contrast is enough to make the turbine as a whole easily visible.

A range of colours, tones, and light conditions are prevalent around the UK coast and change from one day to another under different weather conditions. Lighting affects the amount of contrast in a view (and hence ability to discern objects at sea and other landmasses). Sunrise and sunset in clear weather often provide the maximum contrast where distant objects or landmasses are backlit, whereas diffused light in cloudy or hazy weather conditions provides least contrast. Round 2 offshore proposals are located at distances of between 8km to 25km offshore, so they may not be discernible in certain weather and light conditions. The effects of aspect and lighting on offshore wind farms is illustrated with several hypothetical examples in Figure 21.

Figure 21: The Effects of Aspect and Lighting on Offshore Wind Farms



Above images: At 6km from the viewer, a wind farm development at sea will have a different level of contrast to its background with different lighting conditions. (These images © The Countryside Agency)

The montages in this figure are for illustrative purposes only. In the bottom image, showing the night time view, it would only be possible to show all the lights visible at once by using a time exposure on the photograph. At distances over 8km even the brighter lights (corner turbines etc) are likely to seen as just a twinkle due to the nominal range of the lights recommended.

Contrast between light and dark may be greatest at sunrise and sunset with background lighting, when an object in the sea has a strong colour contrast to its surroundings. Strong directional sun light pronounces this effect, but with a high sun, turbines appear darker. Turbines are likely to be more visually prominent where there is greater degree of contrasts between background and turbine colours. The lighting on turbines for navigational purposes may be visible at night and contrast with the background, but at the distance of most Round 2 projects from shore even the brighter (corner turbines etc) lights are likely to seen as just a twinkle.

When addressing the question of how to minimise the visibility of wind turbines in the sea, the problems to be overcome in order to achieve a measure of concealment lie in the infinitely variable backgrounds; the sea and the sky, and the changes that are produced by weather and light conditions. In addition to the continual changes in weather and light conditions, there is the problem of what angle the turbines are viewed from. For example, the view from a beach will show the turbines against a sky background, while the view from a coastal hill will show the turbines against a sea background. It is also possible that offshore wind turbines may be viewed against land, such as in an estuary where there are views from one coast across sea to another coastline behind the turbines. When prescribing colour that is designed to promote concealment of wind turbines, these variables should be taken into account, for example, in an area with predominantly raised coastline and elevated views with the sea as background, a darker colour turbine may be more suitable to increase concealment of the turbines.

At sunrise and sunset there is often a particular set of light conditions in effect where strong red or orange colours are present. When a wind turbine is up light, i.e. where the observed wind turbine is between the observer and the light source, it will appear as a silhouette no matter what colour it is painted. It can be assumed that from viewing positions located to the east of an offshore wind farm in England and Wales, they will be seen 'down light' i.e. where the observer is placed directly between the light source and the observed wind turbine, for the most of the day and then 'up light' in the evening. From viewing positions located to the west of offshore wind farms, they will be 'up light' for the most of the day and then 'down light' in the evening.

In conditions of weather that produce diffused light, (an overcast day with no sun), concealment is best achieved by using a very light toned pattern/colour which will give the minimum range at which visibility occurs. During the baseline survey, information from the met office should be studied to ascertain the prevailing weather conditions for the area in which the proposed wind farm is located, so that recommendations can be made as to the appropriate turbine colour. It is very likely that in the maritime climate of England and Wales, and particularly in the coastal environment, overcast days with no sun will be prevailing weather conditions over a larger proportion of time than clear blue skies or dark storm clouds. As such, light tones such as off white or light grey are most suitable for offshore wind turbines. The traditional British Navy response to these conditions has been 'battleship grey'. Each offshore wind farm site should be judged based on its own geographic location, coastal orientation, elevation and prevailing weather and light conditions.

6.3.4 Design in Response to Navigational Marking Requirements

A recent IALA recommendation[27] on the marking of offshore wind farms provides guidance on the marking of offshore wind turbines. It recognises the need to preserve the safety of navigation, the marine environment and to protect wind turbines themselves from collision with seafaring vessels. The guidance recommends that offshore wind turbines should be marked so as to be conspicuous by day and night, with consideration given to prevailing conditions of visibility and vessel traffic. It is possible that this requirement could be at odds with recommendations in SVIAs to minimise turbine visibility for viewers on the shore. It is essential that mitigation of the visual effects of offshore wind turbines for land based receptors is considered in the context of requirements for the safety of shipping and navigation interests.

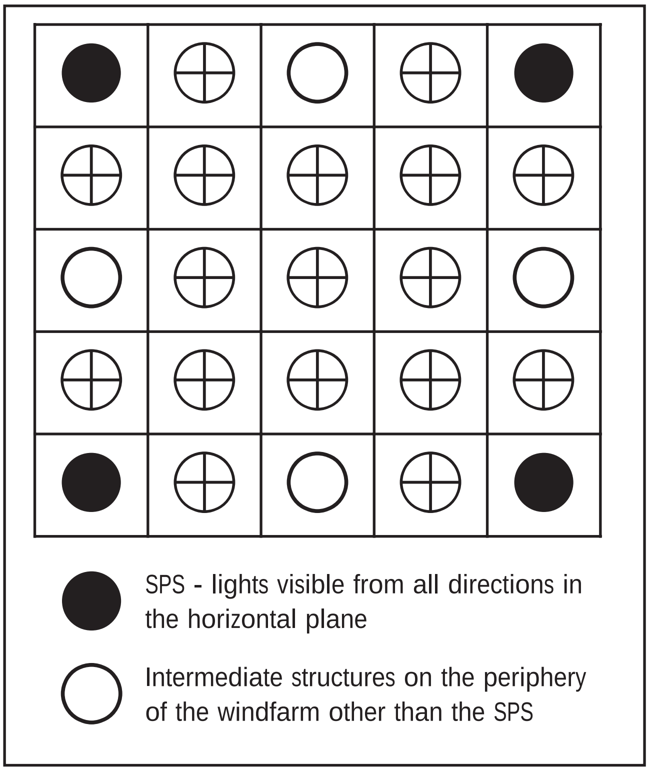
There is a requirement for the tower of every wind turbine in an offshore wind farm to be painted yellow all round to 15 metres above the level of Highest Astronomical Tide (HAT), or to the height of the Aid to Navigation if fitted. Alternative marking may include horizontal yellow bands of not less than 2 metres in height and separation.

Due to the increased danger of collision posed by an isolated structure, there is also a requirement for turbine to be lighted with a white light. These aids to navigation are mounted on the wind turbines below the lowest point of the arc of the rotor blade, but between 6-15 metres above the HAT level. The significant peripheral structures

[27] IALA Recommendation 0-117 on the Marking of Offshore Wind Farms (Edition 2, December 2004)

(SPS), i.e. the corner turbines in an array are required to be fitted with lights visible from all directions in the horizontal plane, and selected intermediary structures on the periphery of a wind farm other than the SPSs are also recommended to be marked. This is illustrated in Box 11.

Box 11: Example light markings of an offshore



wind farm

The Maritime and Coastguard Agency (MCA), through recent guidance notes[28], also requires that all turbines are marked and fitted with short range lighting, as an active safety management system. It should be noted that IALA recommendation 0-117 is a minimum standard to comply with, and that marine administrations such as the Department for Transport (DfT) through MCA may make further recommendations as to the requirements for navigational markings and safety issues.

Although it is possible that the requirement for yellow markings and navigational lights to aid navigation could be at odds with recommendations in SVIAs to minimise turbine visibility, it is considered that the nature of the markings being at the base of offshore turbines still allows mitigation of the main, upper parts of the turbine structure through the use of light colour tones to minimise shore based visibility. A large proportion of offshore turbines can be coloured in light tones to increase concealment, while still ensuring the safety of seafarers by using high visibility markings on the lower parts of the turbines. Navigation markings stand out in the daytime to seafaring vessels, over short to medium distances out at sea, up to around 8km. Views of these markings from the shore will vary with height of the observer and distance of the wind farm offshore. Over a certain distance from the shore, depending on the elevation of the viewer, these high visibility markings will not be seen due to the earth curvature. Locating the development as far away from the coastline as possible will be best method of mitigating the effects of high visibility navigational markings and lights, however this should be assessed on a case by case basis against marine navigational safety requirements, and other environmental constraints.

28 MGN 275 (M) Proposed UK Offshore Renewable Energy Installations (OREI) - Guidance on Navigational Safety Issues (Maritime and Coastguard Agency, 2004)

Key Considerations in Siting, Layout and Design: Key Guidance

- Siting, layout and design offer scope for integrating offshore wind farms into the seascape and to prevent, reduce and mitigate seascape and visual effects;
- There should be a demonstration in the SVIA of the process by which potentially negative effects have been designed out (prevented), reduced or offset;
- Seascape needs to be considered at the outset of the layout and design process to have the desired effect;
- Other (non seascape) issues should be considered alongside, meaning inter-disciplinary team working is essential as an ideal seascape/visual layout is rarely possible, and the seascape assessor needs to take all constraints into account before being satisfied that the best available option has been achieved;
- Consider locating developments in lower sensitivity seascapes with higher capacities to accommodate change;
- Consider locating developments as far away from the coastline as possible;
- Consider locating developments particularly away from coastal landscape designations;
- Consider using headlands and development siting to minimise visibility;
- Consider locating developments in already industrialised and developed seascapes;
- Consider the siting relationship with other existing offshore and onshore wind farms;
- A policy of ongoing design iteration should be employed through the SVIA to modify the project design including location, pattern and numbers of turbines in response to the identified potential visual effects of the proposed development;
- An optimisation should be carried out with the aim of creating a harmonious and positive visual effect. This optimisation process would be documented and reported in the ES together with illustrations showing the evolution of the site layout;
- Minimise the horizontal spread of the layout in key views, which is often one of the dominant factors in determining the magnitude of change in the view;
- It is also important to design offshore wind farm layouts in response to the predominant visual receptors. Consideration should be given to high versus low angle views; and
- Seascape is only one of a number of factors which are significant in siting offshore wind farms, others include marine safety, fisheries, marine processes and ecology, birds and marine archaeology, which should also be considered on a case by case basis; and
- Light tones such as off white or light grey are most suitable to minimise the visible of offshore wind turbines. The recommended colour of turbines should be judged for each offshore wind farm site based on its own geographic location, coastal orientation, elevation and prevailing weather and light conditions.

7. PREDICTING IMPACTS AND ASSESSING THEIR MAGNITUDE

7.1 Introduction

The aim of the impact prediction stage is to identify systematically the likely seascape and visual effects of the proposed offshore wind farm development, and to estimate the magnitude of these effects.

In order to predict impacts it is necessary to establish the starting point for change, i.e. produce a description and record of the existing seascape and visual resources. The baseline study of the existing seascape and visual resources, and the assessment of their sensitivity, described in Sections 4 and 5 provide this starting point. Knowing the resources at the start enables a comparison of how the development will change them during construction, operation and decommissioning. Seascape and visual effects can arise from a variety of elements of an offshore wind farm, and in order to successfully predict impacts, it is also necessary to establish a clear project description at an early stage upon which the impact prediction should be based.

7.2 Project Description

A project description of the proposed development should be provided in the SVIA. In particular, this should include a description of the physical characteristics of the whole development (offshore and onshore) and the land-use requirements during the construction and operational phases, in so far as they may affect seascape, landscape and visual resources.

Often there are issues of uncertainty around particular elements of the project description, for example the size of turbine to be used. Environmental impact assessments shape the project description as they feed into the ongoing project design, and it is often relatively late in the process that the detail of the project description becomes fixed. SVIAs of offshore wind farms can be progressed up to a certain point without the detailed project description, for example the baseline seascape characterisation and visual analysis can be completed, however the impact prediction and evaluation stages require the project description to be fixed before they can begin. The key variables that should be fixed for the impact prediction stage, are the size and exact layout of the wind turbines, which are needed before accurate visibility models can be generated, but it is also important to have firm details of other components of the development, such as the locations of offshore and onshore substations, and information about site management activities (such as serving the turbines) that may have seascape and visual effects.

A checklist of information for inclusion in a project description for an offshore wind farm is presented in Box 12.

Box 12: Checklist of information for inclusion in a project description for an offshore wind farm

- The site and size of license area;
- The types of wind turbines to be used, including their dimensions (hub height, blade tip height and rotor diameter), materials and colours;
- The proposed layout and spacing of all the above structures (grid co-ordinates of the turbine locations required);
- Location, dimensions and form of ancillary offshore structures such as substation and anemometer masts;
- Navigational visibility, markings and lights;
- Any shore based facilities, particularly relating to grid connections and associated structures, i.e. substation, pylons, overhead lines, underground cables. If new buildings, location, floor area, height, colour and materials;
- The type(s) and size(s) of boats servicing the scheme and frequency of site visits;
- The pier, slipway or port to be used by boats for transport of materials to and from the site (whether new or existing);
- Proposed road or track access, and access requirements to the coast, whether new or existing
- Construction plant;
- Temporary construction facilities;
- Construction vessels; and
- A programme of construction and installation.

If the SVIA is part of a full EIA then the project description information detailed in Box 12 will be included elsewhere in the ES so a reference to this, or a summary of the main elements in so far as they may affect seascape and visual resources should be all that is needed in the SVIA.

7.3 Identification of Potential Effects

Once the baseline seascape and visual resources have been described, and the sources of effects identified in the project description, potential effects can be identified and described. Potential seascape and visual effects include direct effects on the seascape/landscape resource, indirect effects on seascape character and qualities, and effects on available views and visual amenity. Definitions of these key terms are provided in Appendix 3.

There is a common misconception that assessing effects on seascape and visual amenity is entirely subjective, and that it is concerned with establishing whether the development appears "attractive" or "beautiful" or not. Issues of beauty are too complex for standard SVIA and can be entirely avoided. Instead the prediction of seascape and visual effects should focus on the extent of visibility, the effects on the setting or perception of seascapes and changes in the nature of views and visual amenity. The impact on people varies not just with the level of visibility and nature of the views, but also in relation to the sensitivity of the people viewing, which in turn is affected by why they are there and what they are doing. Evaluation of the sensitivity of people to visual change is described fully in Section 5. Consideration of visual effects of offshore wind farms should include a study of the magnitude of change in relation to views, cross-referenced with a study of the different receptors and their sensitivities. The SVIA must therefore make strong links between the nature of views and recreation, activity, land use, landscape designation, and public attitudes in order to assess effects on visual amenity.

Potential effects on seascape character and qualities of seascape units, available views and visual amenity, as a result of offshore wind farm development, should be predicted using visibility studies and viewpoint assessments.

7.4 Tools for Predicting Seascape and Visual Effects

7.4.1 Visibility Studies

When predicting the potential seascape and visual impacts of an offshore wind farm, the extent of potential visibility of the development should be shown. The extent of visibility of an offshore wind farm from the land is fundamentally affected by topography, vegetation cover and built elements/structures within the landscape. A Zone of Theoretical Visual influence (ZTV) should be derived from computer modelling, using a Digital Terrain Model (DTM) and specialist software, and from field survey ground truthing. A standard DTM, such as the Ordnance Survey Land-Form Panorama, assumes a bare terrain, unencumbered by vegetation, buildings or other structures. In general the ZTV is likely to over-estimate the spatial extent of visibility of an offshore wind farm, due mainly to the use of a 'worst-case' model of the turbines (largest turbine height is likely to be used) and the simple topographic model that takes no account of the complex natural and man-made elements in the surrounding landscape. It is likely therefore, that actual visibility on the ground is less than that indicated on ZTVs due to the screening effects of surface features and local landforms, however where a ZTV indicates that there is no visibility of wind turbines, this may be considered accurate (within the normal tolerances of the OS data). Where possible, field survey with the ZTV is recommended in order to identify areas of 'dead ground', such as within large woodlands or urban areas, to inform the refinement of a final ZTV.

A visibility assessment should be carried out using the ZTV to describe the general extent and pattern of visibility of the proposed wind farm within the study area. The visibility assessment should also describe the extent of visibility over the main marine, coastline and land activities such as sea based recreational activities, coastal settlements and the main road, rail and footpath network.

Box 13: Summary guidance on offshore wind farm ZTV

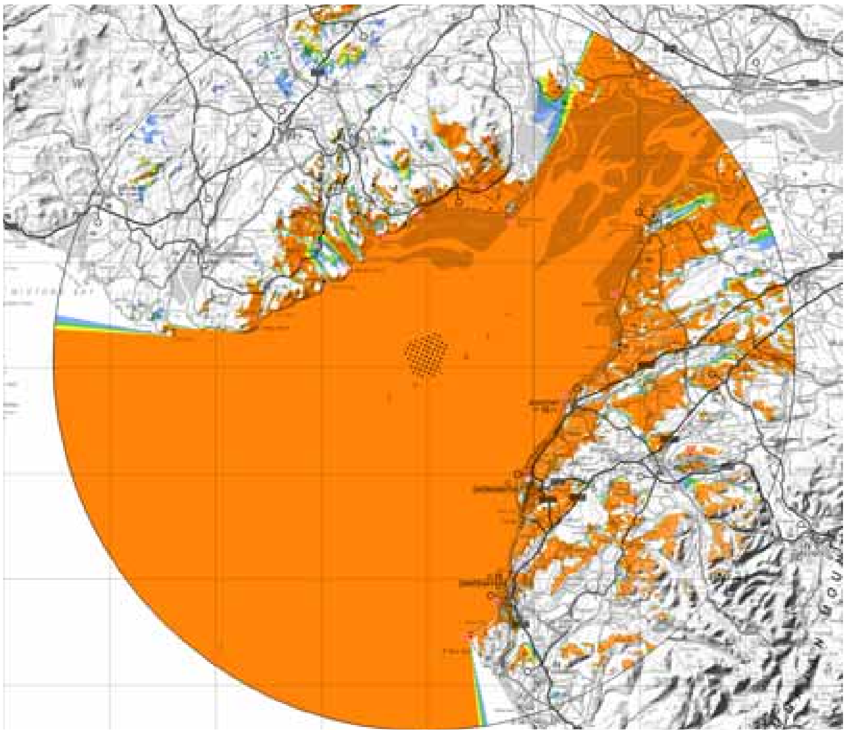
- A ZTV should appear in all SVIAs, superimposed on an OS base map at 1:50'000 or 1:100'000 scale;
- The Digital Terrain Data (DTM) used to calculate the ZTV should be described. The use of OS Panorama data with a 50m cell size is generally recommended, but other products, such as the OS Profile (10m cell size) or NextMAP Britain DTM should be considered where greater resolution or surface features are required;
- In the context of current technologies, the distance for the ZTV should extend to a 35km limit of visual significance;
- The ZTV should assess the degree of visibility based on the numbers of turbines visible to the maximum height of the turbines (the blade tip height), and if possible based on nacelle/hub height;
- Where possible, the ZTV should be verified by field survey; and
- The limitations of the ZTV should be acknowledged in the SVIA.

Based on recommendations in Visual Assessment of Windfarm: Best Practice (SNH, 2002)

The limitations of the ZTV should be discussed in the SVIA, particularly in so far as they relate to coastal landscape and offshore developments. In certain areas, for example in the Greater Wash on the east coast of England, the landscape is so flat that a standard DTM may not accurately predict impacts, as it is likely to show theoretical visibility over the entire study area, despite the fact that in reality surface features (e.g. vegetation, buildings) or particular landscape features, such as sea defences (e.g. the Lincolnshire coast) will afford screening and reduce the ZTV considerably. In these situations, the use of more detailed DTM datasets, and of those which include surface feature models, is encouraged as a way of improving the accuracy of the ZTV. NEXTMap Britain, for example, provides both a high density DTM and a digital surface model, which accounts for the tops of buildings and vegetation on the terrain surface. Field survey work to generate a 'manual' zone of visual influence based on ground truthing and denoting the extent of visibility on a base map should also be considered in circumstances where the nature of the seascape does not support the use of DTMs.

A number of ZTV techniques are available in order assist with impact prediction. The most standard ZTV for wind farm developments should predict the number of turbines visible. It is common for the predicted visibility to be separated into bands of numbers of turbines, such as 1 - 4 turbines, 5 - 8 turbines etc tailored to suit the size of the development. This ZTV shows the amount of the wind farm visible and assists with making judgements on the extent of the area over which changes would be visible and the magnitude of change for a particular receptor. When predicting impacts using visibility studies, it is relevant to consider the effects of curvature of the earth on turbine visibility within the ZTV calculation. The influence of curvature on visibility is most marked in low lying areas, such as at sea level, whereas with elevation on land, it becomes less pronounced. A 150m high turbine would no longer be visible to an observer at sea level at a distance of approximately 52km due to the amount of earth curvature between the viewer and the turbine. The blade tips of the turbine would theoretically become visible at distances of 45-53km, although in reality, the acuity of the human eye to distinguish blade tips at this distance is debatable. An example of this form of ZTV is shown in Figure 22 for Robin Rigg offshore wind farm in the Solway Firth.

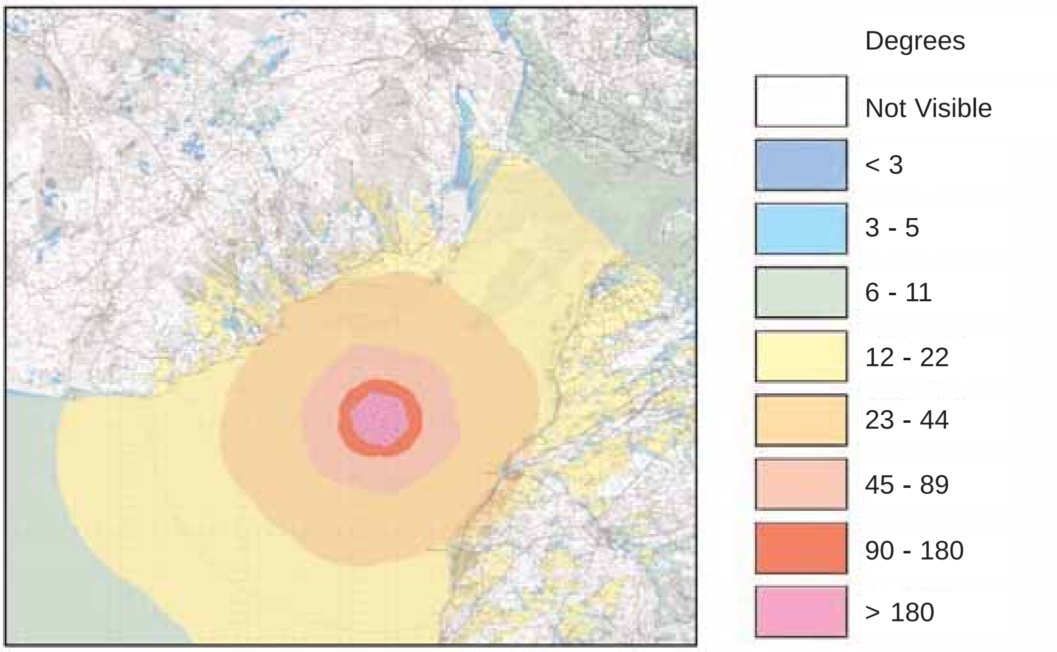
Figure 22: Offshore Wind Farm ZTV



Spurce: Natural Power Consultants/Envision

Predicting the proportion of the view occupied by the proposed offshore wind farm should also be considered when determining the extent and magnitude of change over the study area, and for particular receptors. A horizontal angle subtended ZTV can be used to predict the effect of wind farm developments on the proportion of developed and undeveloped skyline. The ZTV is calculated by taking the bearing from the observer to the left most visible turbine and counting degrees to the right most visible turbine of the wind farm, then mapping the angles on the ZTV. A hypothetical example of a ZTV for a wind farm in the Solway Firth showing curvature of the earth is illustrated in Figure 23.

Figure 23: Offshore Wind Farm ZTV - Horizontal Angle Subtended



Source: Phil Marsh

The standard ZTV showing numbers of turbines visible, and the horizontal angle ZTV showing the proportion of developed skyline are considered to be the most useful ZTVs for the prediction of visual effects of offshore wind farms. However, there are other ZTV techniques available, which are continually developing. An example might be using weighted scoring systems which help predict the amount of the development visible using a 'cloud' of points representing structures in the wind farm, or using weighted scoring with scores decreasing inversely with distance to show the relative visual impact of turbines over long distances.

ZTVs should be used as a tool to inform the consideration of indirect effects on the setting or perception of seascape units and landscape designations. The effects on the perception of the seascape are limited to those areas from where there will be visibility of the proposed wind farm, or areas outwith the visibility of the proposed wind farm where intermittent visibility from within an area results in a perception that is more widespread than the actual effects themselves. Seascape units, landscape character types and designations with direct visibility should be identified using a ZTV overlain with the seascape unit or designation boundaries. This allows the visibility of the offshore wind farm within seascape units to be predicted, and judgements to made on the extent of visibility (such as negligible, limited, intermittent, extensive) from within the seascape unit or designation. The effects on these seascape receptors relate to possible changes to their key characteristics and attributes caused as a result of the introduction of offshore wind turbines. The baseline character assessment provides an evaluation of the key attributes and characteristics which combine to influence the sensitivity to change of the seascape unit or designation. An assessment of the changes to the key attributes of these seascape receptors, caused by the proposed offshore wind farm should be carried out and the magnitude of change caused by the offshore wind farm to each receptor should be evaluated.

7.4.2 Viewpoint Assessment and Visualisation

A viewpoint assessment should be carried out to identify and evaluate the potential effects on available views and visual amenity arising from the proposed offshore wind farm at specific representative locations in the study area.

Viewpoints should be selected in negotiation with statutory consultees, including the Local Planning Authority and the Countryside Agency and CCW (some sites will need to consult both), and public consultation and participation should be considered. The number of viewpoints should be selected to achieve an effective assessment of key viewpoints and an effective assessment of representative viewpoints - for offshore wind farms, this is likely to be between 8 - 20 viewpoints depending on the complexity of the coastline and the nature of the proposed development. Viewpoints should be selected in order to identify both potentially sensitive receptors and potentially significant views on locations or landscapes. The impact prediction component of the viewpoint assessment can be summarised under the following stages:

- Stage 1: Identification of main receptors;
- Stage 2: Identification of receptors within the ZTV;
- Stage 3: Selection of a representative range of potential viewpoints;
- Stage 4: Field survey to locate viewpoints and denote and describe existing views;
- Stage 5: Visibility analysis;
- Stage 6: Viewpoint photography;
- Stage 7: Photomontage production; and
- Stage 8: Virtual reality and videomontage.

It may be helpful to identify a greater number of viewpoints for producing wireframes from, as part of the iterative design and assessment process, and use overlaid or beside panoramic site photos. However the more resource intensive full photomontages may only be relevant for the final proposals, for a selection of the views.

These stages can be described as follows and provide a guide to the process undertaken to predict impacts during the viewpoint assessment.

Stage 1: Identification of main receptors

The main receptors within the SVIA study area should be identified during the baseline the survey of activities and functions described in stage 3 of section 5 in this guidance. These include receptors engaged in the main activities and functions of the seaward, coastline and landward components, including recreation, transport, settlements and commercial activities.

Stage 2: Identification of receptors within the ZTV

The potential extent of visibility of the proposed wind farm should be identified by a ZTV of the proposed development and the receptors identified in stage 1 should be checked against the extent of visibility. Having identified the main receptors in the study area in relation to the ZTV, it is possible to identify and predict those likely to be affected by the proposed development.

Stage 3: Selection of a representative range of potential viewpoints

A representative range of potential viewpoints from the receptors falling within the ZTV should be included in the visual assessment, in relation to the following criteria:

- Type of receptor - based on survey of activities and functions described in Section 4.3. This should include viewpoints in the sea component to represent and assess views of marine users. The visual assessment should not only be made from coastal/shore based viewpoints, but also from viewpoints within the sea component to assess the effects on views of marine recreational users, such as recreational boating, angling and ferries;
- Type of seascape unit - ensuring representative viewpoints from each seascape unit or character type;
- Altitude - selection of high angle views from elevated positions and low angle views from low lying areas;
- Distance of receptor from proposed development - usually to a maximum distance of 35 km from the proposed development; and
- Direction of receptor from proposed development, with the aim of achieving a distribution from different compass points around the site.

Stage 4: Field survey to locate viewpoints and denote and describe existing views

Field survey work should be undertaken to verify the appropriateness of the proposed viewpoints. This involves checking the initial viewpoint grid references on the ground, to ensure that there would be views of the proposed development from these locations. Since the ZTV is likely to be based on 1:50,000 base earthed DTM, it may be that on the ground, a viewpoint selected from analysis of the ZTV, does not actually have any views to the proposed development. In some instances, this can be remedied by slight adjustments to the viewpoint position, although this should remain relevant to the particular receptor(s) for which the viewpoint was selected. It is also important to ensure that the selected viewpoints should have a representative view, i.e. that it does have the maximum potential visibility of the proposed development for the receptor(s) and in relation to the distance and direction criteria. Judgement on the viewpoint position needs to balance the need to represent a 'worse case scenario' and a 'typical/representative' view and this decision making process should be documented.

The fieldwork should be supported by wire frames of the proposed offshore wind farm, (the use of a laptop with appropriate wind farm visualisation software is encouraged to interactively illustrate views on screen in the field and accurately record viewpoint positions and views) observations recorded with photographs and/sketches, and precise viewpoint positions recorded with a hand held global positioning system (GPS) and 1:25'000 OS map.

A standard seascape field survey form should be completed in the field to record and describe the viewpoint location, its users and the existing view from each viewpoint. The existing view should be described in relation to the main physical form of the seaward, coastline and landward components, the main visual elements of the view and activities, its openness, distance, aesthetic factors and character. The field survey record can subsequently be reported in the SVIA.

Following field verification and description of potential viewpoints, the results of the final viewpoint selection should be presented in a summary table with commentary on final viewpoint grid references, distances from the proposed development, receptors and rationale for selection, to be reported in the SVIA.

Stage 5: Visibility data

The viewpoint assessment should be informed using a computer generated visibility analysis carried out using Ordnance Survey Digital Terrain Model (DTM) data and a 3D model of the wind turbines. For each viewpoint included in the viewpoint assessment, computer visibility analysis can draw a line of sight across the terrain model to each turbine in the wind farm, allowing detailed data to be extracted, such as:

- The distance, in kilometres, to the nearest and furthest visible turbines;
- Compass bearing to site centre, and to outer most turbines in the array;
- Number of turbines visible;
- Horizontal angle of the field of view occupied by the array of turbines;

- The height visible of each turbine in the wind farm;
- The minimum and maximum height of turbines visible; and
- Percentage of total height of wind turbines visible.

The quantitative data provided in the visibility analysis informs not only the prediction of the magnitude of effect at each viewpoint, but also the viewpoint photography and photomontage production which rely on information such as the bearings and horizontal angle of the array to ensure that the panorama accurately encompasses and positions the wind turbines in the view.

Stage 6: Viewpoint photography

Viewpoint photography is used to predict and illustrate seascape and visual effects of offshore wind farms. Photography is used, together with 3D computer generated models, to produce 'photomontages' of proposed offshore wind farms. There are a number of computer techniques available for photomontage production, ranging from the use of Autocad software, windfarm design software such as windfarm and windfarmer, and specialist software developed by 3D data visualisation consultancies. All of these software packages require an accurate, rigorous viewpoint photography specification to be followed so that the process of producing visualisations from the photographs and computer models is as accurate as possible. When carrying out viewpoint photography, a specification should be set out which provides a defensible methodology and recording mechanism based on the requirements of the software used to produce the visualisations.

Box 14: Equipment required for viewpoint photography

- Global Positioning System handset (correctly set up to the Ordnance Survey British Grid);
- Tripod that can be set up so the camera is a fixed height above ground, approximately at eye level. Tripod should be marked with a graticule showing degrees;
- Camera mounted spirit level;
- Good quality sighting compass (not digital);
- 1:25,000 OS base map;
- Camera - traditional 35mm SLR camera with 50mm fixed lens, or digital SLR equivalent; and
- Plan of viewpoint locations.

The photographer should record a viewpoint log sheet, and should consider detailing the following information to assist with photomontage preparation:

- Time, date and prevailing weather conditions;
- The GPS grid reference that the photographs have been taken from;
- The photo/film number of the centre frame;
- The bearing on which the centre frame is directed;
- The bearing the camera has been rotated for the left and right frames (e.g. 30º with a 50mm lens);
- The location of the viewpoint on a 1:25,000 base map.

Generally, the following good practice guidance for panoramic viewpoint photography for offshore wind farm SVIAs are encouraged.

Box 15: Good practice guidance for offshore wind farm viewpoint panorama photography

- The camera should be mounted horizontally at eye level on the tripod using a camera-mounted spirit level and orientated in the direction of the bearing to the centre of the wind farm. The bearing must be measured using a good Silva (traditional) compass, as digital compasses are not accurate enough for this purpose. All bearings should be measured using magnetic north. The height of the camera above ground should be recorded.

- Standard panoramas should consist of three overlapping frames, however more than three frames may be required to cover the horizontal extent of the wind farm (and potentially cumulative wind farms) in the view. A panorama which sweeps from coast to coast should be taken to ensure that a sufficient angle of view is covered.

- The camera should be turned through stated angles from the left most frame in the panorama to the right most frame, achieving a consistent overlap of frames by using the graticule marked on the tripod. Each frame should be taken with bracketing of exposures one up and one down, before moving onto the next frame, so that the bracketed images for each frame are taken on the same bearing.

- The time, date and weather conditions should be recorded on the log sheet.

- A photo of the position where the viewpoint photographs were shot should also be taken. It is suggested that the tripod is photographed using either a separate camera or by removing the main camera from the tripod. This provides a precise record of the position used if the photography needs to be replicated.

- Bearings to and grid co-ordinates of reference points in the view such as existing buildings or structures should be recorded to assist with photomontage production. Where there are insufficient reference points, surveying rods may be used to mark the extremities of the wind farm on site, and the sides of the field of view, to assist with positioning the turbines on the seascape horizon. Surveying rods can be blended out of panoramas using Photoshop during photomontage production.

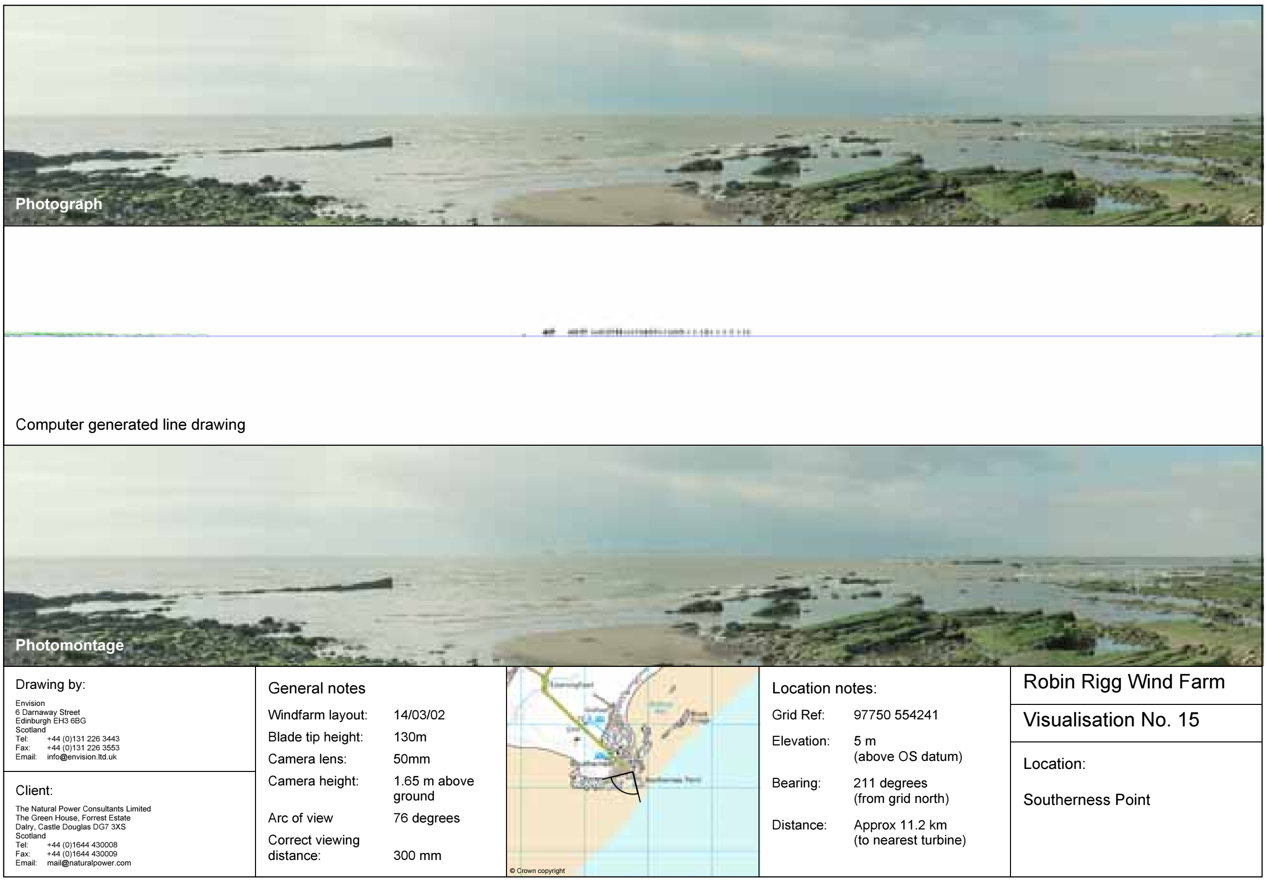
- The outputs of the viewpoint photography should typically be digital images files (Raw files or TIFF format) or 35mm prints. In the case of digital image files, images should be taken with the lowest possible compression ratio in an unaltered state as downloaded from the camera. A clear naming convention should be adopted to relate the delivered photographs with the correct viewpoints. Traditional film should be developed to produce large high quality prints and negatives for scanning.

Stage 7: Photomontage production

A photomontage is the superimposition of an image onto a photograph for the purpose of creating as realistic impression as possible of proposed or potential changes to a view. The prediction and illustration of potential seascape and visual impacts using photographs, wireframes and photomontage is now commonplace and expected in SVIAs. The principal purpose of a photomontage is as a tool to assist the decision making authority in visualising how a development project, in this case offshore wind farms, would look in real life. As such it is important to provide as realistic impression as possible of the appearance of the offshore wind farm as it will be seen from the viewpoint. Nevertheless, debate continues as to how this may be achieved, and on the accuracy and limitations of photomontages for predicting visual effects. This guidance aims to go some way to laying to rest some of the misunderstandings in the debate about photomontages by providing clear, unambiguous recommendations and explanations of the limitations of photomontages.

Photomontages can illustrate an offshore wind farm within the 'real' landscape and from known viewpoints which are relevant and important to people. They provide a geometrically accurate prediction of offshore wind farms, in that the positions of turbines can be produced so that they are identical to the proposed built positions of turbines, and to be the right size in the image. In this sense they provide an invaluable tool to help visualise a proposed development. Photomontages can be produced accurately and produce what appears to be a an accurate view of the proposed turbines, but it is useful to distinguish their geometrical accuracy from accuracy of representation of light, shade and colour - the former can be done, whereas the latter can only be approximated. Some examples of photomontages of offshore wind farms are shown in Figure 24.

Figure 24: Offshore Wind Farm Photomontage



Source: Natural Power Consultants/Envision

Nevertheless, it should be acknowledged that it is very difficult to simulate, on a 2 dimensional page, exactly what the human eye sees in reality. Shepperd (1989)[29] considers that a central cone of vision or field of view with a horizontal angle of 50 degrees is close to what the human eye perceives in any view. Although peripheral vision extends the cone to almost 180 degrees, the lack of clarity and depth of colour seen on the periphery is of limited value in influencing perception, and it is only the central cone of vision which is presented as a clear image.

The act of moving the head from side to side and up and down, is however, a natural and largely subconscious part of the process of 'viewing' a particular scene and allows the reception of a series of clear images that provide context for the central vista. Photomontages by nature are a static image printed on a page. The presentation of a wider cone of view to take account of the effect of peripheral vision is problematic, due to the difficulty in accurately portraying the reduced clarity that occurs in peripheral areas.

It is important that any two-dimensional image printed on a sheet of paper is presented at a size and viewed from a distance such that features within the image match what the eye would perceive from the viewpoint in real life, taking account of the distance at which the image is seen by the viewer. Larger images or over close viewing distances would exaggerate the effects of development, while reduced images or over-distant viewing distances would underplay effects. A simple practical test can compare the printed image of a view photographed using a 35mm camera with a 50mm lens or digital equivalent, with the perception of that view from the viewpoint in the field.

The level of detailed captured on camera, using a standard lens and subsequently printed on paper will, however, always be less than what the eye perceives in the field. The focusing mechanisms of the human eye and camera lenses are different; human vision is binocular and dynamic, compared to a camera that is static and can flatten an image.

The human eye records more detail in the field than is perceived when viewing a photograph, and consequently wind turbines when viewed in reality are likely to appear larger than in a photomontage. The differences between visual perception whilst looking at a photomontage and that in reality are explored in a study carried out for CCW[30]. The study shows that photomontages are of great assistance, but that we must be aware of a number of inherent limitations, including lack of movement, lack of 3D perspective, more limited resolution, a lack of wider context and a lack of the reality of a changing lighting and atmosphere. The study also acknowledges that whereas the turbines may appear to occupy only a small percentage of the photomontage view, in reality we appear to concentrate our attention or small parts of a view at any one time, and our eyes tend to stop at points in the view that contain unusual objects, high contrasts or movement, particularly in certain locations, such as along the horizon line (principle of visual movement), and that our attention may therefore be absorbed with the wind farm.

A sound judgement of the likely appearance of an offshore wind farm can best be made by viewing photomontages (at the correct viewing distances from the eye) on site where it will be possible to bridge the gap between what is shown on the photographic print and what the eye perceives on the ground. The limitations of photomontages should be acknowledged in SVIAs and their preparation and presentation should adhere to the following good practice guidance in Box 16.

29 Visual Simulation: A Users Guide for Architects (Sheppard, Stephen R J, 1989)

30 Studies to Inform Advice on Offshore Renewable Energy Developments: Visual Perception Versus Photomontage (CCW Contract Science Report No. 631, Symonds Group Ltd, March 2004); Available to view at: www.ccw.gov.uk/generalinfo/index.cfm?Action=View&RID=120&subject=Landscape

Box 16: Summary guidance on offshore wind farm photomontages

There is a range of computer software available to produce wind farm photomontages and each has its own specific data requirements and output. These recommendations should be considered when preparing photomontages for visual impact assessments of proposed offshore wind farms, but there are numerous techniques available to the practitioner which should be applied to suit the project requirements.

- Present photomontages with an angle of view of 45 - 50 degrees. Images prepared using a 35mm camera with a 50mm lens (or digital equivalent) have a 40-45 degree field of view and are considered to most closely approximate to the central cone of vision seen by the human eye. Additional visual information beyond this angle is useful to provide context;
- Photographs should be prepared using a 35mm SLR camera with a fixed 50mm or 80mm lens (or digital equivalent), depending on the requirements and nature of the project. An 80mm lens will capture more detail and may be more appropriate for projects located at long distances from the shore;
- In order to present visual context outside of the central cone of view, the preferred solution when using static photography is therefore to show a laterally extended compilation merged from more than one photo frame;
- Photomontages with a 40 - 45 degree field of view presented using a natural viewing distance* of approximately 45-50cm, with the photomontage image printed to a height of approximately 20-24cm;
- Local meteorological and climatic conditions should be recorded and consideration should be given to producing a series of photomontages to accurately represent the visual impact of the proposed offshore windfarm in a number or representative visibility conditions. If this is not possible, photographs should be taken in good weather conditions, offering clear visibility, to represent the maximum visibility scenario;
- Consideration should be given to preparing photomontages to represent the potential visual impact at certain times throughout the year as the orientation and level of lighting changes with the seasonal sun path. This can also be predicted using 3D computer software packages;
- An insert map showing the viewpoint location and the turbine layout should be presented with the visualisations;
- Consideration should be given to numbering turbines, or selective turbines, on wireframes and on insert maps so that the relationship of the wind farm in plan view and 3D view can be easily read;
- Wireframes should be used in an appropriate combination with photographs and photomontage, as both working and presentation tools;
- Visualisations should include all aspects of the offshore windfarm development including turbines, substation and onshore infrastructure if they are within the view. Specific viewpoints should be considered to illustrate the nature of onshore infrastructure;
- The focal length of the lens and camera format used for photographs (and derived visualisations) should always be stated;
- A variety of viewpoint information should be presented with the visualisation, including viewpoint OS grid reference, elevation, viewing distance, bearing, included view angle, camera height, lens focal length, distance to wind farm, number of turbines visible, turbine dimensions, date and time of photograph and weather conditions;
- Consideration should be given in certain situations, such as public exhibitions, to the use of videomontages or virtual reality simulations to depict the movement of the wind turbines within the context of a dynamic landscape or seascape. Logistics limit depiction of movement in written reports, but CD versions of SVIAs may incorporate such simulations;
- Be aware of the inherent differences in visual perception from photomontages, compared to that from field observations of a completed development;
- Be aware of the considerable differences in visual prominence between middle of the day lighting (when contrasts are low) and early morning and evening lighting (when contrasts are greatest), particularly important where key views will contain turbines visible in the sunset.

- The distance from the printed photomontage to the reader’s eye, at which correct monocular perspective is achieved.

Visualisations should be used to inform the consideration of indirect effects on the setting or perception of seascapes as a result of offshore wind farm development. Visualisations should be prepared at viewpoints which are representative of the main views from each type of seascape unit identified in the seascape characterisation. It is important that the assessor has tools available which predict both the extent of visibility in seascape units (ZTVs) and the nature of predicted views (visualisations) likely to arise as a result of the development. Visualisations allow the nature of predicted views of the offshore wind farm within seascape units to be predicted, and judgements to made on the nature of visibility, the arrangement of turbines and degree of contrast or integration of any new features with the existing seascape elements and characteristics.

Stage 8: Virtual Reality and Videomontage

In addition to static visualisations and photomontages, the use of virtual 3D modelling techniques should be considered for SVIAs of Round 2 offshore wind farms. The main techniques available at present are virtual reality fly throughs and video-montage, which can all be explored on a computer using a suitable viewing program.

Virtual reality fly-throughs use a 3D model of the existing landscape and the offshore wind farm proposal using survey data for surrounding areas and design information. They combine height data with aerial photography or digitised OS maps to create an interactive base model, to which a model of the wind farm proposal is added. Aerial photographs or given textures represent the existing situation and the proposal can be modelled in the required location within the virtual landscape. Ideally, this technique should use vertical aerial photographs as the ground texture, but when these are not available, OS map data can be draped over the terrain model and coloured to show altitude, satellite imagery and shading effects. A virtual reality 3D viewer should be used to 'fly' around the study area in real-time allowing the development to be viewed from any location and angle, or along a set flight path. A 3D virtual reality fly-through was produced for the Nysted Offshore Wind Farm in the Western Baltic, Denmark, which can be viewed at http://uk.nystedhavmoellepark.dk/frames.asp.

Videomontage, as its name suggests, is the motion-picture counterpart to photomontage. In the same way that a photomontage consists of a base photograph with a computer rendered still image superimposed on it, a videomontage consists of a base video with an animated image superimposed on it. The base video is shot on site using a video camera. The camera moves used at that time naturally define the camera moves that will be seen in the finished montage. Great care is therefore needed to design the moves so that they will eventually look sensible and show the things they are intended to show, even though the subject matter of the video is wholly absent at the time of filming. The whole process of videomontage is dependent for its success on the accuracy with which the imaginary camera of the computer graphics world mimics the movement of the actual camera used on site. This process, called match-move, is now an established trade in its own right in the motion picture industry.

As match-move is very time-consuming (and therefore very expensive), an alternative approach is to produce videomontage out of still photographs shot on site as a background instead of using live footage shot on site as a base image. These panoramas can be made to behave as if they were cylindrical or spherical shells around the virtual camera in such a way that the perspective is correct in the finished video. The virtual camera cannot move, but it can pan and zoom at will and the precise combination of pans and zooms can be refined through several iterations, instead of having to be achieved once on site with a video camera. An example of this is the video-montage of Robin Rigg Offshore Wind Farm (produced by Envision 3D Ltd for E.ON (UK) Renewables) which was produced using still photographs from one of the land based viewpoints[31].

There are significant advantages to the use of 3D virtual reality and videomontage techniques in the SVIA process. They lead to benefits of efficiency in the communication of ideas and flexibility within the planning and enquiry process. The ability to visualise the proposed scheme in 3D, as a video-montage, or as virtual reality fly through with draped aerial orthophotos, textures and heighted features is a useful tool for the SVIA. These techniques can be of particular use when presenting a scheme for planning approval later in the EIA process. A real-time 3D fly-through can communicate more information than static photomontages, particularly in relation to wind farms, it can convey the visual effect of the movement of the rotor blades, which is a key part of the visual effect of wind farms. The increasing performance of PCs over recent years has made the use of these techniques a practical proposition for visualisation without being prohibitively expensive, and their use is encouraged for Round 2 SVIAs, particularly for those projects where seascape and visual issues are a key issue in the EIA.

31 www.envision3d.co.uk/video/robinsrigg.htm

7.5 Magnitude of Change

At the end of the impact prediction stage, the magnitude of change to both the identified seascape receptors (such as seascape units and designated landscapes) and visual receptors (such as viewpoints) should be assessed in a standardised way. The magnitude of change arising from the proposed offshore wind farm should be described based on the interpretation of a combination of parameters, such as:

Quantifiable parameters

- Distance from the development;
- Number and proportion of turbines visible;
- Proportion of the field of view (horizontal angle) occupied by the development;
- Duration of effect - whether temporary or permanent, intermittent or continuous, frequent or infrequent, at speed or slow-moving;
- Angle of view in relation to main receptor activity;
- The number and extent of resources affected by the development; and
- The amount of navigational lighting required on turbines.

Less quantifiable parameters

- The scale of change with respect to the loss or addition of features and changes in the seascape composition;
- The arrangement of turbines and degree of contrast or integration of any new features or changes with the existing seascape elements and characteristics in terms of form, scale, mass, line, height, colour and texture;
- The nature of the effect - whether positive, negative or neutral;
- Background to the development - such as whether the development is seen against sea, sky or landforms, and the effects of aspect, lighting and weather on this;
- Extent and prominence of onshore built developments, particularly the onshore substation and grid connection; and
- Extent of prominence of other vertical features in the landscape or view, such as pylons, telecom masts, stacks, flues, built developments etc.

The issues which influence magnitude are complex, and all of the above factors should be considered when determining the magnitude of change to seascape or visual receptors.

Nevertheless, it is often the issue of distance from receptor which tends to most strongly influence judgements on magnitude of seascape and visual impacts. Distance is a key parameter, and one which might offer some form of standardisation in the way that visual impacts of offshore wind farms are assessed at different distances.

In the DTI funded Offshore Wind SEA Environment Report[32], a range of visual significance thresholds for offshore wind farms were adopted for high sensitivity seascapes as follows:

- <13km possible major visual effects;
- 13-24km possible moderate visual effects; and
- >24km possible minor visual effects.

These thresholds were based on planning for a notional turbine height of 100 to 150metres (to tip of blade). Although it is noted in the SEA that these distance thresholds are not prescriptive, they were assumed to indicate the distance thresholds within which such levels of effects may occur, for the purpose of defining, at a broad-brush level, which parts of our seascape might be more or less able to accommodate offshore wind farms according to the identified coastal sensitivities. Experience to date suggests we cannot give an exact blanket assurance on these distances, as the prominence or noticability of the visual effects varies considerably with changing lighting and weather conditions, and whether the turbines are seen in the focus of a key view i.e. more sensitive (e.g. in close visual proximity to a headland or island), or the opposite i.e. less sensitive, (e.g. perpendicular to coastline, out at sea, seen as being visually well away from land or existing focus points in key views), or from a high or low elevation view point. The SEA study itself was too broad-brush to factor in such details.

The Scottish seascapes study[33] recommends a seaward limit of visual significance of 35km, as a precautionary principle based on the higher visual ranges available in Scotland than in England and Wales. When considering the limit of visual significance in SVIA, it is vital to consider the actual development scenario of the proposed offshore wind farm being assessed. A proposal for a 100 turbine wind farm, with turbines of 150m in height, will have a different limit of visual significance than a proposal for a 30 turbine wind

32 Environmental Report: Offshore Wind SEA (BMT Cordah for DTI, July 2003)

33 An Assessment of the Sensitivity and Capacity of the Scottish Seascape in Relation to Offshore Windfarms (Final Report July 2004, SNH Commissioned Report / University of Newcastle)

farm with 100m high turbines. The scenario assessed in the Scottish seascapes study[10] was for offshore wind farms with 100 turbines, of 150m in height, arranged in a basic grid layout.

When considering the limit of visual significance it is also relevant to consider the effects of curvature of the earth on turbine visibility. An equation can be used to calculate the distance at which an object would disappear due to curvature of the earth. If we take a turbine height of 150m and assume an observer height of 1.7m (standing on a beach) then the turbine would no longer be visible to the observer at a distance of approximately 52km due to amount of earth curvature between the viewer and the turbine. In reality, the viewer could be more elevated, so for example for an elevation of 50m on the coast, then the turbine would disappear at a distance of approximately 75km. On this basis it is possible to work out how much of the turbine (i.e. the amount of the turbine visible above the horizon) that the viewer would see. Table 4 demonstrates how much or how little of the turbine is visible to the viewer at different distances and heights from the coast.

Table 4: Effects of curvature of the earth on offshore wind turbine visibility

	Amount of turbine visible to viewer at 1.7m (beach) (based on 150m turbine, with 90m rotor diameter)		**Amount of turbine visible to viewer at 50m (sea cliff/headland) (based on 150m turbine with 90m rotor diameter)**	
	Height	**Turbine component**	**Height**	**Turbine component**
at 10km	148m	Tower and rotor blades	150m	Full tower and rotor blades
at 15km	143m	Tower and rotor blades	150m	Full tower and rotor blades
at 20km	135m	Tower and rotor blades	150m	Full tower and rotor blades
at 25km	123m	Tower and rotor blades	150m	Full tower and rotor blades
at 30km	108m	Tower and rotor blades	150m	Full tower and rotor blades
at 35km	90m	Nacelle, top of tower and rotor blades	146m	Tower and rotor blades
at 40km	68m	Nacelle, top of tower and rotor blades	139m	Tower and rotor blades
at 45km	43m	Blade tip	129m	Tower and rotor blades
at 50km	14m	Tops of blade tip	115m	Tower and rotor blades
at 55km	0m	None visible	98m	Nacelle, top of tower and rotor blades
at 60km	0m	None visible	78m	Nacelle, top of tower and rotor blades
at 65km	0m	None visible	54m	Nacelle, top of tower and rotor blades
at 70km	0m	None visible	27m	Blade tip
at 75km	0m	None visible	0m	None visible

For an observer on the beach, turbine blade tips become theoretically visible at distances of 45-53km, although in reality, the acuity of the human eye to distinguish blade tips at this distance is highly debatable. It is more likely that as the nacelles, tops of towers and full rotor blades of turbines become visible over the horizon at distances of around 30-35km, that there is potential for significant effects on visual amenity to occur. This is considered to be the outer limit of potentially significant effects. This does not imply that significant effects will necessarily occur at this distance, which are more likely to occur when the wind farm is located at shorter distances from the coast.

Post construction monitoring is a key tool which can help build much greater confidence and certainty when trying to predict levels of visual impact at different distances. To date the issue has been dealt with as a matter of common consensus from previous experience, with distances largely coming from land-based wind farm inquiries, often based on, and scaled up from, the Sinclair-Thomas Matrix[34]. Based on this matrix, it is possible to estimate the potential visual impact of 150m high offshore wind turbines at different distances, however, this rather ignores the range of factors that tend to reduce or increase magnitude, and in particular it ignores the number of turbines proposed. This is a key factor, as the relative magnitude of visual effect of, for example a 30 turbine offshore wind farm, will be different to a 100 turbine offshore wind farm at different distances. As there is great variation in the turbine numbers proposed for Round 2 offshore wind farms, likely to be ranging from approximately 50 turbines for the smaller schemes up to over 200 turbines for the larger schemes, it is not appropriate to provide hard and fast guidance on visual impact with distance, and instead this guidance would endorse an alternative approach put forward by SNH[35], which encourages consideration of the range of issues which influence magnitude of impact.

Magnitude of change should therefore be determined by a range of criteria, not just distance, in a structured manner as presented in the conceptual model for SVIA in Figure 25.

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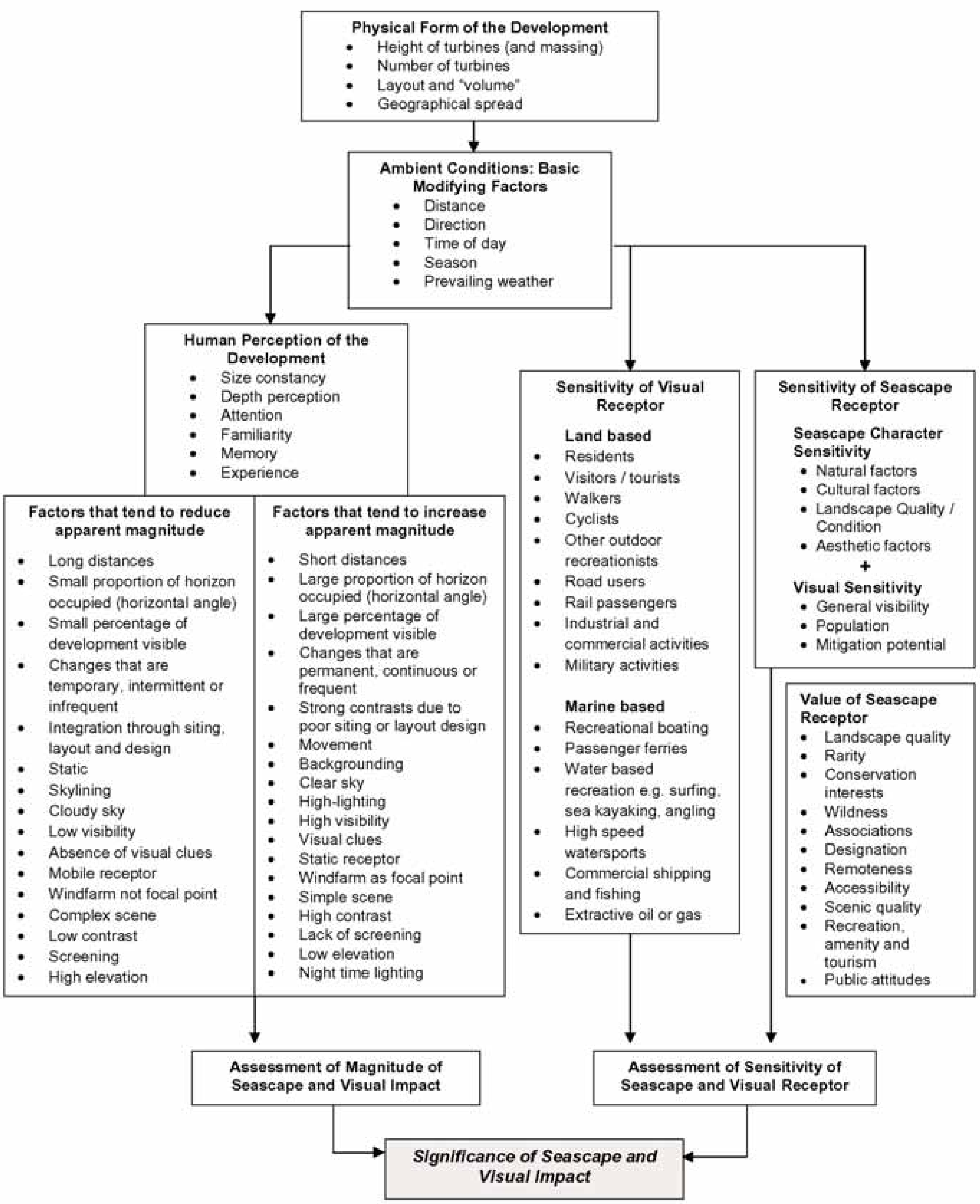
[34] The Potential Visual Impact of Wind Turbines in Relation to Distance: An Approach to the Environmental Assessment of Planning Proposals (Geoffrey Sinclair 1997, Updated for minor changes January 2003);

[35] Visual Assessment of Wind Farms - Best Practice (University of Newcastle, SNH commissioned report 2002)

Figure 25: Conceptual model for assessing significance in SVIA

Adapted from Visual Assessment of Wind Farms - Best Practice (University of Newcastle, SNH commissioned report 2002)



Definitions of magnitude tend to vary between landscape and visual assessments, as found during a review of the Round 1 offshore wind farm SVIAs. Although the concepts applied tend to be broadly similar, the descriptions of levels of magnitude often vary between practitioners and between projects. To a certain extent the flexibility to tailor criteria and thresholds to suit local conditions and circumstances is encouraged, but in order to achieve a level of consistency in offshore wind farm SVIA, this Guidance endorses and expands the definition of magnitude of visual effect suggested by the GLVIA[36] and SNH[37], ranging according to size from very large, large, medium, small, very small to negligible, as shown in Table 5. Where individual projects require their own set of criteria and thresholds, tailored to suit local conditions and circumstances, these definitions should be made explicit and justified in the method statement of the SVIA.

Table 5: Magnitude of change: names, descriptors and definitions

Magnitude	Name	Descriptors - appearance in central vision field	Definition
Very Large	Dominant	Commanding, controlling the view, foremost feature, prevailing, overriding.	Proposed offshore wind farm causes very large alteration to key elements/features/characteristics of the baseline seascape or visual conditions (pre-development) such that there is a fundamental change.
Large	Prominent	Standing out, striking, sharp, unmistakeable, easily seen	Proposed offshore wind farm causes large alteration to key elements/ features/ characteristics of the baseline seascape or visual conditions (pre-development) such that there is an unmistakeable change.
Moderate	Conspicuous	Noticeable, distinct, catching the eye or attention, clearly visible, well defined	Proposed offshore wind farm causes moderate alteration to elements/features/characteristics of the baseline seascape or visual conditions (pre-development) such that there is a distinct change.
Small	Apparent	Visible, evident, obvious, perceptible, discernible, recognisable.	Proposed offshore wind farm causes small loss or alteration to elements/features/ characteristics of the baseline seascape or visual conditions (pre-development) such that there is a perceptible change.
Very Small	Inconspicuous	Lacking sharpness of definition, not obvious, indistinct, not clear, obscure, blurred, indefinite, subtle	Proposed offshore wind farm causes very small loss or alteration to elements/ features/ characteristics of the baseline seascape or visual conditions (pre-development) such that there is a barely distinguishable change.
Negligible	Faint	Weak, not legible, near limit of acuity of human eye	Proposed offshore wind farm causes negligible loss or alteration to elements/ features/ characteristics of the baseline seascape or visual conditions (pre-development) such that there is no legible change.

(Adapted from Guidelines for Landscape and Visual Impact Assessment, 2nd edition (The Landscape Institute and Institute of Environmental Assessment 2002) and Visual Assessment of Wind farms - Best Practice (University of Newcastle, SNH commissioned report 2002)

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36 Guidelines for Landscape and Visual Impact Assessment, 2nd edition (The Landscape Institute and Institute of Environmental Assessment 2002)

37 Visual Assessment of Wind farms - Best Practice (University of Newcastle, SNH commissioned report 2002)

Predicting Impacts and Assessing their Magnitude: Key Guidance

- Establish a clear project description at an early stage upon which the impact prediction should be based;
- Potential effects on seascape character and qualities of seascape units, available views and visual amenity, as a result of offshore wind farm development, should be predicted using visibility studies and viewpoint assessments;
- The extent of potential visibility of the development should be shown using a Zone of Theoretical Visual influence (ZTV) derived from computer modelling;
- The limitations of the ZTV should be discussed in the SVIA, particularly in so far as they relate to coastal landscape and offshore developments;
- Seascape units, landscape character types and designations with direct visibility should be identified using a ZTV overlain with the seascape unit or designation boundaries. This allows the visibility of the offshore wind farm within seascape units to be predicted, and judgements to made on the extent of visibility (such as negligible, limited, intermittent, extensive) from within the seascape unit or designation;
- A viewpoint assessment should be carried out to identify and evaluate the potential effects on available views and visual amenity arising from the proposed offshore wind farm at specific representative locations in the study area;
- The number of viewpoints should be chosen in negotiation with statutory consultees, to achieve an effective assessment of key viewpoints and representative locations. For Round 2 offshore wind farms, this is likely to be between 8 - 20 viewpoints depending on the complexity of the coastline and the nature of the proposed development;
- Potential seascape and visual impacts should be predicted and illustrated using photographs, wireframes and photomontages, prepared in accordance with the detailed guidance in Box 15 and 16;
- In addition to static visualisations and photomontages, the use of virtual 3D modelling techniques should be considered for SVIAs of Round 2 offshore wind farms;
- At the end of the impact prediction stage, the magnitude of change to both the identified seascape receptors (such as seascape units and designated landscapes) and visual receptors (such as viewpoints) should be assessed in a standardised way;
- Magnitude of change should be determined using a range of criteria, in a structured manner, as presented in the conceptual model for SVIA in Figure 25; and
- The classification of magnitude of visual effect should range according to size from very large, large, medium, small, very small to negligible.

8. EVALUATION OF SEASCAPE AND VISUAL IMPACTS - ASSESSING SIGNIFICANCE

The evaluation of significance is the final and arguably the most important stage of an SVIA. The biggest challenge for all practitioners carrying out offshore wind farm SVIAs is assessing which impacts are significant, and which are not. All offshore wind farms produce seascape and visual effects, which may be positive or negative and may vary in size or magnitude. During the evaluation, reasoned judgements should be made on the overall significance of these effects that are predicted to occur, by systematically combining information on levels of sensitivity and impact magnitude for each seascape and visual receptor. Such significance may be temporary or permanent, reversible or irreversible, and is always relative and context specific.

In the context of EIA, 'significance' varies with the type of project and topic under assessment. There are no measurable, technical thresholds in SVIA, and as such the assessor must clearly define the criteria used in the assessment for each project, using his or her skill based on reasonable professional judgement. The important objective is to identify to whom and to what degree an effect is significant.

The Electricity Works (Environmental Impact Assessment) Regulations 2000 (SI 2000/1927) require that "*a description of the likely significant effects of the development on the environment, covering the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development*" are included in an EIA (and therefore an SVIA when assessing seascape and visual impacts), however they do not offer specific statutory guidance on definitions of significance. The GLVIA38 offer guidance on evaluating significance of landscape and visual effects, and provides examples of threshold criteria used by practitioners. The guidance promotes a non-prescriptive approach, where informed and well reasoned judgement is encouraged, together with the need to consider significance on a case by case basis, and tailored to suit local conditions and circumstances.

It is important that in any SVIA, the foundations and assumptions on which significance is based must be clear and explicit. The two principal criteria determining significance are the ***sensitivity of the receptor*** and the ***magnitude of change***. The significance of any identified seascape or visual effect should be assessed on a clearly defined scale, such as major, moderate, minor and none. These categories should be determined through evaluation of the seascape and visual receptor sensitivity and the predicted magnitude of change. A higher level of significance is generally attached to large scale effects and effects on sensitive of high-value receptors.

A number of factors influence whether any seascape or visual effect is significant or not significant. Some of these factors are described in Box 17 as follows.

Box 17: Factors influencing significance

Seascape

Significant

- Changes affecting seascape units which are distinctive or representative;
- Changes affecting seascape units recognised for their national importance;
- Changes that compromise the landscape objectives of a designation;
- Seascapes with a high value and high sensitivity to change to offshore wind farms;
- Changes that are large in scale, and that cause loss of features or fundamental characteristics of the seascape;
- Changes that strongly contrast and do not integrate with the existing seascape composition; and
- Changes that occur at short distances from the seascape unit.

Less significant

- Changes affecting seascape units in poor condition or degraded character;
- Changes affecting seascape units of just local importance;
- Changes that do not comprise the landscape objectives of a designation;
- Seascapes with a low value and low sensitivity to change to offshore wind farms;
- Changes that are small in scale, and that do not cause loss to features or fundamental characteristics of the seascape;
- Changes that, through siting and design, integrate into the existing seascape; and
- Changes that occur at long distances from the seascape unit.

Visual

Significant

- Large scale changes which introduce new, discordant or intrusive elements into the view/seascape;
- Changes in views from recognised and important viewpoints, amenity routes and residents;
- Changes that are seen in the focus points of existing key views (i.e. visually near to, or overlapping with the main subjects of a key view such as headlands or islands, and slot views out to open sea);
- Changes affecting large numbers of people;
- Changes affecting users of wild areas or largely undeveloped seascapes;
- Changes that occur at short distances from the viewpoint;
- Changes where a large proportion of the horizon is occupied by the development; and
- Changes that are permanent, continuous or frequent.

Less significant

- Small changes involving features already present in the view;
- Changes that occur visually well away from the focus points of key views (e.g. seen to be well out in open sea, away from land, headlands or islands)
- Changes affecting less important paths and main roads;
- Changes affecting a relatively small group of people;
- Changes affecting users working in industrialised seascapes;
- Changes that occur at long distances from the viewpoint;
- Changes where only a small proportion of the horizon is occupied by the development; and
- Changes that are temporary, intermittent or infrequent.

A matrix is provided in Table 6 which provides a guide to correlating sensitivity (of the receptor) with magnitude of change to determine significance of effect. The majority of Round 1 offshore wind farm SVIAs used matrices as a guide to evaluating significance. In this respect, there was a degree of consistency in the approach taken by practitioners, however there were often subtle differences in terminology and in defining levels of significance. The matrix put forward in Table 6 should be a helpful tool for mapping and explaining the basis of judgements made, and is put forward as a best practice guide to correlating sensitivity and magnitude to determine significance of seascape and visual effects of Round 2 offshore wind farms.

Table 6: Correlation of sensitivity of receptor and magnitude of change to determine significance of effects

Landscape and Visual Sensitivity		Magnitude of Change				
		Very Large	Large	Moderate	Small	Very Small
	Very high	Major	Major	Major	Major/moderate	Moderate
	High	Major	Major	Major/moderate	Moderate	Moderate/minor
	Medium	Major	Major/moderate	Moderate	Moderate/minor	Minor
	Low	Major/moderate	Moderate	Moderate/minor	Minor	Minor/none
	Very low	Moderate	Moderate/minor	Minor	Minor/none	None

Key: Significant Potentially Significant Not Significant

The matrix in Table 6 should not used as a prescriptive tool, and the methodology and analysis of potential effects at any particular location must make allowance for the exercise of professional judgement. Thus in some instances a particular parameter may be considered as having a determining effect on the analysis. It is important that the process used to arrive at levels of significance is clear, transparent and as objective as possible. The evaluation of significance of effects should be understandable and transparent, with clear, logical and well reasoned descriptions on how conclusions have been reached.

Where the seascape or visual effect is classified as major or major/moderate, this should considered to be a significant effect referred to in The Electricity Works (Environmental Impact Assessment) Regulations 2000 (SI 2000/1927). Where seascape or visual effects is classified as moderate, it is most likely that the effect will not be significant, but it is feasible that it could be judged as significant, depending on the particular circumstances arising. The bases for these judgements on significance should be made clear and explicit on a case by case basis, and confirmed during the assessment process for Round 2 offshore wind farms. As with many aspects of seascape and visual assessment, the significance of any effect may need to be qualified with respect to the scale over which it is exerted.

It should be noted that significant effects need not be unacceptable or necessarily negative and may be reversible. The determination of whether a significant effect is unacceptable or adverse can be extremely difficult. Our experience and understanding of these issues is currently evolving, and Section 11 recommends that monitoring is carried out in order to survey and record the actual seascape and visual impacts of offshore wind farms, and whether they are judged to be positive or negative, acceptable or unacceptable.

The significance of navigational lighting of offshore wind farms at night time should be assessed in relation to the sensitivity and activity of receptors and the magnitude of change caused by any lighting. There will be relatively few receptors that go to the coast specifically to look out to sea at night, and night time lighting of turbines out to sea is likely to be associated with shipping. At long distances, earth curvature will screen lights placed on turbines at the recommended heights of 6-15m above high tide level, and the effect of lights at night is only likely to be potentially significant at short distances. Navigation lighting at night is very much a secondary visual effect of offshore wind farm, and should be dealt with and assessed as such in the SVIA. If the visual impacts of the offshore wind farm are not significant during the day, then it is very unlikely that they will be unacceptable at night.

Ultimately the acceptability of an impact is a political decision made by the people concerned (and therefore may not be consistent between the communities near one proposed development, and another). Nevertheless a reasonable consenting process is far better informed by also having expert judgement on what, from past experience, would be likely to be acceptable. This helps to promote consistency and objectivity in what can otherwise become a polarised and heated debate between different opponent and proponent factions.

A number of examples of evaluation of significance from Round 1 offshore wind farm SVIAs are provided in Appendix 4, as a working illustration of the evaluation and description of significant and non-significant effects on seascape and visual receptors. Once the evaluation of significance of effects on seascape and visual amenity has been carried out, an overall summary of the significant and non-significant effects should be presented in the SVIA. This should seek to pull all the results of the assessment together and provide a quick reference point for readers on the significant and non-significant effects identified. An example of such a summary, provided in the Scarweather Sands SVIA, is shown in Appendix 4.

Evaluation of Seascape and Visual Impacts - Assessing Significance: Key Guidance

- The two principal criteria determining significance are the sensitivity of the receptor and the magnitude of change;
- Reasoned judgements should be made on the overall significance of the seascape and visual effect, by systematically combining information on levels of sensitivity and impact magnitude for each seascape and visual receptor;
- There are no measurable, technical thresholds in SVIA, and as such the assessor must clearly define the criteria used in the assessment for each project, using his or her skill based on reasonable professional judgement;
- The important objective is to identify to whom and to what degree an effect is significant;
- The significance of any identified seascape or visual effect should be assessed on a clearly defined scale, such as major, moderate, minor and none;
- A higher level of significance is generally attached to large scale effects and effects on sensitive or high-value receptors;
- Significance of effects should be determined through the use of a matrix (Table 6) as a guide to correlating sensitivity (of the receptor) with magnitude of change;
- In some instances the conclusions reached may not come out as the relationship in the matrix suggests because a particular parameter may be considered as having a determining effect on the analysis;
- It is important that the process used to arrive at levels of significance is clear, transparent and as objective as possible, with well reasoned descriptions on how conclusions have been reached; and
- Once the evaluation of significance of effects on seascape and visual amenity has been carried out, an overall summary of the significant and non-significant effects should be presented in the SVIA.

9. CUMULATIVE IMPACT ASSESSMENT

9.1 Introduction

Cumulative effects are those which occur, or may occur, as a result of more than one wind farm project being constructed. The degree of cumulative impact is a product of the number of and distance between individual offshore wind farms, the inter-relationship between their Zones of Theoretical Visual Influence (ZTV), the overall character of the seascape and its sensitivity to wind farms, and the siting and design of the offshore wind farms themselves. It is important to recognise that cumulative effects consist of both those upon visual amenity as well as effects on the seascape. The GLVIA[39] refer to the changes to seascape or visual amenity caused by the proposed development in conjunction with other developments, or with actions which occurred in the past, present or are likely to occur in the foreseeable future, as shown in Box 18.

Box 18: Extract from GLVIA on cumulative effects

Cumulative landscape and visual effects result from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future. They may also affect the way in which the landscape is experienced. Cumulative effects may be positive or negative. Where they comprise a range of benefits, they may be considered to form part of the mitigation measures. Cumulative effects can also arise from the inter-visibility of a range of developments and/or from the combined effects of individual components of the proposed development occurring in different locations or over a period of time. The separate effects of such individual components or developments may not be significant, but together they may create an unacceptable degree of adverse effect on visual receptors within their combined visual envelopes. Inter-visibility depends upon general topography, aspect, tree cover or other visual obstruction, elevation and distance, as this affects visual acuity, which is also influenced by weather and light conditions.

9.2 Determining the Scope of the Cumulative Assessment

A cumulative assessment should be carried out by the developer, as part of the Environmental Impact Assessment, and reviewed by the determining authority and consultees. An assessment of cumulative effects associated with the specific development proposal should include the effects of the proposal in combination with:

- Existing offshore and onshore wind farm developments, either built or under construction;
- Approved offshore and onshore wind farm developments, awaiting implementation;
- Offshore and onshore wind farm proposals awaiting determination within the planning process, and thus for which design information is in the public domain. Proposals and design information may be deemed to be in the public domain once an application has been lodged, and the decision-making authority has formally registered the application; and
- All other Round 2 offshore wind farm proposals where the practitioner, consenting authority or consultees consider that cumulative seascape and visual effect of a proposal, taken with other proposed offshore wind farm projects, could be a major factor in determining the acceptability of the development, or where there may be potentially significant cumulative effects arising.

- Existing developments that are not wind farms, but that nevertheless exhibit some of the characteristics of the proposed development, such as in terms of scale, height, movement and contrast to the natural character. Examples may include extensive coastal docklands (with large cranes and other gantry), heavy industrial plants and power stations, containing large towers, pylons, flare stacks etc, including offshore installations such as oil and gas rigs and regular ship mooring areas.

[39] Guidelines for Landscape and Visual Impact Assessment, 2nd edition (The Landscape Institute and Institute of Environmental Assessment 2002)

9.3 Assessing Cumulative Seascape and Visual Impacts

Although a Guide to Assessing the Cumulative Effects of Wind Energy Development has been published[40], there are no published guidelines in England and Wales defining a methodology for the assessment of cumulative effects on landscape and visual amenity that have been approved and endorsed by the Landscape Institute. The approach proposed in this guidance therefore develops that shown in the extract from the GLVIA[41], in Box 18, and recent draft guidance notes on cumulative landscape and visual impact assessment of wind farm developments produced by SNH[42].

The proposed offshore wind farm should form the focus for the study. The assessment should describe, visually represent and assess the ways in which the proposal would have additional impacts when considered together with other existing, consented or proposed wind farms. The emphasis of the assessment should be on the changes the proposal would bring to the existing seascape and visual receptors, which may include a built or consented offshore and onshore wind farm developments as part of its baseline landscape/seascape character. The assessment should therefore identify the cumulative magnitude of change relative to existing visual impacts of wind farms rather than the combined impact of all the wind farms visible. It is preferable therefore to refer to 'an additional cumulative effect' that is additional to the impact to be expected from the developments taken individually.

As the development programme for Round 2 offshore wind farms is staggered over time, with some proposals more advanced and imminent than others, the cumulative effects of each scheme should be assessed consecutively. So, the cumulative assessment should present the contribution of the offshore wind farm being assessed in relation to built/existing Round 1 offshore, and onshore sites, and then its contribution in relation to the other proposed Round 2 offshore sites.

Cumulative ZTVs and visualisations should be examined to identify the areas from where the cumulative wind energy developments may be visible. In addition, wireframe views should be generated for each viewpoint included in the assessment where potential cumulative wind farms will be visible. Based on these figures, the following should be assessed:

- The nature of, and the contribution to, the cumulative effects on seascape and visual amenity of the proposed development in relation to the "existing and approved wind farms, either built or awaiting implementation"; and
- The nature of, and the contribution to, the cumulative effects on seascape and visual amenity of the proposed development, in relation to the proposed "in planning wind farms awaiting determination or consent application", in addition to the "existing/consented wind farms".

9.3.1 Cumulative Effects on Visual Amenity

Cumulative effects on visual amenity consist of combined visibility and sequential effects.

- Combined visibility occurs where the observer is able to see two or more developments from one viewpoint. When considering the cumulative effects arising from combined visibility, it is necessary to consider, for each of the viewpoints within the ZTV of the offshore wind farm concerned, the combined effect of all offshore wind farms which are (or would be) visible from these viewpoints. Combined visibility may either be in combination (where several offshore wind farms are within the observer's arc of vision at the same time) or in succession (where the observer has to turn to see the various offshore wind farms).
- Sequential effects occur when the observer has to move to another viewpoint to see different developments. Sequential effects should be assessed for travel along regularly-used routes like major roads or popular paths. The occurrence of sequential effects may range from frequently sequential (the features appear regularly and with short time lapses between, depending on speed of travel and distance between the viewpoints) to occasionally sequential (long time lapses between appearances, because the observer is moving very slowly and/or the there are large distances between the viewpoints.)

Cumulative visual effects vary in degree with:

- The number and sensitivity of visual receptors;
- The duration, frequency and nature of combined and sequential views (glimpses or more prolonged views; oblique, filtered or more direct views; time separation between sequential views); and

40 Guide to Assessing the Cumulative Effects of Wind Energy Development (ETSU, 2000)

41 Guidelines for Landscape and Visual Impact Assessment, 2nd edition (The Landscape Institute and Institute of Environmental Assessment 2002

42 Guidance: Cumulative Effects of Windfarms (SNH, Version 2 revised April 2005)

- The relative impact of each individual offshore wind farm, with regard to visual amenity.

Location map of offshore wind farms

A location map of all existing, approved and in planning offshore and onshore wind farms awaiting determination or consent application is essential to portray a simple and clear picture of the geographical relationship of wind farm sites (and any other comparable structures) and highlight some initial issues which are likely to be relevant for the assessment. A suitably clear base map should be prepared showing the offshore and onshore wind farm sites which the practitioner, consenting authority or consultees consider could be a major factor in determining the acceptability of the development, or where there may be potentially significant cumulative effects arising.

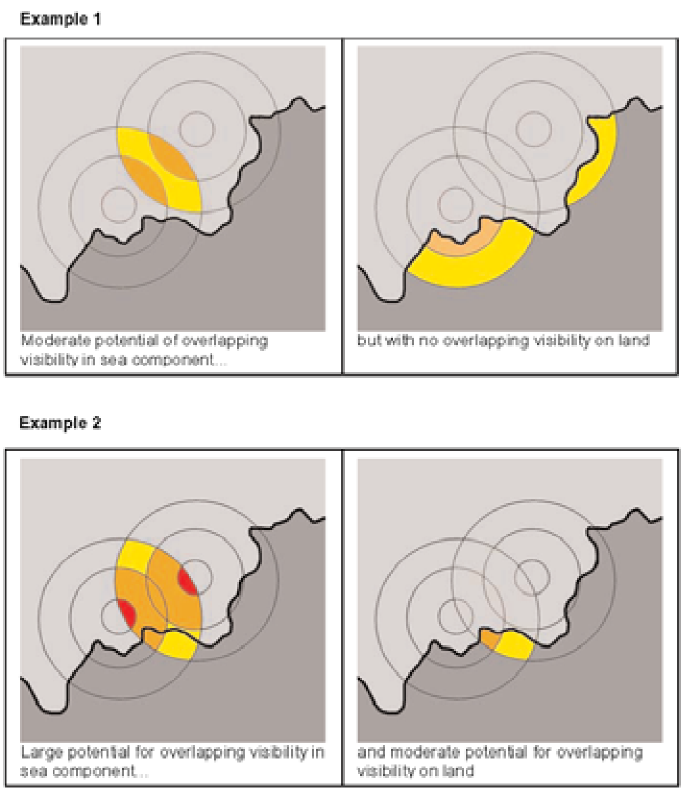
Initial analysis of overlapping visibility

An initial analysis of overlapping visibility should be prepared which maps the 35km radius study areas of the offshore wind farms under consideration. A methodology for mapping the spatial extent of visual impacts of developments in Liverpool Bay has been developed by CCW[43].

The method assumes visual significance limits representing high, medium and low visual impact zones. Using a GIS the zones visual impact were created as a series of concentric polygons centred around each offshore wind farm. Zones of visual impact of numerous offshore wind farms overlap and generate a zone of cumulative visual impact. An initial assessment of the potential for large, moderate or small cumulative change can be made using this method, as illustrated schematically in Figure 26.

All of the sites being considered should be mapped and analysed in this manner against each other, so that all potential cumulative overlaps are considered. A final list of sites to be included in the cumulative assessment should be refined to those which have overlapping visibility within a 35km radius of each other. Wind farms with little or no overlapping visibility, or at great distances from each other, can be scoped out of the assessment at this stage, and focus given to those wind farms which may cause a significant cumulative change to the seascape character or visual amenity of the area.

Figure 26: Prediction of Overlapping Cumulative Visibility of Offshore Wind Farms



Source: CCW © Countryside Council for Wales. All Rights Reserved.

43 Development of a Methodology for the Assessment of Cumulative Effects of Marine Activities using Liverpool Bay as a Case Study (Oakwood Environmental Ltd, CCW Contract Science Report No 522)

Detailed cumulative visibility studies

An assessment of the cumulative impact of other built and proposed offshore and onshore wind farms should be undertaken within the 35km radius study area around the proposed offshore wind farm. A variety of graphic tools should be used to illustrate the cumulative assessment, including cumulative ZTVs. Cumulative ZTVs should show clearly those areas where one or more wind farms are likely to be seen. The following types of cumulative ZTV should be considered:

- **Cumulative wind farm ZTV -** in the case of three wind farms overlapping areas of visibility should be illustrated using a Venn diagram, with three main overlapping colours representing each wind farm, three further colours representing each area of overlapping visibility, and a further colour representing where all three overlap. A colour scheme such as red, blue and yellow as the primary colours, allows corresponding overlapping colours of orange, green and purple to be used to improve the readability of the ZTV. A fourth wind farm can be added to this ZTV as a grey underlay (usually the development proposal) to show where the proposed offshore wind farm will be visible, in relation to three other wind farms. Where more than four wind farms are involved, ZTVs become more difficult to interpret and additional ZTV techniques are required to predict and show the effects clearly. These include:
- **Cumulative Blade Tip ZTV -** Baseline plus change. Demonstrates the potential visibility of proposed offshore wind farm in relation to the existing/consented wind farms and wind farms in the planning system.
- **Cumulative Blade Tip ZTV -** Count of wind farms visible other than assessed offshore wind farm. Demonstrates the potential number of wind farms visible at any point within the study area (existing/consented wind farms or wind farms in the planning system).
- **Cumulative Blade Tip ZTV -** Count of wind farms visible including assessed offshore wind farm. This ZTV is the same as above, but includes the proposed offshore wind farm within the count. The proposed offshore wind farm can be shown as a grey base colour, with the number of other sites visible as a range of other colours. The ZTV is used to assess the number of wind farms visible at any point in the study area, and assess sequential cumulative effects of several wind farm developments.
- **Individual ZTVs for each cumulative wind farm** - These ZTVs demonstrate the potential visibility of each wind farm included in the cumulative assessment. Each ZTV should show the potential number of turbines visible within a 35km radius of the site in question.
- **Horizontal angle subtended ZTV -** The horizontal angle subtended ZTV is used to assess the effect of multiple wind farm developments on the proportion of developed/undeveloped skyline. The ZTV is calculated by taking the bearing from the observer to the left most visible turbine and counting degrees to the right most visible turbine of a wind farm. Where more than one wind farm is visible, the angles subtended by all wind farms visible are added together and the angles mapped on the ZTV hence showing the proportion of skyline effect by wind farms from any point in the study area. This ZTV should be produced to include and not include the proposed offshore wind farm, so that comparison can be made to the difference that the proposal makes to the proportion of wind farm developed skyline in the study area.

Cumulative visualisations and photomontages

Visualisations should be produced, according to the Guidance on photomontages in Section 7.4, in order to illustrate the predicted cumulative views of offshore wind farm developments. These visualisations should show:

- The existing view - at time the photography was shot;
- Predicted view - with existing and consented wind farms, and wind farms awaiting determination or consent application.

Developments at different stages in the planning process should be shown in the following way:

- For existing or consented windfarms, and as yet undetermined applications, the turbines should be shown on the photomontages and/or wireline views (in addition to those turbines of the proposed development being assessed). The drawings should be clearly annotated to interpret the different proposals. The dimensions of the "existing" turbines [hub and blade] should also be clearly stated.
- For all other proposed Round 2, in planning wind farms still awaiting consent application, the likely lateral extent of the array of turbines should be shown, such as with a bracket above the seascape, colour-coded to distinguish this information from the existing, consented or

undetermined application sites. The purpose of including these sites awaiting consent application, as with the base plan, is to provide contextual information as to how the proposal relates to other proposals which may potentially arrive within the planning system; this information will not form part of the cumulative assessment itself. If known, the dimensions and number of proposed turbines should be indicated.

For all wireline and photomontage representations the following information about the cumulative wind farm in the view should be clearly stated:

- Dimensions (in metres) of all turbines;
- Distance of site[s] from viewpoint (in metres or kilometres); and
- Status of "existing" developments i.e. installed/consented/scoping etc.

Wireframes may be the most effective visualisation tool to illustrate cumulative views, and where they are used it is helpful to present them together with the matched panoramic photograph from the viewpoint.

Matrices

Matrices should be used to summarise complex information into a simple format to inform judgements on magnitude of cumulative change. The viewpoint assessment may be illustrated with matrices such as those shown in Table 7 and 8.

Table 7: Cumulative viewpoint analysis matrix

		Wind farm visible (within 30km)	Distance (km)	No. of turbines visible	Compass bearing to site (°) (Direction)	Horizontal angle (°)
	Proposed Wind Farm	✓	27.9km	19	64 (NE)	4.3
Built/consented	Wind farm 1	✓	24.4km	12	77 (E)	3.1
	Wind farm 2	▲	45.5km	34	6 (N)	1.8
	Wind farm 3	✗	22.8km	0	276 (W)	0
	Wind farm 4	▲	43.3km	14	44 (NE)	1.7
	Wind farm 5	✓	22.3km	13	61 (E)	3.5
	Total	3	N/A	92	N/A	14.4

✓ Wind farm visible ✗ Wind farm not visible ▲Wind farm theoretically visible, but over 35km from the viewpoint.

The results of the cumulative viewpoint assessment should be summarised in an overall matrix, for example as shown in Table 8.

Table 8: Summary matrix from cumulative viewpoint assessment

Notes: **Distance from viewpoint** - the distance to the nearest turbine of the windfarm **Turbines visible** - the number of turbines visible Percent visible - the percentage of the total height of all the turbines **Subtended angle** - represent the proportion of developed skyline occupied by windfarms ▲Wind farm theoretically visible, but over 35km from the viewpoint.		**Vp 1**	**Vp2**	**Vp3**	**Vp4**	**Vp5**
Wind farm 1	Distance from viewpoint (km)	3	4.4	8.3	27.9	11.6
	Turbines visible	0	1	0	19	4
	Percent visible	0.0	0.8	0.0	96.4	3.9
	Subtended Angle (°)	0.0	1.0	0.0	4.3	4.0
Wind farm 2	Distance from viewpoint (km)	9.3	10.7	5.5	24.4	4.2
	Turbines visible	0	0	12	12	12
	Percent visible	0	0	79.7	99.8	95.0
	Subtended Angle (°)	0	0	13.0	3.1	11.7
Wind farm 3	Distance from viewpoint (km)	▲	▲	▲	24.5	▲
	Turbines visible	0	0	0	34	0
	Percent visible	0	0	0	44.6	0
	Subtended Angle (°)	0	0	0	4.7	0

Sequential visual effects

Sequential effects on visibility occur when the observer has to move to another viewpoint to see other developments or a different view of the same development. Routes to be assessed should consist of main roads, rail routes, national footpaths and passenger ferry routes, and be defined and agreed with the SVIA consultees. The extent and selection of these routes for assessment should be informed by the location map of cumulative wind farms and the cumulative ZTVs. The assessment should clearly describe the baseline conditions and then describe to what extent the proposal would add additional visual impacts.

This assessment should be described and summarised in a table or other suitably clear presentation. An example is provided in Table 9.

Table 9: Cumulative visual effects on transport route

	Approx length and duration of route	**Max no. of wind farms visible**	**Wind farms visible**	**Description of cumulative effects**
Baseline Situation				
With proposed offshore wind farm				

The description should be informed and depicted by supporting wireline drawings and, where relevant, photomontages. Computer generated moving images or videomontage techniques may be particularly appropriate for the assessment as an illustration of sequential cumulative effects. These techniques are discussed further in Section 7.4. Alternatively, a series of static images could be produced and viewed in time sequence. The "journey scenario" should clearly describe the notable points along the route where impact occurs and should be described and assessed in terms of:

- Direction of view ('direct', 'oblique', 'aligned on route', or 'looking NW of route' etc.);
- Distance from nearest turbine;
- The number of turbines visible at each windfarm development;
- Which parts of the turbines are visible at each development (e.g. blade tips, hubs, upper towers or full towers); and
- The duration of effect, for example, by assuming an average driving speed the duration of effect along the journey can be predicted.

9.3.2 Cumulative Effects on Seascape Character

These affect the physical fabric or character of the seascape, or any special values attached to the seascape.

- Cumulative effects on the physical fabric of the seascape arise when two or more developments affect seascape components such as coastal vegetation, rock formations, sand dunes or other physical features. Although this may not significantly affect the seascape character, the cumulative effect on these components may be significant - for example, where the last remnants of an area of salt marsh are removed by the onshore works required for two or more developments.
- Cumulative effects on seascape character arise from two or more offshore wind farm developments. In this way, they can change the seascape character by creating a different seascape character type, in a similar way to large scale afforestation. That change need not be adverse; some derelict or industrialised seascapes may be enhanced as a result of such a change in seascape character. The cumulative effects on seascape character may include other changes, for example trends or pressures for change over long time periods, which should form part of any consideration of a particular project.

Windfarms may also have a cumulative effect on the character and integrity of seascapes that are recognised to be of special value. These seascapes may be recognised as being rare, unusual, highly distinctive or the best or most representative example in a given area. This recognition may take the form of local or national designations, citations in development plans, community plans or other documents, or may not be formally recorded prior to the SVIA.

The assessment should identify and evaluate the potentially significant cumulative effects on the seascape as a result of the proposed wind farm. These potentially significant effects may arise due to a combination of the existing/consented wind farms that are potentially visible from within these seascape units, together with the proximity to and potential visibility of the proposed offshore wind farm. Within other seascape units, the proposed wind farm will not have a significant effect. In some cases the proposed offshore wind farm will be seen at distance and in the context of numerous cumulative wind farms. In some seascape units the proposed offshore wind farm will be seen alone and in such cases there will be no cumulative effects on seascape and visual amenity.

The study of potential cumulative effects on seascape character should include the description and assessment of the following receptors:

- Effects on seascape character units

The effect of development on existing seascape character units should be described. It is likely that as more wind farms are developed and at closer distances to each other they will begin to be perceived as a key seascape characteristic and will therefore change seascape character.

- Effects on landscape designations

Effects of additional development on the qualities and the integrity and objectives of any relevant landscape designation should be analysed and described.

- Effects on historic gardens and designed landscapes

Effects of additional development on the character and integrity of any relevant designed landscape interest should be considered. Issues such as the landscape setting of the designed landscape and the impact on key views from the designed landscape will be important considerations requiring analysis.

- Effects on sense of remoteness or wildness

The existing experience of remoteness and wildness should be described and the cumulative effects of development analysed.

9.3.3 Magnitude of Cumulative Change

The cumulative magnitude of change contributed by the proposed development, in relation to existing and approved wind farms, and in planning wind farms awaiting determination or consent application, should be assessed. This assessment should be based on the interpretation of a range of parameters, to take account of cumulative change, including:

- Number of existing and proposed wind farms and wind turbines visible

Offshore wind farms may be seen as isolated features or as a key characteristic of the seascape or view. Greater numbers of proposed wind farms and turbines are more likely to cause large cumulative changes.

- Scale of proposed wind turbines

Taller wind turbines are more likely to cause a large change and alter the perception of vertical scale in the landscape. This will be the case particularly when larger turbines are seen in comparison with developments using smaller turbines or when proposed turbines are viewed in comparison with other landscape features.

- Distance to existing and proposed wind farms

A proposed wind farm has the potential to cause a large change to a particular receptor, while having only a small cumulative effect due to the effects of distance. If a proposed additional wind farm is seen in a view, for example, at a close distance, it is likely to cause a large change, but if the existing wind farm is located at a very long distance from the viewer, then the cumulative change is small if the viewer can barely see the existing wind farm. Large cumulative changes are likely to occur when both the existing and proposed wind farms are both fully visible, at close distances from the receptor, possibly in the same direction of view and forming a large developed proportion of the skyline.

- Horizontal angle and proportion of development/ undeveloped skyline

A viewer's eye tends to be drawn towards the skyline. Where an existing offshore wind farm is already prominent on a skyline the introduction of additional structures along the horizon may extend the developed horizon and angle of view occupied by wind turbines. The proportion of developed to non-developed skyline is therefore an important consideration when determining magnitude of cumulative change.

- Direction and distribution of existing and proposed wind farms

Windfarms may appear in the same cone of vision, seen without the viewer needing to turn their head, or be seen from the same viewpoint but when looking in different directions. Windfarms in the same cone of vision are likely to cause a smaller change to the overall view or seascape character, than those 'on all sides' of the view out to sea.

- Degree of visual coalescence and contrast of existing and proposed wind farms

A proposed offshore wind farm with a contrasting design to an existing wind farm is likely to cause a larger change than a wind farm which is designed to fit in with the character and appearance of the existing project. Developments may visually coalesce so that they seem part of the same development due to their proximity in a view, which may result in a lower change if they are seen to be cumulatively concentrated.

- Focal points in the seascape

An existing wind farm development may act as a focal point in the seascape and the effects of other wind farm developments on this should be considered when determining magnitude of change.

On the basis of professional interpretation of these parameters, the magnitude of cumulative change arising at seascape and visual receptors caused by the proposed wind farm, should be evaluated according to the magnitude parameters (very large, large, moderate, small, very small and negligible) defined in Table 5.

9.3.4 Significance of Cumulative Effects

The significance of any identified cumulative seascape or visual effect should be assessed in relation to the sensitivity of the receptor and the predicted magnitude of change. The receptors which should be assessed include all the seascape units, landscape designations and viewpoints agreed for the main assessment and any other specific cumulative viewpoints which might be agreed during consultation.

The significance of any identified cumulative seascape or visual effect should be evaluated in relation to the sensitivity of the receptor and the predicted magnitude of change according to the matrix shown in Table 6. As with non-cumulative effects, this should be used as a non-prescriptive tool, and as a guide to making complex judgements.

When assessing significance of cumulative effects, consideration should be given to whether the proposed wind farm crosses the threshold of acceptability for the total number of wind farms in area seascape. As no existing methodology exists for identifying when a seascape has reached its capacity in terms of wind farms, it is necessary to revert back to any strategic policies, locational guidance documents or existing landscape assessments which seeks to identify the landscape objectives and policies for the area.

There are few written seascape policies to date but in practice it is likely that the three strategic areas for Round 2 sites will become de facto 'wind farm seacapes' as a consequence of the large numbers of turbines being proposed in these areas. This is not to advocate such development, but acknowledges that the cumulative effects are likely to make offshore wind farms a key characteristic of those seascapes. Receptors may start to associate offshore wind farms with these seascapes. However, this does not mean that all the smaller parts of these areas (as represented by local seascape units) will have offshore wind farms as a key characteristic, and additional importance (in terms of conserving rarity and intactness) to conserving certain smaller seacape units within these three areas should be given when designing offshore wind farms and considering their cumulative effects.

Cumulative Impact Assessment: Key Guidance

- Cumulative effects are those which occur, or may occur, as a result of more than one wind farm project being constructed;
- It is important to recognise that cumulative effects consist of both those upon visual amenity as well as effects on the seascape;
- Cumulative effects on visual amenity consist of combined visibility and sequential effects;
- The SVIA should describe, visually represent and assess the ways in which the proposal would have additional impacts when considered together with other existing, consented or proposed wind farms that could be a major factor in determining the acceptability of the development, or where there may be potentially significant cumulative effects arising;
- The cumulative effects of projects staggered over different timescales should be assessed consecutively;
- Cumulative ZTVs and visualisations should be examined to identify the areas from where the cumulative wind energy developments may be visible;
- A location map of all existing, approved and in planning offshore and onshore wind farms awaiting determination or consent application is essential;
- An initial analysis of overlapping visibility should be prepared which maps the 35km radius study areas of the offshore wind farms under consideration;
- An assessment of the cumulative impact should be undertaken within the study area for the proposed offshore wind farm;
- Matrices should be used to summarise complex information into a simple format to inform judgements on magnitude of cumulative change;
- Sequential effects on visibility occur when the observer has to move to another viewpoint to see other developments or a different view of the same development. Routes to be assessed should consist of main roads, rail routes, national footpaths and passenger ferry routes;
- The study of potential cumulative effects on seascape character should include the description and assessment of the effects on seascape character units, landscape designations, historic gardens and designed landscapes;
- The cumulative magnitude of change contributed by the proposed development, in relation to existing and approved wind farms, and in planning wind farms awaiting determination or consent application, should be assessed;
- The assessment should identify the cumulative magnitude of change relative to existing visual impacts of wind farms rather than the combined impact of all the wind farms visible. Refer to 'an additional cumulative effect' that is additional to the impact to be expected from the developments taken individually;
- The significance of any identified cumulative seascape or visual effect should be evaluated in relation to the sensitivity of the receptor and the predicted magnitude of change according to the matrix shown in Table 6; and
- The degree of cumulative impact is a product of the number of and distance between individual offshore wind farms, the inter-relationship between their Zones of Theoretical Visual Influence (ZTV), the overall character of the seascape and its sensitivity to wind farms, and the siting and design of the offshore wind farms themselves.

10. PRESENTATION OF FINDINGS

10.1 Introduction

This section provides information on the presentation technique, both written and illustrative, available to communicate the results of SVIAs of offshore wind farms. The presentation of the SVIA is often key to successfully communicating the baseline seascape and visual environment, and the subsequent effects on it as a result of the proposed development. The assessment should be rigorously documented and explained, integrated, consistent and presented in a logical, clear and well structured manner. The written and graphic outputs of the SVIA should be chosen appropriately, produced rigorously and presented clearly and accurately, as they may be subject to close scrutiny during review of the ES and may need to be defended at Public Inquiry.

SVIAs will rarely be carried out in isolation, but generally form part of a wider assessment of environmental impact that may arise from a proposed offshore wind farm and presented in an ES. As such, the findings of the SVIA should be presented in a chapter format which can be integrated into the ES, either as a stand alone technical chapter, or as a summary chapter with the detail in a technical appendix.

SVIA documents can end up being very long and repetitive, which does not make for effective communication. The necessary rigour dictates a lot of detail, guided by its purpose to comply with consenting authorities' requirements, documenting to them that a reasonable iterative design and impact assessment process has taken place. However the document should be more than only this:

- It is an opportunity to communicate clearly, model ways of thinking and understanding about seascape and visual impacts to communities of interest and communities of place (i.e. outside the landscape profession). They may be very concerned about these impacts but may also have never had to express them in an objective and rigourous way before. If the SVIA is easily understood, then on the principle of Ockam's Razor[44], more support is likely to be given to the SVIA than any other counter study.
- It is an opportunity to promote consideration of seascape and visual issues by showcasing the valuable contributions that the Landscape profession can make to such developments, particularly in their early stages of siting and layout.

[44] A principle used by scientists to refer to situations where the simplest and most likely sounding answers (or ways of thinking about an issue) are more likely to gain credibility and widespread support than those that appear very complex and are understood by very few.

10.2 SVIA ES Chapter Contents

The precise content of the SVIA may vary between projects, depending on factors such as the scope of work agreed with consultees, the nature of the development and the sensitivity of the affected seascape. In general though, the SVIA should open with basic information on the nature of the development and purpose of the assessment, moving on to provide an explanation of how the scope of the assessment was defined and setting out the methodology used for the assessment. The core part of the SVIA should provide separate 'baseline' and 'impact assessment' sections. The baseline should describe the baseline environment and assesses its sensitivity to change, value and capacity to accommodate change. The impact assessment should describe the residual effects arising from the proposed development (both offshore and onshore elements) on the seascape, landscape and visual resource of the study area. In this context, residual effects mean the effects arising once the siting, layout and design mitigation measures have been incorporated into the project design. The SVIA should go on to consider the cumulative effects arising from the proposed wind farm in conjunction with built/consented wind farms within the study area and those at planning application stage. The SVIA should be concluded with a summary of the significant, and non-significant, seascape, landscape and visual effects arising from the proposed offshore wind farm and conclusions discussing the acceptability of the significant seascape, landscape and visual effects arising from the proposed wind farm. A proposed list of contents for an offshore wind farm SVIA chapter could consist of the following.

Introduction

Introduction to the SVIA, setting out the purpose of the assessment, the nature of the development and the structure of the assessment.

Scoping and method of assessment
A summary explanation of how the scope of the assessment was defined, consultation responses and a description of the methodology used for the assessment. A detailed methodology may be provided in an Appendix.

Baseline studies of existing landscape, seascape and visual resources

A description and assessment of the baseline seascape, landscape and visual resources of the application site and study area.

Assessment of sensitivity, value and capacity
An assessment of the quality, sensitivity, value and capacity to accommodate change of the seascape units in the study area.

Project Description and mitigation measures (including siting, layout and design)
A description of the siting, layout and design mitigation measures incorporated in the project design aimed at reducing, minimising or offsetting potential seascape, landscape and visual effects.

Prediction and evaluation of residual effects on seascape and visual amenity
Prediction and evaluation of the significance of residual effects arising from the proposed offshore wind farm on the seascape, landscape and visual resource of the seascape units, landscape types, designated areas, and visual receptors within the study area.

Prediction and evaluation of residual effect on seascape and visual amenity of Grid connection and onshore infrastructure

Prediction and evaluation of the significance of residual effects arising from the proposed onshore installation on the seascape, landscape and visual resource of the study area. (The assessment of the onshore installation may be written as a separate section/chapter for the ES, or worked into the main SVIA as required).

Cumulative impact assessment
An assessment of the potential cumulative effects arising from the proposed wind farm in conjunction with built/consented wind farms within the study area and those at planning application stage.

Summary
A summary of the significant, and non-significant, seascape, landscape and visual effects arising from the proposed offshore wind farm.

Conclusions
A discussion of the acceptability of the significant seascape, landscape and visual effects arising from the proposed wind farm.

Monitoring
Recommendations for ongoing monitoring of seascape and visual effects of the proposed offshore wind farm.

The preparation of a non-technical summary will also be required, which should be written in non-technical language, suitable for the general public and interested parties to understand the key SVIA issues without needing to study the full SVIA report.

10.3 Suggested Figure List for the SVIA

Figures and visualisations to support the SVIA chapter should either be incorporated within the text of the SVIA report, or presented in a separate figures volume and referenced in the SVIA text. The readability of a document is vastly improved when figures and illustrations can be read alongside the text of the SVIA. Consideration should be given to including the following figures to illustrate the SVIA.

Contextual and baseline environment
- SVIA Study Area and Site Location;
- Context Plan/Admiralty Chart;
- Landscape Designations;
- Linear receptor routes - Footpaths, Amenity Routes, Cycleways and Roads;
- Seascape Characterisation Context Plan - National/ Regional Seascape Units; and
- Seascape Characterisation - Individual Regional Seascape Unit Maps.

Mitigation Measures
- Layout evolution/optimisation plan.

Zone of Visual Influence Maps (as required)
- Blade Tip ZTV;
- Blade Tip ZTV with Seascape Character Units;
- Hub Height ZTV;
- Horizontal Angle Subtended ZTV;
- Weighted Scoring with Distance ZTV;
- Offshore Wind Farm ZTV Showing Effect of Earth Curvature;
- Location Plan - Cumulative Wind Farm Sites;
- Cumulative Blade Tip ZTV - Baseline plus change;

- Cumulative Blade Tip ZTV - Number of Wind Farms visible; and
- Cumulative ZTV - Horizontal Angle Subtended.

Viewpoints and photomontages

- Viewpoint Location Plan; and
- Viewpoint Photomontages/Wireframes (including cumulative wind farm as required).

11. MONITORING

11.1 Recommendations for Monitoring of Seascape and Visual Effects

Monitoring is the continuous assessment of environmental effects by the systematic collection of data over space and time. It can be continuous, using recording methods, but more commonly for seascape and visual impacts, should involve periodic repeat data collection aimed at comparing the predicted and actual impacts. It is the only mechanism for comparing predicted and actual impacts, and hence of checking whether mitigation measures have been put in place successfully.

Although this guidance encourages monitoring, it is not strictly part of the EIA process and is not statutory in the UK. As a result, developers may choose not to undertake monitoring, however the lack of post development monitoring is a deficiency in current EIA practice. Monitoring of seascape and visual effects is encouraged so that the successes and failures of SVIA can be judged and the improvement of future SVIAs facilitated. The following general recommendations are encouraged as best practice.

- Undertake monitoring to allow the authorities to measure the actual effects of the development, as opposed to the predicted;
- Undertake monitoring during the construction and post development stages;
- Undertake monitoring to provide information about responses of particular receptors to impacts e.g. whether peoples perceived value of landscape/seascape has been significantly effected by a development. This may include reference to Tourist Board surveys carried out before and after the development;
- Undertake monitoring to provide information about the nature of effect, i.e. whether people regard the development as positive or negative;
- Undertake monitoring of any seascape and visual benefits and services provided by the development, such as use of a visitor/interpretation centre;
- When undertaking monitoring studies, tie them in with Quality of Life Assessments; and
- Contribute monitoring results to a database that can facilitate the improvement of future SVIAs / EIAs.

We all wish to avoid public opposition to developments leading to a public inquiry. We need to try to understand what it is that the public may be sensitive to, and work to (1) avoid proposals likely to trigger such objection, and (2) reassure the public about the development, showing how change can be positive as well as negative.

Landscape professionals can provide their professional judgement through the SVIA process to help advise the developer as to likely public senstivities, so these can be addressed within the location and design process as far as possible, before they become a problem. However to be more accurate, the landscape professional ideally needs information from which to guide making such judgements, particularly if their experience is not local to the development area. Very few studies exist that are likely to have sufficient local knowledge to enable accurate predictions of how the public will react to a particular proposal, and the subjective nature of public reaction makes accurate prediction very difficult.

The best practice to aim for is to build up experience from monitoring public attitudes towards seascapes and offshore wind farms, both before and after they have been developed, and comparing differences, so future prediction can be more refined. However there is no requirement for such monitoring as part of the SVIA, so this is presented merely as a suggestion and not an essential part of SVIA guidance.

11.2 Round 1 Public Perception and Before and After Studies

There are relatively few examples of monitoring of seascape and visual impacts of offshore wind farms, however this section discusses some examples of before and after studies and public perception studies carried out for Round 1 offshore wind farm projects.

11.2.1 North Hoyle

A public perception study has been carried out for North Hoyle by npower renewables. This study is not published and was unavailable at the time of writing this guidance, but is recommended as an example of best practice for Round 2 offshore projects.

A recent (unpublished) student study piloted an approach that helps determine the thresholds of visual impact from offshore wind farms, with reference to weather, based on observing the completed North Hoyle development on many occasions and weather conditions, but at the same time of day, at many locations, at 1km distance intervals. Whilst only a small pilot, its results suggest patterns of 'tail off' in levels of visibility over certain distances, and this merits further study. There are very few similar published studies to date, but such studies could help build much greater confidence and certainty when trying to predict levels of visual impact at different distances. (To date the issue has been dealt with as a matter of common consensus from previous experience, distances largely coming from land-based wind farm inquiries, based on, and scaled up from, the "Thomas-Sinclair matrix").

11.2.2 Scarweather Sands

As part of the Scarweather Sands Round 1 offshore project, a team of Greenpeace volunteers conducted a survey[45] on the beach at Porthcawl, Wales to introduce the Scarweather Sands offshore wind farm to visitors to the area.

The survey team spoke to 650 tourists, showing them a photomontage of what the proposed wind farm would look like, and asked them simply whether they'd be 'more likely', 'just as likely' or 'less likely' to return to the resort if the wind farm went ahead.

The response was overwhelmingly positive. The majority of people (83%) said they would be just as likely to return to these beaches for their summer holidays, and a sizeable number (13%) said they'd be even more likely to come back. Only 4% said they would be less likely to return to the resort.

Many of the tourists thought the wind farm would liven up the view and be an added attraction. Others seemed well informed about global warming, and expressed a desire to support a clean solution. The survey results indicate that the presence of an offshore wind farm would make no difference to their decision to return, while those who would be 'more likely' to come back out number those who would be 'less likely' by three to one.

45 Scarweather Sands Opinion Survey (Greenpeace, July 2004)

11.3 European Experience

An analysis of the impacts of offshore wind farms in Europe[46] indicates that the direct European experience is based principally on two major offshore wind farm developments in Denmark: the 80 turbine, 160MW project at Horns Rev in the North Sea, and a 72 turbine, 165.6MW project at Nysted in the Western Baltic. These were commissioned and generating in 2002 and 2003 and have provided 1-2 years of post-construction impact experience. Further smaller scale developments in Denmark, such as the 20 turbine Middelgrunden Offshore Wind Farm in the strait of Øresund near Copenhagen, and in Sweden have also provided useful experience.

The development of a questionnaire to assess visual and socio-economic impact of the two major Danish offshore wind farm developments has gone through a development stage and results should be reported in 2005. To date though, relatively little work has been undertaken in Denmark to assess the visual impact and public attitude to these built offshore wind farms. The EIA assessment of Horns Rev concluded that the visual impact was minimal because the wind farm is 15-20km offshore. At Nysted, where the wind farm is much closer inshore and highly visible from the coast of Lolland-Falster, it is recognised that the turbine array is a 'significant element in the coastal landscape'.

46 Offshore Wind Farms - the European Experience (Dr Ian Miller, CCW Policy Research Report No. 05/03, 2005)

APPENDIX 1 - BACKGROUND CONTEXT

Introduction

This chapter provides an overview of the offshore wind industry in England and Wales. It presents the distribution of Round 1 and 2 sites. It describes the main seascape and visual issues of concern, highlighted during an initial consultation with various government departments, developers, consultants, regulatory agencies and organisations, and outlines the policy context and consents process relevant to offshore wind. It also provides a summary of existing guidance on seascape, landscape and visual impact assessment, and reviews the seascape assessments carried out for Round 1 offshore wind developments.

Offshore Wind Farm Development

Wind turbines for offshore wind farms vary in size and output. Those used for offshore wind farms in the UK depend on the turbine technology, location of the site and the build date for the project. The turbines built at North Hoyle offshore wind farm are 107m to blade tip, while those approved at Robin Rigg (Solway Firth) and Burbo (Liverpool Bay) are 130m (maximum to blade tip). According to the DTI SEA report[47], offshore turbines are likely to move into the range of 3-5MW and with a maximum height from sea level (to blade tip) of up to 150-160m, however these output and dimensions may change as the technology for offshore wind turbines develops over time. There is no typical offshore wind farm development, with turbine outputs, sizes and numbers varying between Round 1 and Round 2, and between individual projects. Offshore wind farms are currently either being built or proposed at locations up to around 30km off the England and Wales coast. Turbines tend to be spaced in rows or grid patterns with a minimum separation distance between turbines, based on the rotor diameters and tower heights proposed, and marine navigation requirements.

Figure A1: Scroby Sands Offshore Wind Farm

Source: BWEA

The construction period needed to build an offshore wind farm varies depending on the size of the wind farm, its location and the construction techniques used. Construction activities can run in parallel, for example, installation of turbines can progress whilst sea to shore cabling is laid and onshore substations constructed.

A typical offshore wind farms consists of:

- Wind turbines;
- Turbine foundations;
- Offshore substation;
- Foundation platforms;
- Cabling (offshore and onshore);
- Meteorological monitoring mast;
- Onshore substation; and
- Interconnection facility (onshore)

[47] Environmental Report: Offshore Wind SEA (BMT Cordah for DTI, July 2003)

Offshore wind turbines are generally laid out in a grid structure - either a basic grid, offset grid or feathered grid, but there are a range of options for turbine layouts, which respond to a range of technical, economic, environmental and navigational constraints. Analysis of current developments indicates that at present developers tend to use a basic grid pattern. This is explored further in the siting, layout and design discussion in Section 6 of this guidance.

The offshore wind turbine typically consists of a:

- Foundation;
- Access platform;
- Tower section;
- Nacelle (transformer and gearbox); and
- Blades.

Traditionally offshore wind turbines are coloured light grey or off white. There is a requirement for the tower of every wind turbine to be painted yellow all round from the highest level of Highest Astronomical Tide (HAT) to 15 metres in order that the turbines are highly visible to seafaring ships and vessels. In order to site wind turbines in the sea it is necessary to first install ***foundations*** in the sea bed on which they can be erected. Monopile foundations are most commonly used, consisting of a single steel tube which is driven into the seabed. A 'transition piece' is then connected to the exposed pile and fixed by grouting. Manufactured turbines can then be loaded directly onto ships for transport and installation onto the prepared foundations. An example of the type of ship likely to be used to install offshore wind turbines is the Mayflower TIV-1 wind turbine installation vessel.

Figure A2: Wind Turbine Installation Vessel at North Hoyle

Source: Gunnar Britse, www.windpowerphotos.com

The turbine installation vessel would be launched from the nearest available port and when it reaches the wind farm site, it positions itself beside a foundation, lowers it supporting legs to the seabed, and provides a steady platform from which the wind turbines can be lifted onto the foundations using the cranes fitted to the ship. Once the turbine is in place, the ship raises its legs and moves on to the next foundation.

The foundations are fitted with an ***access platform*** that enables safe access to the turbine itself, consisting of boat landing and safety ladders.

A ***monitoring mast*** is typically installed on the offshore wind farm site to collect wind speed and other meteorological information. Typically this would consist of a 2m diameter steel monopile foundation surmounted by a steel lattice tower approximately 50-60m in height. Data is transmitted to shore using remote dial-up technology.

Subsea cables are necessary to inter-connect the turbines and to connect the wind farm to the onshore substation, allowing the transmission of electricity to the grid. Interconnector cables are laid along the rows of turbines buried up to 3m below the seabed. Electricity is transmitted to shore using several cables running to shore buried in the seabed, where they typically join with the onshore cabling at an interconnection facility. ***Onshore cabling*** is necessary to link the offshore cables to an onshore substation, to facilitate the transfer of electricity.

Most offshore wind turbines are designed to remain operational with minimal maintenance and supervision for 20-25 years, although the lifespan of the Round 2 projects is expected to be up to 50 years with re-powering during that time. The operation of an offshore wind farm can be controlled remotely from an operations room, but two service visits per year are required to each turbine to maintain the turbines in operational condition and these would require the launching of suitable vessels to take maintenance staff from the shore to the wind farm.

The Energy Act 2004 includes a statutory scheme for the decommissioning of offshore wind farms. Provision is also made to remove the wind turbines and all associated structures at the end of the lease agreement with the crown estate, returning the wind farm site back to the condition it was in before construction took place. Turbines are removed using equipment similar to that employed during construction.

Overview of the Offshore Wind Industry

Round 1 Offshore

Following discussions with Government, The Crown Estate published leasing arrangements for the development of offshore wind farms in 1999. The Crown Estate is the public body which owns over 55% of the UK foreshore and almost all seabed out to 12 nautical mile (nm) territorial limit. In 2000, following commissioning of the Blyth project, The Crown Estate announced the first round of offshore windfarm development and released the pre-qualification procedures for the allocation of seabed sites for development.

Figure A3: Blyth Offshore, Northumberland

Source: AMEC

A group of prospective developers proceeded to co-operate with the Crown Estate, which released information on the process for site allocation and leasing in December 2000. There was a tremendous response with more applications submitted than had been anticipated. Generally, potential developers undertook a site selection process, identifying and refining potential locations for offshore wind farms around the UK coast based on initial site selection criteria in the physical, biological and human environment. Sites were selected based on the most favourable balance of environmental, economic and technical factors, such as average wind speed, shallow water depth, suitable seabed surface, suitable electrical infrastructure, landscape setting, bird migration routes and marine ecology.

The Crown Estates procedure for the Round 1 offshore wind farms, which concluded in April 2001, followed three stages:

- Pre-qualification;
- Site allocation; and
- Granting of an Agreement for Lease (which was entirely at the discretion of the CE Commissioners).

To pre-qualify, applicants had to satisfy the following three requirements in priority order:

- Financial standing;
- Offshore development expertise; and
- Wind turbine expertise.

Developments had to comply with a number of conditions:

- Sites had to be within the 12-nautical-mile territorial limit around the UK;
- Sites had to be at least 10 kilometres apart (unless agreement made between developers to develop adjacent or in closer proximity);
- Site areas limited to 10 sq km;
- Sites had to have a minimum generating capacity of 20 megawatts; and
- Sites were restricted to a maximum of 30 turbines.

In identifying sites, applicants also had to take account of all the relevant environmental factors, including proximity to shipping, dredging areas, fisheries, conservation areas, cables and pipelines. Applicants were also required to provide a statement and project plan with reference to their first choice, showing the main stages of development.

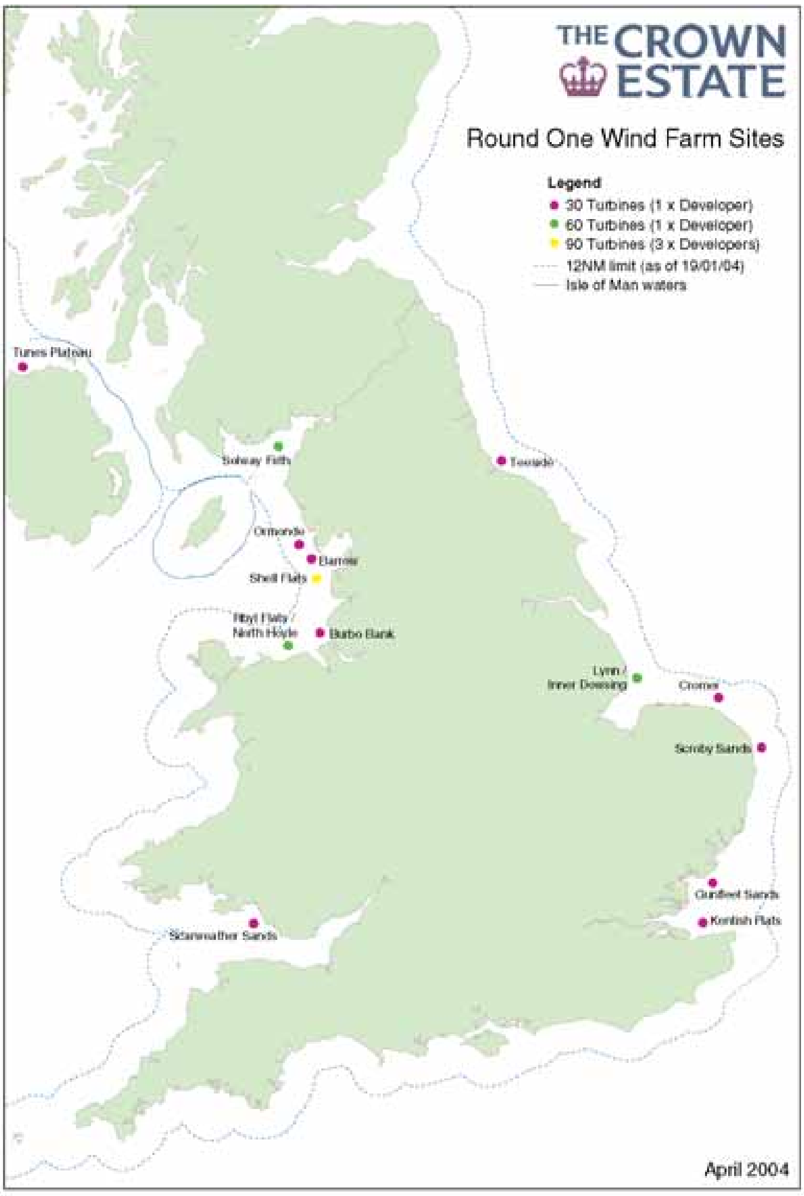
The resulting successful qualifying consortia and their potential sites were announced in April 2001. This was 'Round 1' of UK Offshore Wind Development, consisting of 18 sites of up to 30 turbines around the UK coast. Round 1 intended to be a demonstration round, enabling developers to develop technical experience etc in offshore wind farm development in the UK. Some of these projects have now changed hands or merged over the last 3 years, with the result of over 1 GW of consented capacity in the form of 13 projects, as shown in Table A1.

Table A1: Round 1 Offshore Wind Farms

Project name	Company	Site Location	Project Capacity
Barrow Offshore	Warwick Offshore Wind Ltd/Centrica/DONG	7km off Walney Island, near Barrow in Furness	30 Turbines 108MW
Burbo	Elsam/enXco	Liverpool Bay. 6.4km off North Wirral and Liverpool	30 Turbines 90MW total
Gunfleet Sands	GE Wind Energy	7km off Clacton on Sea, Essex	30 Turbines 108MW total
Inner Dowsing and Lynn	AMEC/Centrica	Lincolnshire, 5-7km off Skegness	60 Turbines 216MW
Kentish Flats	Elsam/Global Renewable Energy Partners (GREP)	8.5km off Herne Bay and Whitstable, North Kent	30 Turbines 90MW
Norfolk Offshore Wind Farm	EDF Energy	7km off Cromer, North Norfolk	30 Turbines 108MW total
North Hoyle	npower renewables	North Wales, 7.5km off Prestatyn and Rhyl	30 Turbines 60MW
Rhyl Flats	npower renewables	North Wales, 8km off Colwyn Bay, North Wales	30 Turbines Up to 150MW total
Robin Rigg	E.ON (UK) Renewables	Solway Firth,12.5km off Maryport (England)9.5km off Rockcliffe (Scotland)	60 turbines 216MW
Scarweather Sands	E.ON (UK) Renewables/ENERGI E2	South Wales, 9.5km off Porthcawl	30 Turbines 108MW total
Scroby Sands	E.ON (UK) Renewables	2.5km off Great Yarmouth, Norfolk	30 Turbines 60MW total
Shell Flat	Cirrus Energy	7km off Cleveleys, Lancashire	90 Turbines 324 MW total
Teeside	Northern Offshore Wind/EDF Energy Ltd	North East, 1.5km off Redcar and Teesmouth	30 Turbines 90MW total

The locations of these Round 1 offshore wind farms is shown in Figure A4.

Figure A4: Round 1 Offshore Wind Farms



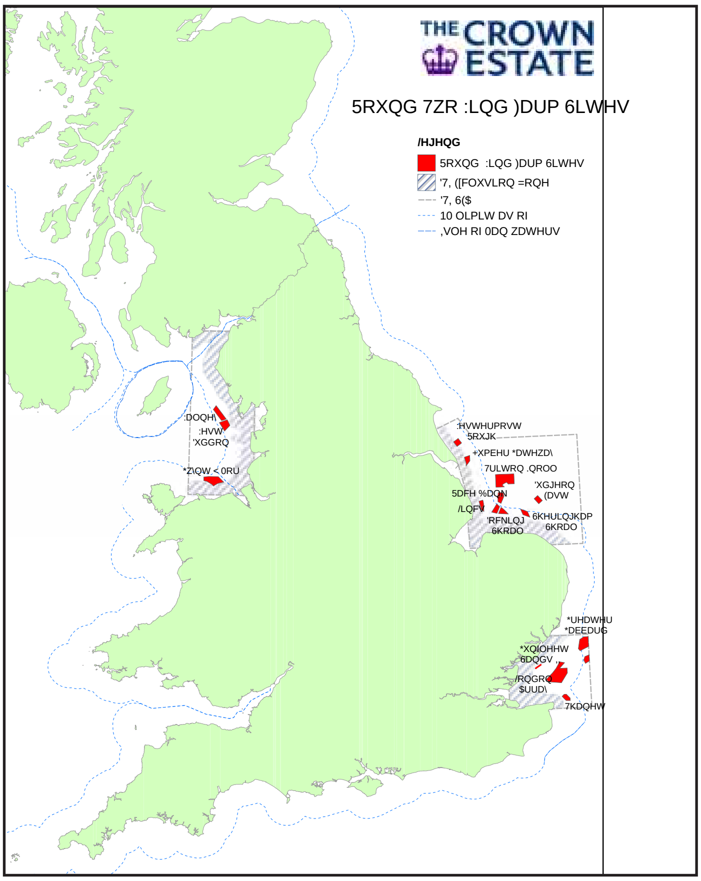
Source: Crown Estate The windfarm location maps have been reproduced with permission of The Crown Estate, are for general information only and are subject to change. Readers are advised to check The Crown Estate website for the most recent information and co-ordinates of individual windfarm projects. www.thecrownestate.co.uk

Round 2 Offshore

While the majority of Round 1 projects were in the process of gaining planning consent, the DTI held a consultation, Future Offshore, which concluded in February 2003. Its purpose was to develop a strategic framework for the offshore wind and marine renewables industries. Many issues were raised, including the consents process and the legal framework, the need for Strategic Environmental Assessment (SEA) and the necessary electrical infrastructure.

The DTI proceeded to commission an SEA48 of three areas in which competition for offshore wind farm site leases would be focused around the UK coast - the Thames Estuary, the Greater Wash and North West. These are shown in Figure A5.

Figure A5: Offshore Wind Strategic Environmental Assessment (SEA) Areas



Source: Crown Estate

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These three areas were marked for potential development and selected for SEA on the basis of the Windbase database[49] and provisional indications from the industry (submitted to the DTI by the BWEA) of areas of most interest in terms of offshore wind development. Key features governing the identification of the three areas included proximity to grid connections serving important markets and offshore siting criteria conducive to cost-effective construction, operation and maintenance of wind farms.

The SEA brought together important data from many sources to assist in selecting the most environmentally responsible sites and practices for the second round of offshore wind; on a larger scale and further out to sea. This SEA was completed in July 2003.

A strategic seascape study was carried out as part of the DTI's SEA report. The main objective was to identify levels of sensitivity of seascape units to offshore wind farms in three Round 2 SEA areas - the Thames Estuary, the Greater Wash and North West. This was based on a series of factors such as land use, the presence of landscape designations and recreational activities. Minimum offshore distances for wind farms were established at 8km, 13km and 24km respectively for low, medium and high sensitivity seascape, based on Iplanning for a notional turbine height of 100 to 150metres (to tip of blade). Although it is noted in the SEA that these distance thresholds are not prescriptive, they were assumed to indicate the distance thresholds within which such levels of effects may occur, for the purpose of defining, at a broad-brush level, which parts of our seascape might be more or less able to accommodate offshore wind farms according to the identified coastal sensitivities. Experience to date suggests we cannot give an exact blanket

49 Windbase was a GIS based initiative developed by The Crown Estate to identify key constraints amd opportunities for development.

assurance on these distances, as the prominence or noticability of the visual effects varies considerably with changing lighting and weather conditions, and whether the turbines are seen in the focus of a key view i.e. more sensitive (e.g. in close visual proximity to a headland or island), or the opposite i.e. less sensitive, (e.g. perpendicular to coastline, out at sea, seen as being visually well away from land or existing focus points in key views), or from a high or low elevation view point. The SEA study itself was too broad-brush to factor in such details. Whilst a set of distances proved helpful to inform the SEA study, it should not be implied that it would be appropriate to build any wind farm, or any amount of turbines, of any height, based only on the 8-13-24km principle. For each development proposal, a more detailed and sensitive consideration is required that takes into account the specifics of the location and setting, and the numbers and height of turbines. It is worth noting that a study commissioned by the Welsh Assembly Government, 'Facilitating Planning for Renewable Energy'(ARUP/WHITE consultants), has recently recommended greater minimum distances of 15 km from a designated coast and 10 km for other coast.

The consequences of the SEA, in terms of seascape and visual interests, were that a coastal strip would be excluded from all three strategic areas. This excluded coastal strip has a minimum width of 8km, based on the major effects threshold for low sensitivity seascape units identified in the SEA report, but also extends to 13km in areas of high sensitivity, such as around the North Norfolk coast and parts of the North Wales coast. This exclusion zone was imposed not just because of visual impacts or reducing them, but also because of shallow water feeding areas for birds, potential impacts on local fisheries and areas of high tourism and recreation. These excluded regions are shown in Figure A6.

On completion of the first phase of the SEA, and publication of conclusions and guidance on development scenarios, The Crown Estate announced tender arrangements for Round 2. Expressions of interest from potential developers of new offshore wind sites under Round 2 were invited and developers were able to tender for any sites within the boundaries of the strategic areas other than these excluded regions, and strongly advised to take account of the advice given in the SEA report. Developers were required to provide comprehensive details of financial standing, business development plan, development considerations (including environmental impacts) and decommissioning plans. High level consultation with Gov departments and their agencies and advisors also took place. The Crown Estate tender resulted in significant interest, much more than scenarios expressed in DTI SEA. The preliminary approach to site selection taken by offshore developers was based on the range of environmental constraints presented in the SEA report, including seascape and visual. The site selection process also took a wide range of other technical, environmental and economic factors into account, including water depth, the nature of the wind resource in the area, the capacity of the onshore grid capacity, other planned offshore developments (such as gas pipelines) and dense maritime navigational routes.

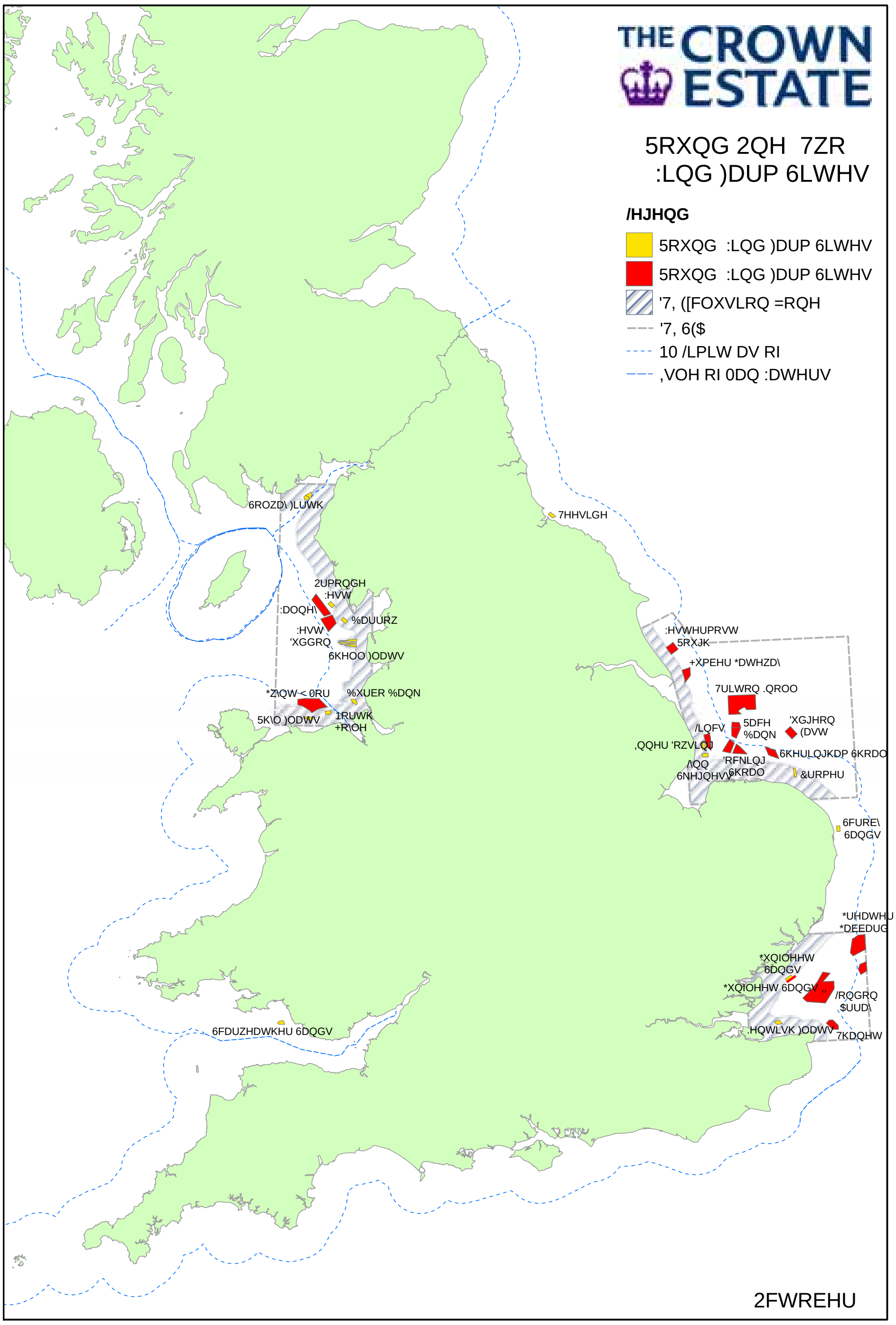
Bids for site options were assessed by a panel consisting of The Crown Estate and DTI, against a range of criteria including environmental constraints identified in the SEA, and the financial standing, offshore development expertise and site knowledge of the development consortia. Consultation with regulatory agencies and stakeholders on the proposed site locations was then undertaken and the strategic seascape and visual considerations raised for some of the sites was fed into the delineation of final site boundaries.

The results were announced in December 2003. The Crown Estate offered 15 site lease arrangements spread across the three strategic areas, with a potential combined capacity of up to 7.2GW to operate offshore wind farms under Round 2. These projects are shown in Table A2.

Table A2: Round 2 Offshore Wind Farms

Project Name	**Site Developer**	**Site Location (SEA Area)**	**Maximum project capacity (MW)**
Docking Shoal	Centrica	Greater Wash	500
Dudgeon East	Warwick Energy	Greater Wash	300
Greater Gabbard	Airtricity-Fluor	Thames	500
Gunfleet Sands II	Deltaic	Thames	64
Gwynt y Mor	npower renewables	North West	750
Humber	Humber Wind Limited	Greater Wash	300
Lincs	Centrica	Greater Wash	250
London Array	London Array	Thames	1,000
Race Bank	AMEC	Greater Wash	500
Sheringham Shoal	Sciria	Greater Wash	315
Thanet	Warwick Energy	Thames	300
Triton Knoll	npower renewables	Greater Wash	1,200
Walney	DONG	North West	450
West Duddon	Scottish Power	North West	500
Westernmost Rough	Total	Greater Wash	240
			7,169

Figure A6: Round 2 Offshore Wind Farms



Source: Crown Estate

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Future Rounds

The Government currently has no short-term plans for further rounds at this stage, as they are focusing on the results of Rounds 1 and 2. The DTI has funded the production of an "Atlas of UK Marine Renewables" that maps out wind, wave and tidal resources around the UK. It will assist in informing the priority areas for future commercial exploitation of renewable energy.

Policy Context (Coastal Zone)

Planning Policy Context

The development of an offshore wind farm exceeding 1MW in capacity requires consent under Section 36 of the Electricity Act 1989 from the Secretary of State (DTI). The Town and Country Planning Act 1990 is not relevant to offshore installations, but is applicable to the onshore components of offshore wind projects. Onshore construction falls within the jurisdiction of the relevant Local Authority, for all works above Mean Low Water Mark (MLWM). Local Authorities are also a key consultee in the scoping process for offshore wind farm developments, and can provide real benefits to the SVIA because of their local knowledge, for example in the selection of appropriate locations for the viewpoint assessment. Certain elements of the development plan and planning policy guidance therefore have relevance to offshore wind farm projects. In England, planning policy statements (PPS) of relevance include

- PPS1: General Principles;
- Draft PPS 7 - Sustainable Development in Rural Areas;
- PPS9: Nature Conservation;
- PPS15: Planning and the Historical Environment;
- PPS16: Tourism;
- PPS 20: Coastal Planning; and
- PPS 22: Renewable Energy.

In Wales, Technical Advice Notes (TAN) of relevance include:

- TAN 5: Nature Conservation and Planning;
- TAN 6: Agricultural and Rural Development;
- TAN 8: Renewable Energy;
- TAN 12: Design;
- TAN 13: Tourism; and
- TAN 14: Coastal Planning.

The coastline of England and Wales is a significant national asset, and as such there is a variety of other relevant policy context, when considering development in the coastal zone.

This context is described as follows.

Shoreline Management Plans (SMPs) (DEFRA)

The Government has encouraged the formation of voluntary coastal defence groups primarily made up of maritime district authorities and other bodies with coastal defence responsibilities. The groups provide a forum for discussion and co-operation. They also play an important role in the development of Shoreline Management Plans (SMPs) for their area. An SMP provides a large-scale assessment of the risks associated with coastal processes, and presents a long term policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner. In doing so, an SMP is a high level document that forms an important element of the strategy for flood and coastal defence.

First generation SMPs have been completed around the coastline of England and Wales. Many operating authorities have adopted the recommendations of their Plan as a basis for production of individual strategic plans, monitoring programmes and studies for all or parts of their coastline and, where proven by strategic plans, the implementation of appropriate projects. Future generations of SMPs should build on the first generation Plans, taking account of information subsequently collected or changing circumstances. Defra's 'Futurecoast' study is relevant to the update of plans as it helps determine a vision for the longer term shoreline needs.

The planning system is important in guiding the way in which the coast is developed and conserved. Both statutory and non-statutory plans play an important role in achieving this. The statutory plans (e.g. Structure and Local plans) are prepared against the background of National planning guidance, with non-statutory plans (e.g. SMPs, Coastal Management Plans (CMPS) and Local Environment Agency Plans (LEAPs) providing further advice and guidance on the development or management of a particular location or "theme". SMPs provide details on a wide range of coastal issues, assisting local councils to formulate planning strategies and control future development of the shoreline.

The Futurecoast study was commissioned by Defra. The results of the study were distributed to coastal defence operating authorities on CD in October 2002 to inform Round 2 of the preparation of Shoreline Management Plans (SMPs). The study provides predictions of coastal evolutionary tendencies over the next century, which are to be considered in the updating of SMPs and other Strategic Plans targeted at determining broad scale future coastal defence policy throughout the open coast shorelines of England and Wales.

The study has considered fresh approaches to assessing shoreline evolution within such plans. The analysis of future shoreline evolution potential for each section of coast, which is the main component of the study, provides an improved understanding of the coastal systems and their behavioural characteristics. The study included a range of supporting studies, focusing upon maximising use of existing information and experience. A number of additional data sets were also produced.

The main outputs from the research were:

- Improved understanding of coastal behaviour - this has used and built upon the information contained within the Round 1 SMPs and other existing studies;
- Assessment of potential future shoreline behaviour for two scenarios: unconstrained (i.e. assuming no defences or management practices) and managed (i.e. assuming present management practices continue indefinitely);
- A 'toolbox' of supporting information and data that can be used in future assessments of shoreline behaviour - this includes (1) the background thematic studies produced for this project and (2) the additional data sets and information generated.

The key conclusions from the project are presented in a series of statements known as Shoreline Behaviour Statements. Much of this information has also been provided as mapped data or is linked to the maps, such as data sets on cliff behaviour assessments, analysis of historic shoreline movement and climate change impacts. This is all presented on a single interactive CD, supplemented by two further CDs, which contain oblique aerial photographs covering the entire open coast of England and Wales.

Further information is available at

http://www.defra.gov.uk/environ/fcd/futurecoast.htm

Integrated Coastal Zone Management (ICZM)

Integrated Coastal Zone Management (ICZM) is a process which promotes the sustainable management of the coastal zone, including the integration of social, economic and environmental interests. It describes the way in which activities and interests in the coastal and marine environment are co-ordinated, managed and delivered, with the objective being to establish sustainable levels of economic and social activity in coastal areas whilst protecting the coastal environment.

ICZM has been encouraged by the European Commission and the UK Government as the best approach to the sustainable development of coastal zones, and there are now moves towards implementing a more formal ICZM framework in the UK. An ICZM strategy provides a management framework for ICZM programme development for a given area. Whether an ICZM strategy is being developed at a national, regional or local level, it must provide a vision for the integrated management of the particular coastal zone that it addresses.

In 2003 Defra published a stocktake of ICZM in the UK[50], which describes the environmental, social and economic characteristics and natural resources of the UK's coast; identifies the different laws, agencies and other stakeholders that influence the planning and management of activities on the coast; and analyses how these bodies integrate with each other, identifying any gaps, overlaps or opportunities. The final report completes the first stage in the UK's implementation of the EU Recommendation on ICZM[51]. More information on how Defra and the devolved administrations will take forward this work will become available once the outcomes of related government reviews on marine nature conservation and development in coastal waters have also been published.

The system of ICZM offers the scope to address environmental factors, such as concerns raised about the seascape and visual impacts of developments in the coastal zone. Increasingly in the future, ICZM will assist with strategic planning for new offshore wind farm developments, through the participation of organisations and individuals with an interest in the coastal zone.

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50 ICZM in the UK: A Stocktake (DEFRA, March 2004)
51 http://www.europa.eu.int/comm/environment/iczm/home.htm

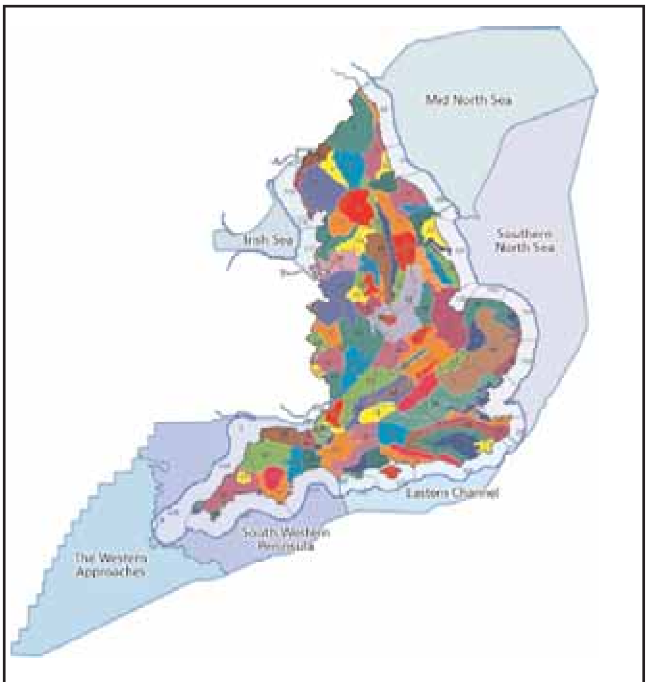
Marine and Coastal Natural Areas (English Nature)

Natural Areas are sub-divisions of England, each with a characteristic association of wildlife and natural features. They provide a way of interpreting the ecological variations of the country in terms of natural features, illustrating the distinctions between one area and another. Each Natural Area has a unique identity resulting from the interaction of wildlife, landforms, geology, land use and human impact. They are defined as either terrestrial, coastal or marine Natural Areas.

Marine Natural Areas take account of natural processes and the interaction between them, the underlying geology and wildlife. They contribute to regional planning and management of the seas around England, offering a framework within which we can develop and implement an ecosystem approach to managing human uses of the marine environment. Six Marine Natural Areas have been identified:

- Mid North Sea;
- Southern North Sea;
- Eastern Channel;
- South Western Peninsula;
- Western Approaches;
- Irish Sea.

Figure A7: Natural Areas



Source: English Nature

Though the boundaries of the Marine Natural Areas reflect a number of natural factors, the boundaries only encompass the seas around England, not other parts of the UK. Each Marine Natural Area is accompanied by a report which describes its environment and natural character, key habitats and species, human activity and use. The information contained within these regional reports provides advice on the nature conservation value of large areas of sea.

Coastal Natural Areas cover the immediate coastal zone, forming sub-divisions of the English coast, each with a characteristic association of wildlife and natural features. 23 coastal natural areas have been identified, as shown in Figure A7.

Further information on Natural Areas and Marine Natural can be found on English Nature's website at

http://www.english-nature.org.uk/science/natural/NA_search.asp

Digitial boundaries can be downloaded from

http://www.english-nature.org.uk/pubs/gis/GIS_Register.asp

Overview of Consents Process for Offshore Wind

The DTI is the focal point for offshore wind farm applications in England and Wales. The development of an offshore wind farm requires consent under Section 36 of the Electricity Act 1989 from the Secretary of State (DTI). Developers can apply alternatively under the Transport and Works Act 1992 which for projects in Welsh territorial waters would be considered by the Welsh Assembly Government.

Although there is no mandatory process to be followed by a developer in order to obtain all the required consents for a proposed offshore wind farm development, recent DTI guidance[52] provides developers with a streamlined approach, by which the processing of applications will be co-ordinated by the DTI's Offshore Renewables Consents Unit (ORCU).

[52] Guidance Notes: Offshore Wind Farm Consents Process (DTI, March 2004)

The agreements for Lease over Round 2 sites grant the developers a development option for seven years during which time the successful bidders have to obtain the relevant statutory consents. It is impossible to define all the consents required by a developer as some are site dependent in both the offshore and onshore environments. There are, however, certain consents that will be required for any offshore wind site. These are:

- Electricity Act 1989 (EA) - Section 36;
- Transport and Works Act 1992 Order (TWA). Note: the TWA is an alternative to the Electricity Act;
- Food and Environment Protection Act 1985 (FEPA) - Section 5; and
- Coast Protection Act 1949 (CPA) - Section 34.

The DTI's Guidance Notes: Offshore Wind Farm Consents Process (March 2004), provides further guidance on this legislation.

The number of consents/licences that developers will need will differ according to the specific nature of individual sites and the particular preferences of developers. The main consent routes available to developers are:

- Electricity Act/FEPA/CPA and other consents; and
- Transport and Works Act/FEPA and other consents.

Where a developer chooses the Electricity Act/FEPA /CPA route, the DTI's ORCU receive and co-ordinate all consent/licence applications. During this process ORCU works closely with the Marine Consents Environment Unit (MCEU).

The Crown Estate is landowner not regulator and the lease is effectively a binding contract for exclusive use of specific area of seabed. Only when all consents are in place can the developer draw down the Lease and enter the site to start construction.

APPENDIX 2 - SUMMARY OF EXISTING GUIDANCE ON SEASCAPE, LANDSCAPE AND VISUAL ASSESSMENT

There are a number of existing sources of guidance on SVIA. These are summarised as follows.

Guide to Best Practice in Seascape Assessment (Countryside Council for Wales, Brady Shipman Martin and University College of Dublin, 2001)
This guide is possibly unique in offering a method for assessing seascape, using a process centering around dividing seascape into a set of areas based on land-sea inter-visibility, and also including aspects of landscape characterisation. It draws on well-established methods for landscape assessment in Britain and Ireland and modifies them to suit the very different environment of the coastline and sea - the 'seascape'. It does not replace existing landscape assessment methods, but provides the additional dimensions required where coastline and marine components need to be considered as well.

Assessing seascape can be very useful when planning and designing in the coastal zone. Relevant issues at present include changes to seascape character due to coastline development, marinas, coastal defences and offshore wind farms. As with landscape assessment, the guide aims to provide a level of rigour and transparency in the collection and analysis of information about seascape, which can be put forward to inform spatial planning policies, scenic designations, design guidance, impact assessments, and to inform decision-makers in development control situations.

The Guide provides extensive and valuable guidance for seascape assessment, however it is more academic than practical in its approach, and does not provide guidance specific to the offshore wind farm development scenario.

Landscape Character Assessment: Guidance for England and Scotland(Countryside Agency and Scottish Natural Heritage, 2002)
This guidance provides updated advice on Landscape Character Assessment (LCA), an important tool for all those involved in influencing the landscape. The guidance reflects how methods and techniques for LCA have developed in recent years and builds on interim guidance which was subject to consultation in 1999. The guidance covers England and Scotland, although aspects certainly have relevance to Wales, and other parts of the British Isles.

The guidance defines the principles and process of LCA, such as the key principles of landscape character, making judgements, the role of objectivity and the application of different LCA scales. It extends it's coverage to describe four main steps of the LCA process, from defining the scope (step 1), through desk study (step 2) and field survey (step 3), to characterisation and description (step 4). Finally it offers advice on making judgements based on landscape character, such as landscape strategies, landscape guidance, attaching status to landscape and landscape capacity. It uses a number of case studies in planning, conservation and management to illustrate LCA in practice. It provides a basic guide to the approach and methods of Landscape Character Assessment, and a separate series of topic papers which offer more detail on particular uses of LCA.

The LCA guidance provides the main source of guidance on landscape character assessment for landscape consultants, however its brief does not specifically to extend to address seascape characterisation.

Guidelines for Landscape and Visual Impact Assessment, 2nd edition (The Landscape Institute and Institute of Environmental management and Assessment 2002)
The GLVIA are designed to encourage high standards for the scope and content of landscape and visual impact assessments. They present general guidance on good practice in the preparation of landscape and visual impact assessments, based on current best practice developed from the experience of Landscape Institute and IEMA members. The guidance covers the nature of landscape and visual impact assessments, and provides advice on the key stages of an LVA, from describing the proposed development, through baselines studies to identifying, assessing and mitigating landscape and visual effects. The GLVIA also presents good practice guidance on presentation techniques such as visibility mapping and visualisations.

The GLVIA provides the main source of guidance on visual impact assessment for landscape consultants, however its brief did not specifically to address seascape characterisation, nor the impact assessment process for offshore wind farms specifically.

Guidance on the Environmental Impacts of Wind farms and Small Scale Hydro-electric Projects (Scottish Natural Heritage 2001)
This guidance describes the typical components of an onshore windfarm, the importance of landscape character and how windfarm design relates to landscape character to create an overall image. They include discussion on landscape value, visual relationships between windfarms and the landscape, and cumulative impacts. The Guidance encourages a character based approach to wind farm design, where wind farms are sited in such a way as to protect existing landscape qualities.

The report explains that the visual impact of a windfarm depends upon the extent of visibility (area from where it is seen) and the nature of visibility (how it appears within these views). The extent of visibility of a windfarm is influenced primarily by its size and positioning, distance of view and prevailing weather conditions. The nature of visibility depends on how the windfarm looks as a basic visual element i.e. single point, pattern and how the windfarm is viewed e.g. edge of view, gradual, surprise. The Guidance suggests that the overall image of a windfarm is determined by a combination of the windfarm image and landscape character, which produces either a sensitive, dominating, sculptural, utilitarian, simple or confusing image of the wind farm, and a positive or negative perception of whether it is appropriate or inappropriate to the landscape.

The Guidance stress the importance of rationale. Windfarms look most appropriate in a landscape where their presence and design appears rational. For a windfarm, the logical position is where there is an abundance of wind, most commonly in open areas. A simple wind farm image is encouraged, with consistency between turbine models and spacing so that it does not appear confusing in relation to the landscape. Furthermore, siting windfarms across different landscape character areas is discouraged and a buffer zone is recommended to visually separate windfarms from existing development.

The report endorses the use of landscape and visual impact assessments as part of a full EIA, carried out according to the GLVIA as the most suitable method for achieving the 'best environmental fit' for a windfarm development. It encourages full use of presentation techniques such as ZTV's, wirelines, photomontages and video montages to illustrate the results of landscape and visual assessments.

The brief for this guidance did not specifically extend to offshore wind farm developments and it focuses on onshore wind, together with environmental impacts common to both wind and small scale hydro energy developments.

Visual Assessment of Wind farms - Best Practice (University of Newcastle, SNH commissioned report 2002)
This guidance recognises the variations in the way that visual impact and the significance of visual impacts are dealt with in EIA, and attempts to provide advice to reconcile these differences. The guidance identifies and investigates relevant work on visibility, visual impact and significance, compares the as-built visibility of wind farms in Scotland with estimates of visibility in environmental statements, and draws conclusions about appropriate distances for ZTV in different circumstances. Detailed recommendations are presented and summarised covering general LVA issues, together with more specific aspects such as zones of visual influence, viewpoints, visualisations, receptor sensitivity, impact magnitude and significance.

This report provides detailed research into best practice on the landscape and visual assessment of onshore wind farms, however it is academic, rather than practical in approach, and its brief did not extend specifically to SVIA of offshore wind farms.

Studies to Inform Advice on Offshore Renewable Energy Developments: Visual Perception Versus Photomontage (CCW Contract Science Report No. 631, Symonds Group Ltd, March 2004)
This study was produced to enable the Countryside Council for Wales to provide guidance and advice to all parties involved in the visual impact assessment of offshore wind farm developments. The study brings together a combination and comparison of current best practice with field observations of the North Hoyle Wind Farm, off the North Wales coast.

The study explorers the use of photomontages to accurately predict the visual impact of such developments and reviews the current techniques used in the preparation of visual impact assessments. The study concludes with recommendations and suggested amendments to current techniques that are currently considered as best practice in the preparation of photomontages. The study provides useful Guidance and recommendations on the visualisation / photomontage aspects of visual impact assessment for offshore wind farms and reference to it is made in this guidance.

It was found that whilst photomontages and photographs of the built development can be very similar, field observations of offshore wind farms can differ significantly from the perception of the photomontage due to visual factors such as size, perspective, movement, weather and lighting. Photomontages were found to be a valuable tool to show horizon spread and layout patterns in the correct locations, but the media limits our ability to appreciate scale and distance, which are essential components to understand when assessing visual impact.

The study brief did not extend to seascape characterisation, or the impact assessment process for offshore wind farms specifically, focusing on the photomontage/visualisation aspects of visual impact assessment.

The brief for this project did not extend to specific Guidance for SVIA of offshore wind farms, however it does provide a number of recommendations, ranging from considering visibility issues, differences in scale of offshore and onshore developments, balancing economic interests with safeguarding the natural heritage and addressing potential cumulative impacts.

An Assessment of the Sensitivity and Capacity of the Scottish Seascape in Relation to Offshore Windfarms (Final Report July 2004, SNH Commissioned Report/University of Newcastle)
The Scottish Executive has set out an aspirational target of 40% renewables by 2020. A proportion of this extra installed capacity is expected to come from marine technologies, including offshore wind farms. Scottish seascapes are renowned for their natural heritage. This study was commissioned to formulate a strategic response which will provide guidance on areas where the impact of offshore wind energy development on Scottish seascapes will be of least significance. The study identified seascape units around the Scottish coastline, carried out a visibility assessment for these units, considered seascape values and calculated an overall capacity index by combining seascape sensitivities, visibility and landscape values. Generally speaking the study identified that the main patterns of capacity are low along the west coast, while there is a higher relative capacity present on the east coast, Shetland and North Lewis. The study is focused on Scotland and on the strategic issues of sensitivity and capacity of the coast.

APPENDIX 3 - GLOSSARY OF KEY TERMS

Seascape

The everyday meaning of **seascape** is a 'picture or view of the sea' (in Wales the term for this is "Morlluniau"), however this guidance broadens the concept to mean a term for:

"***the coastal landscape and adjoining areas of open water, including views from land to sea, from sea to land and along the coastline***", and describes "***the effect on landscape at the confluence of sea and land***". In Wales this distinction is already understood through the term "Morweddau".

Thus, for the purpose of this guidance, we have chosen to define 'seascape' as a discrete area within which there is shared inter-visibility between land and sea (a single visual envelope). Every seascape therefore has 3 defined components:

- an **area of sea** (the seaward component);
- a **length of coastline** (the coastline component); and
- an **area of land** (the landward component).

Historic Seascape

Historic seascape is taken to be the natural seascape as altered by human activity - the total assemblage of visible things that human beings have done to alter the interface and relationship between land and sea, the effect that human activities have had on this environment and vice versa.

Cultural (or Associative) Seascape

The cultural (or associative) seascape is taken to be the "visible evidence of mentality, whether intellectual, imaginative or spiritual, within the seascape, including what is perpetuated by memory or by scholarship (i.e. this includes historic as well as contemporary or emerging associations).

Landscape Character

Landscape character is the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement. It creates the particular sense of place of different areas of the landscape.

(ref. The Landscape Institute with the Institute of Environmental Management and Assessment (2002) p. 12. Guidelines for Landscape and Visual Impact Assessment).

Landscape character is the distinct and recognisable pattern of elements that occur consistently in a particular type of landscape. Particular combinations of geology, landform, soils, vegetation, land use, field patterns and human settlement create character. Character makes each part of the landscape distinct, and gives each its particular sense of place.

(ref. Scottish Natural Heritage and The Countryside Agency (2002) p.9. Landscape Character Assessment - Guidance for England and Scotland).

Quality

Quality in seascape reflects the <u>condition</u> of the components or features that comprise a seascape. It also reflects the extent to which the character of the area is well defined, in the sense that features present are not fragmented, are in good condition, and the seascape unit is an integrated whole.

(ref. GSA, Countryside Council for Wales)

Value

Value in seascape reflects the relative <u>degree of importance</u> attached to a seascape feature, seascape character area or seascape type. Different value judgements are possible and can be based on quite different underlying aesthetic systems. Subjectivity can be limited, or at least made transparent, by the use of explicit criteria, for example rarity, fragility, integrity, diversity, tranquillity, and wildness value. In this sense, some of the issues may be expressed in terms of both their quality (e.g. an undeveloped seascape may still be tranquil) and value (e.g. visitors and residents attach great value to that seascape because of its tranquil quality). Regard should also be had to consensus opinion, as expressed by statutory or local designations, or simply by the popularity of a seascape.

(ref. GSA, Countryside Council for Wales)

Evaluation

This is about making judgements on significance. The Guidance describes this in terms of evaluating significance of an effect on seascape character or visual amenity.

Communities of Interest

Include professionals, developers, conservationists, government and local authorities; and

Communities of Place

Include residents, weekenders, workers, and visitors.

Inherent Seascape Sensitivity

To promote consistency with landscape assessment, a similar definition can be made to that used for "overall landscape sensitivity", i.e. it is a term that refers to the inherent sensitivity of the seascape itself, irrespective of the type of change that may be under consideration. It is likely to be most relevant in work at the strategic level, for example in preparing regional spatial strategies. Seascape sensitivity can be defined as embracing a combination of:

- The sensitivity of the seascape resource (in terms of both its character as a whole and the individual elements contributing to character); and
- The visual sensitivity of the seascape, assessed in terms of a combination of factors such as views, visibility, the number and nature of people perceiving the seascape and the scope to mitigate visual impact.

Adapted from Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity (Countryside Agency and Scottish Natural Heritage, 2002).

A simpler form can be the degree to which a particular seascape type or area can accommodate change arising from a particular development, without detrimental effects on its character.

Adapted from The Landscape Institute with the Institute of Environmental Management and Assessment (2002). Guidelines for Landscape and Visual Impact Assessment

Seascape Sensitivity to a Specific Type of Change

To promote consistency with landscape assessment, this term should be used where it is necessary to assess the sensitivity of the seascape to a particular type of change or development - in this case, offshore wind farms. It should be defined in terms of the interactions between different components of the seascape itself, the way it is perceived and the particular nature of the type of change or development in question.

Adapted from Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity (Countryside Agency and Scottish Natural Heritage, 2002).

Seascape Capacity (to Accommodate Change)

This term should be used to describe the ability of a seascape to accommodate different amounts of change or development of a specific type. This should reflect:

- The overall sensitivity of the seascape, but more specifically its sensitivity to the particular type of development in question. This means that capacity will reflect both the sensitivity of the seascape resource and its visual sensitivity; and
- The value attached to the seascape or to specific elements in it.

Adapted from Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity (Countryside Agency and Scottish Natural Heritage, 2002).

In evaluating capacity, the character of the area will be the most important factor, but it is also likely that the perceived value of a seascape will directly affect judgements about acceptable change. The concept of capacity to change is inseparable from consideration of the type of development proposed, and it likely that an overall assessment of capacity without reference to such information would be of little value.

Seascape Effects

Landscape effects are typically described as the likely nature and scale of changes to individual landscape elements and characteristics, and the consequential effect on landscape character, resulting from a proposed development (The Landscape Institute with the Institute of Environmental Management and Assessment (2002). Guidelines for Landscape and Visual Impact Assessment). However, with offshore wind farms, the majority of the development is not on a landscape, so consideration should be given to seascape effects - that is the indirect visual impacts on the setting or perception of coastal landscapes as a result of offshore development, as well as the landscape effects arising from the land based development components such as substations and grid connections.

Visual Effects

Development or other change to the physical environment of a seascape may alter its appearance, i.e. produce visual effects. However these visual effects would impact on people, who are visual receptors. The significance of the visual impacts will vary depending not only on the alteration of appearance, but on the attitudes, aspirations and ways that people use and value a place. For example substantial negative visual effects on a seascape might lead to a change in some people's behaviour. For example tourists may stop visiting, or visit for a different purpose. It is still possible that substantial visual effects (usually expressed in terms of their "magnitude") may not lead to alternations in people's attitudes, aspirations and ways people use and value a place, suggesting the impacts would not be significant. Visual impacts are normally studied quite separately from considering impacts on the character of a place. GLVIA provides definitions and standard visual impact assessment methodologies. From CCW guidance.

Direct Effects

A direct effect is an effect that is a direct result of a particular feature of the development, for example as a result of the loss or removal of coastal vegetation, rock formations, sand dunes or other physical features. These effects can be located accurately on a plan, such as where an underground cable is laid through a sandbank, or where a substation is located in an area of grassland, and can be described accurately and objectively, by quantifying the extent (e.g. the area) of the effect. Direct effects are often most readily mitigated by sensitive landscape restoration, and impact magnitude should consider the duration of the effect, which may often be relatively short term, during the construction phase. Direct effects on the seascape itself, for example direct effects on the sea bed, are likely to be beyond the remit of the SVIA, and are more readily addressed in other environmental studies of the physical environment, such as the geology, sedimentary process, sea-bed ecology or marine archaeology assessments. As such, direct effects as assessed in an SVIA should focus predominantly on the coastline and landward components.

Indirect Effects

An indirect effect is an effect that is produced away from the site of the development, arising from consequential changes in the seascape that are located some distance away from the source of the effect. With offshore wind farms, the majority of the development is not on a landscape, so consideration should mainly be given to the indirect effects on the setting or perception of coastal landscapes (seascapes) as a result of offshore development.

Zone of Theoretical Visual Influence (ZTV)

A term used to describe the theoretical areas around a proposed development, up to a certain distance, over which it is visible, derived from computer modelling, using a digital terrain model.

Inter-visibility

The state of being able to see or be seen from one location to another.

Limit of Visual Significance

The distance in a zone of visual influence, beyond which visibility is assumed to be too feint to be significant. The reality of visual effects are that they tail off with increasing distance, due to atmospheric haze, the Earth's curvature, and the resolution of the human eye. A set distance is therefore only ever an approximate guide, and assumptions should not be made that moving a development from just inside "significance" to just outside "significance" would have a significant effect. A graduated limit of visual significance is often adopted to represent limits of "high", "moderate" and "low" levels of visual effects. At sea, where topography is flat, these limits would be perfect circles around point objects. From CCW guidance.

Cumulative Visual Impact

Cumulative visual effects occur where more than one source of effect is present. The combined visual effect may not be represented entirely by the sum of the individual visual effects. For example, each of 20 visual effects might not individually significantly alter people's attitudes, aspirations, values and uses of a place, whereas all 20 taken together might be significant. A useful approach in assessing offshore wind farms is to overlay the zones of visual influence and limits of visual significance for each development, and observe that where areas overlap, cumulative visual effects would occur. In addition, cumulative visual effects may occur as a series along a route, perhaps where two zones of visual influence overlap. These would need separate assessment, based on ferry routes, popular sailing or boating routes at sea, and main road or rail transport routes on land.

Magnitude of Change

This is the scale or degree of change to the seascape or visual resource, ranked or qualified with a series of levels, indicating a gradation from negligible to substantial. Different sets of criteria will be applicable to seascape and visual effects, and for different types of development. However in all cases the criteria should be clearly defined, simple, readily understood and applicable to the circumstances in which they area applied. The quantification of magnitude is generally based on the scale or degree of change, (through consideration of quantifiable factors such as the distance and extent of view occupied), plus the nature of the effect (whether adverse or beneficial) and its duration, including whether it is permanent or temporary. For example, a temporary change that is confined to a small area and visible from only a limited number/range of receptors, may be considered to be of slight magnitude.

(ref. Interpreted from The Landscape Institute with the Institute of Environmental Management and Assessment (2002). Guidelines for Landscape and Visual Impact Assessment)

Significance of Effects

Significance is a function of the sensitivity of the affected landscape/seascape and visual resources, and the magnitude of change that they will experience. Significance is not absolute and can only be defined in relation to each development and its location. The two principal criteria determining significance are the magnitude of effect and the sensitivity of the receptor. A higher level of significance is generally attached to larger-scale effects and effects on sensitive receptors, thus small effects on highly sensitive receptors can be more significant than large effects on less sensitive receptors. In England and Wales, a significant effect may be a material consideration for assessing the suitability of a planning application or consent application for a development.

(ref. Interpreted from The Landscape Institute with the Institute of Environmental Management and Assessment (2002). Guidelines for Landscape and Visual Impact Assessment)

Public Perception

A belief or opinion, often held by many people and based on appearances. The way the people as a whole understand, interpret or experience a new feature in a given seascape or particular view of the sea.

Acronym List

SVIA - Seascape and Visual Impact Assessment

GLVIA - Guidelines for Landscape and Visual Assessment

GSA - Guide to Best Practice in Seascape Assessment

SEA - Strategic Environmental Assessment

EIA - Environmental Impact Assessment

LCA - Landscape Character Assessment

ZTV - Zone of Theoretical Visual Influence

DTM - Digital Terrain Model

CCW - Countryside Council for Wales

SNH - Scottish Natural Heritage

CA - Countryside Agency

IALA - International Association of Marine Aids to Navigation and Lighthouse Authorities

MCA - Maritime and Coastguard Agency

DfT - Department for Transport

APPENDIX 4 - EXAMPLES OF ASSESSING SIGNIFICANCE

Box A1: Examples of assessing significance of effects of offshore wind farms on seascape character

Significant effect on seascape character

Lynn Offshore Wind Farm

Gibraltar Point Seascape Unit

This unit lies to the south of Skegness and forms the northern entrance to The Wash. Gibraltar Point is a dynamic and diverse unit consisting of freshwater marsh, salt marsh, sand dunes and beach. Much of the unit is designated for its nature conservation interest. The purpose behind this designation is to conserve the stretch of coastline and the flora and fauna that it supports. The area is popular with visitors and this is encouraged by the visitor centre and trails that transect the nature reserve.

Within the seascape unit, the nature of the landform and vegetation creates quite an intimate space, and long distance views are restricted. The exception to this is along the eastern edge of the dunes, foreshore and beach, where there are extensive views out across the North Sea and The Wash. The landscape quality is considered to be medium, and the natural heritage designations which apply relate to the diversity of the habitat within the seascape unit and flora and fauna that it supports rather than its landscape character or quality.

The sensitivity of the character unit to change out at sea is considered to be medium to high. To the west of the eastern sand dunes the character of the landscape is confined by the dunes and primarily concerned with the diversity of the habitat. However on the seaward side of the dunes, this sensitivity rises as the influence of the sea and the associated sea views make more of a contribution to the character.

This seascape unit consists of the area at the North West end of The Wash. There is a pronounced line of dunes running along the coast and extensive mud flats and salt marshes along the coastal edge. The rich and diverse habitat of the area supports an extensive range of flora and fauna and is a National Nature Reserve.

The proposed Lynn turbines will be located at a distance of over 5 km to the north north east of the area. Although the area supports a rich and varied habitat, it is considered to be of medium landscape quality, but medium to high sensitivity to change in relation to the extent to which the open expanse of sea contributes to the character of the seascape unit. The turbines will introduce a group of man made elements to the sea surface, at distances of over 5 km and will occur in views northwards along the coastal edge, extending seawards from the dunes. The magnitude of the change arising from the proposed offshore wind farm at Lynn is considered to be substantial at elevated locations on the dunes seaward and along the edge of the seascape unit. The effect on the seascape character of these parts of the unit to be major and represents a significant effect. Elsewhere at Gibraltar Point, the magnitude of change would be **moderate/slight** and the associated effect would be **moderate/minor**.

The Inner Dowsing turbines will be just over 7 km to the north east of the area, and the two offshore wind farms will introduce two groups of turbines to the sea surface. The magnitude of cumulative change at elevated parts of the dunes and along the coastal edge is considered to be substantial, and the cumulative effect on the seascape character of the coastal edge and elevated parts of the area will be major and represents a significant effect. For the upland parts of the Gibraltar Point seascape unit the magnitude of cumulative change will be **moderate/slight** and the effect will be **moderate/minor** and does not represent a significant effect.

Lynn Offshore Wind Farm Environmental Statement (AMEC)

Not significant effect on seascape character

Scarweather Sands Offshore Wind Farm

The Gower Seascape Unit

General extent - from Worms Head to Mumbles Head, a distance of approximately 25km.

Marine character - open, very few installations.

Coastal character - a series of bays, cliffs and headlands, with the distinctive rock islands of Worms Head and Mumbles Head. A narrow zone between the Lowest Astronomical Tide (LAT) and the edge of the inland plateau. Relatively broad intertidal zone in the bays and a very narrow intertidal zone around the base of cliffs. Coastline is generally undeveloped, with limited vehicular access to the coast but good pedestrian access via an extensive network of cliff-top footpaths, and the lighthouse at Mumbles Head.

Character of hinterland - a relatively narrow hinterland between the top of the cliffs/plateau edge and the high points on the inland plateau and a slightly wider hinterland in the lower lying land to the back of the two larger bays, Port-Eynon and Oxwich. Generally rural with limited development concentrated into a few settlements, mainly in bays, with scattered farmsteads, and a Coastguard station, Meteorological station, and radio masts at Tutt head.

Seascape quality - high

Assessment - The proposed offshore wind farm site will be located within the eastern visibility splay of the Gower seascape unit and will be visible from all of the marine zone. Views of the site will also be possible from the southeasterly facing slopes and bays, as illustrated by the existing and predicted views from Port-Eynon (Viewpoint 1, Figure 5.5a), Cefn Bryn (Viewpoint 2, Figure 5.5b) and Bracelet Bay (Viewpoint 3, Figure 5.5c), where the overall magnitude of change in the view is predicted to be moderate/slight (from the coastline nearest to the turbines) reducing to slight (from the coastline 20km+ from the viewpoint).

However, the offshore wind turbines will be 11km+ southeast of the coastline of this seascape unit and, as a result of the southwesterly orientation of parts of the coastline and hinterland slopes, the site will not be visible from a large proportion of the coastal and hinterland slopes, as illustrated by the ZTV in Figure 5.4a. For example, there will not be any views of the wind farm from Caswell Bay, from most of the coastal section from Pwlldu Head to Oxwich Bay, from the headland and cliffs to the east of Port-Eynon Bay and from Port-Eynon Point to Worms Head.

Although the wind farm will be visible from parts of this seascape unit, the turbines will be in the far east of the zone and sufficiently far away in these views for the magnitude of change to be moderate/slight or less. Also, the turbines will not be visible from much of the coastal and hinterland zones. As a result, the wind farm will not become one of the defining characteristics of this seascape unit nor will it raise or lower the quality of this unit. Therefore, the proposed offshore wind farm will not have a significant effect on the character of the Gower seascape unit.

Scarweather Sands Offshore Wind Farm EnvironmentalStatement, E-On (UK) Renewables

Box A2: Examples of assessing significance of effects of offshore wind farms on visual amenity

Significant effect on visual amenity

Robin Rigg Offshore Wind Farm

Viewpoint 9: Mote of Mark, Rockcliffe

The viewpoint is located at the high point of the Mote of Mark in Rockcliffe, at grid reference E284526 N554006. It is reached by a waymarked footpath from the car park in Rockcliffe. It is representative of views from a key archaeological site and visitor attraction in Rockcliffe. It does not represent views from the majority of the residential area at Rockcliffe which is more enclosed with views toward the proposed development contained by Barcloy Hill. The panoramic photograph, wireframe and photomontage show the existing and predicted views from Mote of Mark, Rockcliffe.

Existing view The existing view to the application site is long distance and panoramic. The view looking south east towards the proposed development is dominated in the foreground by the intertidal estuary, headlands and islands of the East Stewartry Coast seascape unit. The flat, patterned mudflats of the Rough Firth are distinctive and dynamic, changing the character of the view according to the tidal state. These contrast with the rolling coastal landform and headlands of Barcloy Hill, Castlehill Point and Almorness Peninsula, which enclose the Rough Firth and channel views out to sea. Islands at Rough Island and Hestan Island are also important elements in the view, and their relationship and connection with the landscape change with tidal state. Rocky shores and small sandy bays are present around the coastline. Landcover is dominated by pasture land, rough grazing and deciduous woodland, and varies between the more tended pasture land to the north on Barcloy Hill to the rough grazing, gorse and woodland on Almorness Peninsula. Residential properties and the camping/caravan site at Rockcliffe form the main built elements in the view, but a fort at Castlehill Point and a lighthouse on Hestan Island are also present. The photomontage in Figure 24 is part of a wider panoramic view which extends from Mark Hill round to the coastal uplands of Bengairn and Screel Hill on the landward side of the East Stewartry seascape unit.

Predicted view The wireframe indicates that 60 turbines will be visible offshore. Towers and rotor blades of all the turbines will be visible against a background of landscape on the Cumbrian coast to the north of the layout and sky to the south of the layout, however views of the Cumbrian coast will only occur in optimum visibility conditions. The view toward the proposed development has a variety of landscape elements and interest. It is also a dynamic view with ever changing tidal states, and relationships between mudflats, islands and headlands. The layout of the proposed offshore wind farm will be seen in relation to these features in the foreground and in relation to the backdrop of the Cumbrian coast. The northern end of the layout appears above Castlehill Point, and most of the turbines break the horizon of landscape on the Cumbrian coast. The layout is compact, with clear lines of turbines in the centre appearing to spread into a more evenly spaced array of turbines toward the edges of the array.

Magnitude of change The towers and rotors of 60 turbines will be visible from this location, with the closest visible turbine at a distance of 12.3km. The turbines cover a horizontal angle of 16.7º. The horizontal extent of the wind turbines has been minimised during the layout optimisation process. The view incorporates dynamic coastal features in the East Stewartry Coast NSA, so the turbines will change the viewers perspective of the peninsulas, bays and islands in the foreground and the turbines will also break the horizon of the Cumbrian coast in clear weather conditions. The associated magnitude of change is considered to be **moderate**.

Effects on landscape/seascape character and quality The viewpoint is located within the East Stewartry Coast seascape unit, which is of exceptional quality and high sensitivity to change. The key characteristics of this landscape type are its incised bays and estuary, prominent headlands, peninsulas, islands and mudflats. The irregular, indented coastline and varied landcover form a landscape of great diversity and it is also a working, inhabited and much visited area. The landscape and seascape of the area will be experienced in relation to the proposed development from areas where views of the sea are offered, which tend to be either suddenly revealed at the coast, raised areas of the surrounding hinterland or channelled along the orientation of the bay. The proposed offshore wind farm will introduce a group of man made turbines to the seascape, at the eastern side of the mouth of the Rough Firth. The effect of the proposed offshore wind farm on landscape character and quality is considered to be **major/moderate**.

Effects on visual amenity The viewpoint is representative of views for walkers and visitors using the footpath and visiting the Mote of Mark in Rockcliffe. The sensitivity of the viewpoint is therefore considered to be high as the receptors are likely to place a high value on the landscape and visit it specifically for its historical and archaeological value. The site bears evidence of human presence in the area since the 4th century AD and is managed by the National Trust for Scotland. The effect on visual amenity of the proposed offshore wind farm on the Mote of Mark viewpoint is considered to be major/moderate, which in the context of this assessment constitutes a significant effect.

Robin Rigg Offshore Wind Farm, Environmental Statement, E-On (UK) Renewables

Not significant effect on visual amenity

Norfolk Offshore Wind Farm

Viewpoint 1: Cley Eye, Cley next to the Sea

Viewpoint 1 is the most distant from the proposed wind farm with the distance to the nearest turbine being 21.5km. From this elevation (8m AOD) the turbines will be seen to sit just below the horizon. Calculations indicate that, due to the earth's curvature, the turbines will appear 2m shorter for every 5km of distance. Thus, at a distance of 21.5km from the nearest turbine, approximately 8.5m of the turbine will sit below the horizon line (i.e. a little less than 10% of the turbine column will be screened from view).

The turbines will occupy approximately a 16º sector of view. Looking due eastwards along the shingle ridge, the eye is drawn along the coastline which leads to the higher ground around Sheringham which, from this viewpoint, appears as a small promontory extending out to sea. The proposed wind farm will visually relate to this 'promontory'.

From the viewpoint to the north of the shingle ridge, an expansive 180º panorama is available. For those on the shingle beach views are very much orientated northwards over the sea. However, for those on the shingle ridge itself the available panorama is effectively 360º. The breadth of available views thus assists in reducing the perceived visual prominence of the proposed wind farm. From this viewpoint shipping can be seen further out to sea although the viewer has to specifically search the horizon for larger commercial vessels. The ease with which they can be detected however will vary greatly according to prevailing atmospheric and weather conditions at any one time. The same will certainly be true for the wind turbines which, individually, are substantially less bulky than shipping vessels.

Although the turbines will represent a new element within the available view, their simple vertical form will not sit uncomfortably with the broad horizontal characteristics of the view. Although the wind farm will be seen on the horizon line it is judged that it will share a comfortable relationship with the perceived distant promontory and the wind farm will not be overly conspicuous within the available panorama.

This view will be enjoyed by a range of visual receptors including visitors to the beach, anglers, hikers and users of the Peddars Way/North Norfolk coast path, naturalists and other day visitors to the area. Overall the magnitude of effect upon the visual environment of the proposed wind farm development is judged to be no more than Slight. Correlating the magnitude of effect against the baseline sensitivity, and allowing for the quality of the existing view, the net significance of effect is judged to be minor.

Norfolk Offshore Wind Farm, Environmental Statement, EDF Energy

Box A3: Summary of significant effects

Scarweather Sands Offshore Wind Farm **Summary of significant and non significant seascape and visual effects**		
Seascape		
Resource	**Significant effects**	**Non-significant effects**
Seascape character	Swansea Bay local seascape units (Margam and Kenfig Sands - Port Talbot Works to Sker Point, and Locks Common/Porthcawl - Sker Point to Porthcawl Point)	Swansea Bay local seascape units (The Mumbles - Mumbles Head to Clyne River, Swansea - Clyne River to River Tawe/Swansea docks, and Baglan Bay - River Tawe to Port Talbot docks). Plus the Gower, Glamorgan Coast, Exmoor East and Exmoor West seascape units
Landscape character	Margam Moors, Margam Mountains (coastal slopes only), Kenfig Burrows, and Porthcawl Hinterland (coastal zone only)	Port Talbot, Port Talbot Steel Works, Margam Slopes, Margam Mountains (overall), Porthcawl Hinterland (inland zone), Porthcawl, Merthyr Mawr Warren, Cornelly Plateau, Pyle and Kenfig Hill
Purposes of designated landscapes		Exmoor National Park, Gower AONB, Gower Heritage Coast, Glamorgan Heritage Coast and Exmoor Heritage Coast
Views from and purposes of registered historic landscapes	Views from parts of the Kenfig and Margam Burrows LOHI, e.g. from the beach (Kenfig Sands) and from high points on the dunes, and western facing slopes of the Margam Mountain LSHI, but not on the purposes of these registered historic landscapes	Views from and purposes of the West Gower and Cefn Bryn LOHI, and the Merthyr Mawr Warren LOHI Views from parts of the Kenfig and Margam Burrows LOHI, and the majority of the Margam Moutain LSHI
Visual		
Receptors	**Significant effects**	**Non-significant effects**
Residents	In properties along Locks Common and on Porthcawl seafront	In properties on The Mumbles, in Swansea, Neath, Baglan, Port Talbot, Pyle, most of Porthcawl, Bridgend and all the villages, farmsteads and individual properties on the Gower and Glamorgan coastlines
Visitors	On beaches at Margam Sands, Kenfig Sands and Rest Bay	On the country parks and all the other beaches around the coastline
Golfers	On the Royal Porthcawl golf course	On all the other golf courses in the study area
Road users	Between junctions 37 and 38 on the M4, and on Porthcawl seafront road	On most of the M4, all the A, B, minor and unclassified roads and most urban streets
Rail travellers		On the Bridgend to Neath line
Cyclists		On the Sustrans routes
Horseriders	On the local bridleway network around Kenfig	On the remainder of the local bridleway network in the study area
Walkers	On the local footpath around Kenfig and Sker Point	On the South West Coast Path, St Illyd's Way, Coed Morgannwg Way and Ogwr Ridgeway Walk, and the remainder of the local footpath network
Mariners and ferry passengers	On shipping and ferry routes into and out of Swansea Bay	
Fisherman, anglers, etc	On inshore waters in Swansea Bay	
Scarweather Sands Offshore Wind Farm, Environmental Statement, E-On (UK) Renewables		

APPENDIX 5 - LIST OF PROJECT CONSULTEES

(Includes all consultees issued a questionnaire in the initial consultation and consultation draft of the guidance)

NAME	COMPANY
Steering Group	
Angela Wratten	Department of Trade and Industry
Andrew Wharton	Countryside Agency
Georgia Markwell	Npower Renewables (on behalf of BWEA)
Jacky Martel	Countryside Agency
Jenny Simmonds	Scottish Natural Heritage
John Briggs	Countryside Council for Wales
Sarah Wood	Countryside Council for Wales
Victoria Copley	English Nature
Round 1 and 2 Developers	
Neil Birch	Npower Renewables
Steve Gopsill	E.ON (UK) Renewables
Peter Clibbon	GREP UK Marine Ltd
Jens Hansen	Centrica/DONG
Gareth Lewis	AMEC Wind Energy
Andy Bevington	Centrica
Jim Sandon	Renewable Energy Systems (RES) Ltd
Ian Johnson	E.on (UK) Renewables
Adrian Maddocks	Elsam
Anne-Marie Coyle	GE Gunfleet Ltd
Alex Tyler	EDF Energy (Cromer)
Eleri Owen	Offshore Wind Energy
Malcolm Garrity	Scottish Power/Cirrus Energy
Tony Scorer	EDF Energy (Northern Offshore Wind Ltd)
Ian Hatton	Ormonde Energy
Tim Proudler	E.ON (UK) Renewables
Richard Evans	Warwick Energy
Chris Hill	Airtricity
Alan Thompson	Centrica
Bernard van Hemert	Scira Offshore Energy Ltd
Paul Abbott	Total E&P UK PLC
Damian Aubrey	Wind Prospect Development Ltd
Gerry Jewson	West Coast Energy
Lorelei Line	Humber Wind Limited
Other offshore developers	
Jan Rusin	Talisman Energy (UK) Limited
Michael Harper	B9 Energy Offshore Developments

Consultants

Ian Phillips (Chair, Technical and Environment Committee)	Landscape Institute
Annie Coombs	TEP/Landscape Institute
Jeffrey Stevenson	Jeffrey Stevenson Associates
Jenny Wilson	RSK Environment
Kay Hawkins	E4environment Ltd
Lindsey Guthrie	SLR Consulting
Patrick Charlton	Environs Partnership
Phil Marsh	PDM Environmental Data Analysis
Rebecca Rylott	Entec UK Ltd
Susan Griffiths	Susan Griffiths Partnership
William Wheeler	LDA Design
Peter Veitch	Casella Stanger
Ed Frost	Royal Haskoning
David Bean	PMSS
Jeremy Sainsbury	Natural Power Consultants Ltd.
Sarah Dacre	BMT Cordah
Shelagh Brian	Scott Wilson
Corinna Demmar	RPS

Local Authorities

Alison Hogge	Aberdeenshire Council
Isabelle Davies	Angus Council
Phillip Harris	Dumfries and Galloway Council
Mark Dakeyne	Denbighshire County Council
Peter Warner, Planning Policy Officer	Great Yarmouth Borough Council
Colin Phillips, Development Control Manager	Barrow in Furness Borough Council
Dick Feasey, Development Planning Officer	Kent County Council
Martin Wakelin, Principal Landscape Planner	Essex County Council
Tim Venes	Norfolk County Council
Alun Owen, Director, Environment	Anglesey Council
Eifion Bowen, Head of Planning	Carmarthenshire County Council
Kim Flanders, Planning Policy and Appeals Manager	City and County of Swansea
Geoff White, Head of Planning Services	Neath and Port Talbot County Borough Council
Martin Hooker, Assistant Director of Planning Services	Bridgend County Borough Council
Rob Thomas, Head of Planning and Transportation,	The Vale of Glamorgan Council
John Rennilson	The Highland Council
Alistair Lorimer	Scottish Borders Council
Ian Glen	East Lothian Council
Stan Yates	Conwy
Mike Pender	Denbighshire
Huw Evans	Flintshire
Iwan Evans	Gwynedd

Other Regulatory Agencies

Sandra Close	Environment and Heritage Service
	The Planning Service (Northern Ireland)

Educational/Research Institutions

Dr Andy McLeod	University of Edinburgh
Maggie Roe	University of Newcastle

Stakeholders

David Barraclough	RTPI
Dr Gordon Edge	BWEA
Jason Ormiston	Scottish Renewables Forum
Duncan Glass	Trinity House Lighthouse Service
Joe Collins	Maritime and Coastguard Agency (MCA)
Dr Susie Tomson - Planning and Environment Officer	Royal Yachting Association
	Associated British Ports
Malcolm Gilbert	National Confederation of Sea Anglers (NFSA)
Alan Waton, Head of Land Use Planning or:	National Trust
Ben Dyson	National Trust
Rowena Langston	RSPB
The Secretary	Visit Britain
The Secretary	Ramblers Association
Jill Hachor	CPRE
Peter Ogden, Director	CPRW
	English Heritage
Miriam Mciver	Historic Scotland
Hugh Fogarty	RNLI
Archie J	Northern Lighthouse Board
R McCabe	Irish Lights
Nigel Adams	Welsh Tourist Board
Brian Barrows	Welsh Development Agency
Nic Wheeler, Chief Executive	Pembrokeshire Coast National Park Authority
Aneurin Phillips, Chief Executive	Snowdonia National Park Authority
Sian Rees	CADW
	Council for National Parks
Jill Smith	National Association of Areas of Outstanding Natural Beauty
Nicola Clay	Port of London Authority
Dr Madeleine Harvard	Wales Coastal and Marine Partnership
Stephen Midgeley, Coastal Project Officer	Scottish Coastal Forum
John Disley, CBE	The Snowdonia Society
Malcolm Ridge, Chairman	The Gower Society
The Secretary	The Friends of Pembrokeshire National Park

The Secretary	Friends of the Glamorgan Heritage Coast
Richard Luxmoore	National Trust For Scotland
Brian Irving	Solway Coast AONB
Paul Esrich	Suffolk Coast & Heaths Unit
Douglas Beveridge	NFFO (Fishing)
Mark Russell	BMAPA (Marine aggregates)
Tony Hall	British Shipping
David Shepherd	RNLI (Search and Rescue)
Dr Carolyn Heeps	Crown Estates
Zoe Crutchfield	JNCC

Government

Richard Bellingham	Scottish Executive
Lesley Thomson	Scottish Executive
Andrew Adcock	Welsh Assembly
Christopher Morgan	Welsh Assembly (Planning)
Lynn Griffiths	Welsh Assembly
Ron Loveland	Welsh Assembly (Office of Chief Technology)
Jill Thomas	Welsh Assembly (Countryside Division)
David Stanley (Head of Renewable Energy)	Department of Enterprise, Trade and Investment (Northern Ireland)
Neil Stewart	Scottish Executive (Energy Division - Policy)
Ben Maguire	Scottish Executive (Enery Division - Consents)
Nick Evans	Scottish Executive (Planning)
Sally Thomas	Scottish Executive (Countryside and Natural Heritage)

Government Research Advisory Group members

Philip Bloor	DTI
Carolyn Heeps	Crown Estate
Colin Brown	
Jennifer Hauser	DEFRA
John Hartley	Hartley Anderson
John Mairs	DFT
John Maslin	DEFRA
Paul Leonard	DEFRA
Quentin Huggett	Geotek
Richard Hulme	DFT
Roberts Caroline	DTI
Gary Spencer	DTI
Sue Reed	DEFRA
Ollie Whitehead	DTI

APPENDIX 6 - REFERENCES, FURTHER READING AND LINKS

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