



Galloper Wind Farm Project
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4 EIA PROCESS

4.1 Introduction

4.1.1 The purpose of Environmental Impact Assessment (EIA) is to provide, through drawing a wide range of information together in a systematic way, an independent assessment of a project's likely environmental impacts. This Chapter of the Environmental Statement (ES) outlines the statutory requirement for the EIA, provides detail on other influencing Directives, and sets out the project's approach to undertaking the EIA.

4.2 Requirement for EIA

4.2.1 The proposed Galloper Wind Farm (GWF) project is an offshore wind farm development over 100MW in capacity and is therefore considered a Nationally Significant Infrastructure Project (NSIP) in accordance with The Planning Act 2008 (see **Chapter 3 Legislative and Planning Context**).

4.2.2 Under the Planning Act 2008, the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 No. 2263 apply. These Regulations transpose the EIA requirements of the EU Directive (EIA Directive) 85/337/EEC, as amended by Directive 97/11/EC and Directive 2003/35/EC.

4.2.3 As an offshore wind farm development, the proposed GWF project is considered under Schedule 2 of the EIA Regulations as 'industrial (energy) installations for the production of electricity, steam and hot water (projects not included in Schedule I)' and Annex II of the EIA Directive, as 'installations for the harnessing of wind power for energy production (wind farms)'. Schedule 2 NSIPs require an EIA where they are likely to have significant impact on the environment by virtue of factors such as their nature, size or location.

4.2.4 Galloper Wind Farm Limited (GWFL) considers it appropriate to carry out an EIA for the proposed GWF project. With respect to the EIA Regulations, GWFL has advised the IPC of its intention to submit an ES and therefore the IPC has confirmed that the project is considered EIA development under Reg 6(1)(b). The project EIA will also include the grid connection to shore, and the new onshore grid infrastructure. The onshore works includes six new 'downlines' which connect two Sealing End Compounds to the extended arms of two existing 400kV pylon on the route to the Sizewell nuclear facility (see **Chapter 1 Introduction** and **Chapter 5 Project Details**). As the application will be submitted on the basis that it includes two NSIPs, the same description under Schedule 2 of the EIA Regulations applies.

4.3 EIA Guidance

4.3.1 The EIA has been carried out in accordance with the EIA Regulations 2009 and the EU Directive 85/377/EEC as amended. This ES, as the reporting mechanism for the EIA, has been prepared in accordance with the following key guidance:

- Overarching National Policy Statement (NPS) for Energy EN-1;
- NPS for Renewable Energy Infrastructure EN-3, and NPS for Electricity Networks Infrastructure EN-5;
- Guidance issued by Communities and Local Government (CLG) – Planning Act 2008: Nationally Significant Infrastructure Projects Application Form Guidance (September 2009);
- Infrastructure Planning Commission (IPC) Guidance Note 1 – On pre-application stages (Chapter 2 of the Planning Act 2008) (August, 2011);
- IPC Advice Note 6 - Preparation and submission of application documents;
- IPC Advice Note 9 – Rochdale Envelope;
- IPC Advice Note 10 – Habitats Regulations Assessment;
- IPC Advice Note 12 – Development with significant transboundary impacts consultation;
- Advice Note 13 – Preparation of a draft order granting development consent and explanatory memorandum;
- Department of Energy and Climate Change (DECC) (formerly the Department of Trade and Industry (DTI)) Guidance Note ‘Offshore Wind Farm Consents Process’ (DTI, 2004);
- Cefas guidance note for Environmental Impact Assessment in respect of Food and Environment Protection Act 1985 (FEPA) and Coast Protection Act 1949 (CPA) requirements (2004);
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects. Draft for Consultation (Cefas, 2011);
- Nature conservation guidance on offshore wind farm development (Department of Environment Food and Rural Affairs, 2005);
- The Conservation of Habitats and Species Regulations 2010;
- The Wildlife and Countryside Act 1981;
- The Offshore Marine Conservation (Natural Habitats, &c.) (Amendment) Regulations 2010;
- Developing guidance on ornithological cumulative impact assessment for offshore wind farm developers. COWRIE CIBIRD Stage 2 (King *et al.*, 2009);
- A Review of Assessment Methodologies for Offshore Wind Farms COWRIE METH-08-08 (Maclean *et al.*, 2009);
- Institute of Ecology and Environmental Management (2006) Guidelines for Ecological Impact Assessment in the United Kingdom (version 7 July 2006). <http://www.ieem.org.uk/ecia/index.html>;

- Institute of Ecology and Environmental Management Draft guidelines for marine Ecological Impact Assessment – 2010; and
- Institute of Environmental Management & Assessment, 2004. Guidelines for Environmental Impact Assessment. IEMA, Lincoln (www.iema.net).

Strategic Environmental Assessment context

- 4.3.2 Strategic Environmental Assessment (SEA) is required under the EC SEA Directive (2001/42/EC) and is enacted in England under The Environmental Assessment of Plans and Programmes Regulations 2004. The SEA's purpose is to provide consideration of the environmental implications of a draft plan or programme (encompassing public and stakeholder consultation), in order to inform Government's decision making process on the plan / programme.
- 4.3.3 The Crown Estate's Round 2.5 leasing programme has not had a specific energy generation target or spatial extent assigned and therefore has not had a dedicated SEA undertaken for it. There are however two existing SEAs that can be drawn upon for informing the Round 2.5 projects; these being the Round 2 SEA (2003) and the Offshore Energy SEA (2008/2009). The Offshore Energy SEA was undertaken with a view to enabling further rounds of offshore wind farm leasing in the UK Renewable Energy Zone (outside 12 nautical miles) and the territorial waters of England and Wales (within 12 nautical miles of the coast), with the objective of achieving some 25GW of additional generation capacity by 2020¹.
- 4.3.4 The EIA for GWF has given due consideration to the context of the project in light of the Offshore Energy SEA, as well as taking into account any pertinent findings from the Round 2 SEA. For example, the recommendations from the Offshore Energy SEA summarises that offshore wind farm developments should not:
- Impinge on major commercial navigation routes, significantly increase collision risk or cause appreciably longer transit times;
 - Interfere with civilian aviation including radar systems;
 - Jeopardise national security for example through interference with radar systems or significant reductions in training areas; or
 - Result in significant detriment to tourism, recreation and quality of life (DECC, 2009).
- 4.3.5 The context of the project in relation to the relevant SEAs is provided within the specific parameter Chapters.

¹ www.decc.gov.uk

4.4 The EIA Process

4.4.1 EIA is an iterative tool for systematically examining and assessing the impacts and effects of the construction, operation and decommissioning phases of a development on the environment.

4.4.2 The formal reporting mechanism for an EIA is the ES and in accordance with Schedule 4, Part 2 of the EIA Regulations it is required to contain the following information as a minimum:

- A description of the development comprising information on the site, design and size of the development;
- An outline of the main alternatives studied by the applicant and an indication of the main reasons for the applicant's choice, taking into account the environmental effects;
- The data required to identify and assess the main effects, which the development is likely to have on the environment;
- A description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects; and
- A non-technical summary (NTS) of the information provided.

4.4.3 The following stages typically occur during an EIA:

- Screening – determining whether a development needs an EIA;
- Scoping – determining the issues that the EIA should address;
- Ongoing formal non-statutory consultation, i.e. outside periods of statutory consultation;
- Original data collection and surveys where necessary to fill data gaps;
- Impact identification and evaluation;
- Identification of mitigation and residual impacts;
- Identification of monitoring requirements;
- Under the IPC regime, submission of Preliminary Environmental Information to the relevant statutory stakeholders as part of the consultation required under Section 42 of the Act (and made available to the community under Section 47);
- Liaison to resolve matters arising from representation on the Preliminary Environmental Information;
- Completion of ES and submission of application;

Statutory screening and scoping opinions

4.4.4 An Environmental Scoping Study (GWFL, 2010) was produced and submitted to the IPC in July 2010. The formal Scoping Opinion, received in

August 2010, identified the following potential issues which have been considered within this ES:

- The degree of flexibility in the proposal (the Rochdale Envelope, see **Section 4.5**) and ability to assess the potential impacts of the proposal;
- The need for up to date baseline and survey information;
- The need to describe the impact assessment methodology, use of legislation and guidelines or best practice, and to explain how the significance of any impacts will be described or assessed;
- The need to identify the physical scope of the assessment and that this is sufficient to enable consideration of the potential impacts;
- Safety and navigation impacts;
- Nature conservation impacts;
- Cumulative impacts both on and offshore, including GWF, GGOWF and Sizewell Power Station proposals;
- Substations and grid connection works;
- The need to consider the assessment as a whole and not as a series of unconnected specialist reports; and
- Consideration of alternatives particularly for the substation proposals.

4.4.5 A copy of the full Scoping Opinion (IPC, 2010) is available on the project website at <http://www.gallopwindfarm.com/consultation.php>.

Section 42 and 47 consultation

4.4.6 Section 42 of the Planning Act details the developers' duty to consult with Local Authorities (outlined further in Section 43 of the Planning Act), prescribed bodies and those persons with an interest in the land (outlined further in Section 44 of the Planning Act). Pre-application consultation guidance (published by Department for Communities and Local Government (DCLG), 2009) states that the consultation documents (which will normally also be the Preliminary Environmental Information (PEI)) used during the statutory consultation should contain sufficient detail for consultees to provide an assessment of the likely impacts.

4.4.7 Section 47 of the 2008 Act details the duty to consult with the local community, and gives specific details on how, and with whom, this consultation should take place. A Statement of Community Consultation (SoCC) was consulted upon in May 2011 and published in June 2011 to map out the approach to Section 47 consultation (see **Chapter 7 Consultation**).

4.4.8 A Preliminary Environmental Report (PER) was prepared that detailed the PEI. The PER was then used to inform both Section 42 and 47 stakeholders about the proposed development and to provide an opportunity to be involved with, and to feed into, the ongoing EIA process.

- 4.4.9 The formal consultation process was undertaken between June and July 2011, adopting an approach where Section 42, 47 and 48 consultations under the Planning Act were aligned. The responses from this formal consultation have influenced the final design of the project and have been incorporated, where relevant, within this ES. Full details of the consultation responses received during this process, and how they influenced the project are provided within the Consultation Report. The comments which related to the EIA are summarised in a table in each relevant topic Chapter of the ES. Each table indicates how the ES has addressed the issues raised.

Original data collection and surveys

- 4.4.10 Specialist studies and site surveys have been undertaken to inform the EIA; the approaches and details of which have been agreed through the consultation process (see **Chapter 7** for details). Further detailed information on the specific studies undertaken is provided within each relevant Chapter of the ES.

4.5 The Rochdale Envelope principle

- 4.5.1 GWFL has adopted the established principle of the Rochdale Envelope for the purpose of preserving essential flexibility within some major elements of the project. This principle applies a “worst case” approach to the assessment of the different impacts associated with the GWF project, as established through relevant case law (*R. v Rochdale MBC ex parte Milne* (No. 1) and *R. v Rochdale MBC ex parte Tew* [1999] and *R. v Rochdale MBC ex parte Milne* (No. 2) [2000]). These case precedents have established a custom and practice that has evolved in relation to projects where the final design is not available at the consent application stage. This approach has been confirmed by the courts as enabling the legal requirements of the relevant EIA regulations to be complied with, so long as appropriate conditions are placed in the resulting consents to ensure that the ‘worst case’ likely impacts will not be exceeded by the final built development, and will not give rise to a likely significant effect on the environment which has not been assessed.
- 4.5.2 The IPC has produced an advice note on the use of the Rochdale Envelope, which seeks to address potential implications of using this methodology on NSIP projects (IPC, 2011). The advice note outlines the key areas where the level of detail needs to be addressed and provides guidance on how to approach these appropriately.
- 4.5.3 The need for the flexibility in the project is explained in the Explanatory Memorandum, which accompanies and explains the terms of the DCO. This addresses the issue in general terms as well as explaining the reasons for each of the main elements of flexibility within the project details. A summary of the prime drivers for flexibility is as follows:
- The ability to optimise projects in both design and economic terms to ensure that schemes are sufficiently attractive to investors to secure

the significant capital that is required to bring projects through to delivery;

- To allow for detailed design to be refined in the project procurement phase, notably taking into account the evolution of foundation and WTG technology available and variety of installation techniques;
- An essential need to maintain competitive market behaviour in the supply chain without prejudicing legal procurement rules.

4.5.4 The need for optimisation contains two important dependent requirements:

- The ability to avoid fundamental supply chain constraints that could prevent delivery; and
- The ability to maximise 'energy capture', i.e. megawatt-hours over a given period as opposed to total megawatts installed.

4.5.5 The flexibility included within the DCO for the GWF project will only be lawful in EIA terms if it is clearly defined and controlled in the DCO, and the project variations permitted (which are large offshore, but limited and entirely unremarkable onshore) have been properly understood and assessed. The control in the DCO takes the form of limits in the project description (e.g. maximum total MW of the project), and requirements (i.e. conditions) which set the parameters of specific features of the project (e.g. maximum height of each blade tip above LAT). For the offshore elements of the project, these controls are, deliberately, repeated in the deemed marine licence. This licence also contains a further level of control, where a variety of detailed approvals must be obtained from the MMO before the offshore works may commence. For the onshore elements of the scheme, a variety of detailed approvals must be obtained from the local planning authority (Suffolk Coastal District Council) before the onshore works can commence.

4.5.6 To demonstrate the care and thoroughness with which the flexibility in the DCO has been assessed in the EIA, Chapter 5 Project Details reproduces in a series of tables the key limitations and parameters within the DCO and marine licence and explains the flexibility which the relevant parameters allow. In addition, the tables contain comments as to what is most likely in practice, though the EIA has taken into account the full range of variations, not just the most likely ones.

4.5.7 This provides the foundation for ensuring that the ES has been undertaken in line with the requirements of the EIA Regulations (Schedule 4, Part 1, 19).

4.5.8 With this thorough understanding of the development envelope which needs to be assessed, GWFL has given careful consideration to all potential impacts that may result from the proposed GWF development, for each parameter, and ensured that the assessment made for each potential impact is reflective of the realistic worst case scenario for the specific parameter under investigation. An assessment of the "realistic worst case scenario" in

this ES is to be regarded as the same as the assessment of the "maximum potential adverse impact", which is the terminology used in EN-1 and EN-5.

- 4.5.9 Where relevant, the definition of what is considered the realistic worst case scenario, and why, is detailed within each technical Chapter throughout this ES document.
- 4.5.10 Where necessary the specification of the realistic worst case scenario for a particular parameter has been backed up by a dedicated study. For example, to determine the worst case effect on wave and tidal regimes, sensitivity modelling was carried out on the different foundation types and development scenarios (see **Chapter 9 Physical Environment**). Furthermore, for certain parameters a different worst case development scenario may exist for individual impacts (taking fish and shellfish resource as an example, the worst case scenario for disturbance from noise is different to that from loss of habitat). Where this is the case, the scenario used within the assessment and appropriate justification has been clearly defined within the technical Chapter.
- 4.5.11 Adopting this thorough approach has ensured that the development permutations which have not been expressly assessed could not give rise to a significant environmental impact above that which has already been assessed. Furthermore, it allows the assessment to remain concise and focused on the realistic worst case scenario (and therefore, likely significant impacts) whilst avoiding unnecessary duplication of assessment effort.
- 4.5.12 GWFL has been mindful of the need to assess potential impacts in holistic terms throughout the EIA. The assessment has ensured that no likely significant effect has been overlooked by focussing unduly on any one parameter at a given time. This has been an integral part of the identification of the realistic worst case or cases which have been assessed in the ES, and is addressed in each topic specific chapter. In addition, potential inter-relationships between multiple identified impacts, from different aspects, to a given receptor have also been considered within each topic chapter and are discussed in **Chapter 29 Inter-relationships**.
- 4.5.13 Whilst more detailed in this instance, the Rochdale Envelope approach is in line with all previous UK offshore wind farm projects and has been routinely accepted by DECC (including its predecessors) and statutory consultees, including statutory nature conservation bodies (SNCB). Furthermore, the resulting Round 2 Food and Environment Act (1985) (FEPA) consents have included substantial flexibility on design parameters under a 'worst case' approach. For example, the GGOWF application, and subsequent FEPA consent, comprised the following level of flexibility (Marine and Fisheries Agency (MFA), 2007):
- Overall project area of approximately 147km²;
 - Up to 140 turbines;

- Turbines rated capacity in the range of 3 to 7MW;
- Maximum tip height 170m;
- Nominal hub height of 105m and 130m rotor diameter;
- Air gap between turbine blade and MHWS will be not less than 22m;
- Distance between turbines and between rows of turbines shall not be less than 650m;
- The following types of foundations may be installed: monopile, concrete gravity foundation, tripod;
- Up to 5 met masts (nominal height of 105m, steel monopile diameter approximately 2.5m and length approximately 70m, up to 30m driven into seabed);
- Up to 4 offshore substations (typical dimensions in the order of 30m length 20m width 15m height, total height up to 40m) and inter-array cables;
- Up to 4 subsea export cables (ploughing or jetting, up to 10 cables will cross the Inner Gabbard and The Galloper sand banks);
- Inter array cables will use a typical voltage of 33kV and cables connecting OSP are likely to be 132kV; and
- Cables likely to be buried using a combination of ploughing and jetting using ROV, may be installed from barge or jack up either beached or moored near Sizewell Beach. Near shore and deep water lay may be separate operations.

4.5.14 While GWF must be considered in its own right, and under new legislation, it is notable nevertheless that the level of flexibility sought for GWF, as explained in **Chapter 5 Project Details** is in line with that deemed acceptable and granted for the adjacent GGOWF project.

Impact identification and evaluation

4.5.15 The identification and evaluation of impacts has been carried out via a number of methods and techniques, which include data collation and literature review, consultation, reference to relevant guidance and standards, original data collection and analysis including multivariate analysis and computer modelling, as well as experience of similar developments, including the neighbouring GGOWF site. This EIA is designed to evaluate potential changes to the existing environment, both positive and negative, as a result of activities associated with construction, operation and decommissioning of the GWF project.

4.5.16 The impact methodology follows standard terminology, with documentation to support the assessment. However, flexibility is retained for individual receptors. Details of the assessment methodology and data sources used are provided for each parameter in the relevant section.

4.5.17 Central to the assessment approach to be used is the conceptual ‘source-pathway-receptor’ model. The model identifies potential impacts resulting from the proposed activities on the environment and sensitive receptors within it. The approach is transparent, guides assessors through the linkages between the sources of impacts and the routes through the environment to potentially sensitive receptors. The parameters of this model are defined as follows:

- Source – the origin of a potential impact (i.e. an activity such as cable installation and a resultant effect e.g. re-suspension of sediments). This element of the model also corresponds to the ‘magnitude’ factor of the potential impact described later;
- Pathway – the means by which the effect of the activity could impact a receptor (e.g. for the example above, re-suspended sediment could smother sessile benthos). This element of the model also corresponds to the ‘sensitivity’ described later; and
- Receptor – the element of the receiving environment that is impacted (this could either be a component of the physical, ecological or human environment such as water quality or marine mammals). This element of the model also corresponds to the ‘value’ described later.

4.5.18 Each impact assessment section of each chapter uses this source-pathway-receptor principle when considering the potential impacts arising during the construction, operation and decommissioning stages of the project.

4.5.19 It is important to distinguish between the terms ‘effects’ and ‘impacts’ as they are often used interchangeably to mean similar things:

- Effects are the physical changes in the environment that result from a particular project aspect (e.g. cable installation), these are usually measurable (e.g. in time, space, volume, weight or length) and include a range of physical changes to the environment (e.g. increased turbidity, noise, changes in wave conditions, removal of habitats); and
- Impacts are the potential changes in existing conditions of sensitive receptors in the physical, ecological or human environment as a result of an effect.

4.5.20 Therefore, whilst the EIA Regulations use the term ‘effects’ throughout to describe changes to existing conditions, this ES uses the term ‘impacts’.

4.5.21 Impacts can be classified in the following ways:

- Direct impacts: these arise from aspects associated with the construction, operation or decommissioning of the proposed development (e.g. the loss of species within the footprint of cable installation);
- Indirect impacts: these are a result of direct impacts and may be experienced by a receptor that is removed (in space or time) from the direct impact (e.g. smothering of species due to the settlement of re-suspended sediments); and
- Cumulative impacts (see **Section 4.7**), which can include:
 - ‘within project’ impacts that are likely to result from the different aspects of the proposed GWF project;
 - the impacts likely to result from the proposed GWF project and other developments; and
 - the impacts from other projects and activities that have been or will be carried out in the foreseeable future with sufficient certainty or understanding to assess.

Significance levels

4.5.22 A number of criteria have been utilised to determine the significance of the environmental impact(s) identified. These include:

- Magnitude of the impact (a function of spatial extent, impact duration, impact reversibility and impact likelihood);
 - Spatial extent of the impact (small scale/large scale);
 - Duration of the impact (short term/long term);
 - Reversibility of the impact (including species or habitat recoverability); and
 - Likelihood of occurrence of the impact (with an explanation of how likelihood has been assessed);
- Sensitivity and level of tolerance of the receptor or species;
- Conservation or protected status of the receptor or species;
- Confidence in the impact prediction; and
- The margins by which set values are exceeded.

4.5.23 Of these criteria, the sensitivity of the receptor and the magnitude of the impact are the most important measures. The definition of sensitivity and magnitude varies depending upon the parameter under question, and therefore these will be defined in detail within each relevant parameter section of the EIA.

Receptor value and sensitivity

- 4.5.24 Within the impact assessment the receptor's sensitivity is identified, from negligible to very high. For some aspects a generic approach will be applicable, which is based on the following hierarchy recommended by the Institute of Ecology and Environmental Management (IEEM) with respect to ecological parameters:
- International;
 - UK;
 - National;
 - Regional;
 - County (or metropolitan, e.g. London);
 - District (or unitary authority, city, or borough);
 - Local or parish; and
 - Within zone of influence only (which might be the project site or a larger area).
- 4.5.25 The sensitivity of the receptor is a function of its capacity to accommodate the proposed form of change and would reflect its capacity to recover if it is affected. In order to help define the degree of a receptors' value and sensitivity, the following guidance presented in **Table 4.2** have been adopted for the purposes of the EIA.
- 4.5.26 The classification provided within **Table 4.2** (or the technical parameter specific value/sensitivity criteria described in the relevant section) cannot cater for all possible permutations of value and sensitivity for features or receptors, and professional judgment will be applied to the specific subject concerned.

Table 4.2 Definition of terms relating to the sensitivity and value of generic receptors

Value / Sensitivity	Definition
Very high	Value: Very high importance and rarity, international scale and very limited potential for substitution. Sensitivity: Feature / receptor has no capacity to accommodate the proposed form of change.
High	Value: High importance and rarity, national scale, and limited potential for substitution. Sensitivity: Feature / receptor has a very low capacity to accommodate the proposed form of change.
Medium	Value: High or medium importance and rarity, regional scale, limited potential for substitution. Sensitivity: Feature / receptor has a low capacity to accommodate the proposed form of change.
Low	Value: Low or medium importance and rarity, local scale. Sensitivity: Feature / receptor has some tolerance to accommodate the proposed change.
Negligible	Value: Very low importance and rarity, local scale. Sensitivity: Feature / receptor is generally tolerant and can accommodate the proposed change.

Impact magnitude

4.5.27 The impact assessment also defines the magnitude of the effect, from no change to high. Magnitude refers to the 'size' or 'amount' of an impact. It is a function of other aspects such as impact:

- Extent (i.e. the area over which the impact occurs);
- Duration (i.e. the time for which the impact is expected to last prior to recovery or replacement of the resource or feature);
- Likelihood (i.e. the chance that the impact will occur); and
- Reversibility (i.e. an irreversible (permanent) impact is one from which recovery is not possible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it).

4.5.28 In order to help define the level of impact magnitude, the following guidance (**Table 4.3**) has been used for the EIA.

Table 4.3 Definition of terms relating to the magnitude of an effect

Magnitude	Definition
High	<p>Very significant, permanent / irreversible changes, over the whole feature / asset, and / or significant alteration to key characteristics or features of the particular environmental aspect's character or distinctiveness.</p> <p>Impact certain or likely to occur.</p>
Medium	<p>Significant, permanent / irreversible changes, over the majority of the feature / asset, and / or noticeable alteration to key characteristics or features of the particular environmental aspect's character or distinctiveness.</p> <p>Impact certain or likely to occur.</p>
Low	<p>Noticeable, temporary (during the project duration) change, over a minority of the feature / asset, and / or limited but noticeable alteration to key characteristics or features of the particular environmental aspect's character or distinctiveness.</p> <p>Impact will possibly occur.</p>
Negligible	<p>Noticeable, temporary (for part of the project duration) change, or barely discernible change for any length of time, over a small area of the feature or asset, and/or slight alteration to key characteristics or features of the particular environmental aspect's character or distinctiveness.</p> <p>Impact unlikely or rarely to occur.</p>
No change	<p>No loss of extent or alteration to characteristics, features or elements.</p>

Impact significance

4.5.29 Following the identification of receptor value and sensitivity and magnitude of the effect, it is possible to calculate the significance of the impact following the Impact Assessment Matrix (IAM) in **Table 4.4**.

4.5.30 In addition, it is also important to understand that impacts can be positive as well as negative, for instance a development may result in positive outcomes for biodiversity.

Table 4.4 Significance of an impact resulting from each combination of receptor sensitivity and the magnitude of the effect upon it

Value / Sensitivity	Magnitude				
	High	Medium	Low	Negligible	No Change
Very High	Severe	Major	Moderate	Minor	No Change
High	Major	Moderate	Minor	Minor	No Change
Medium	Moderate	Minor	Minor	Negligible	No Change
Low	Minor	Minor	Negligible	Negligible	No Change
Negligible	Minor	Negligible	Negligible	No Change	No Change

Note: Shaded cells (red to yellow) indicate impacts of some or serious concern

4.5.31 The significance of the impact(s) identified can then be defined according to the terminology in **Table 4.5**. This methodology provides a consistent framework for considering and evaluating impacts.

Table 4.5 Terminology for classifying environmental impact

Impact Significance	Definition
Severe	An impact on an internationally, nationally or regionally important site / asset that will be affected through loss of all or a majority of the site or specific features / elements that are fundamental to its importance. Only adverse impacts are normally assigned this level of significance, and they represent key factors in the decision making process.
Major	Very large or large change in site / asset conditions, both adverse and beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or, could result in exceedence of statutory objectives and / or breaches of legislation.
Moderate	Intermediate change in site / asset conditions, which are likely to be important considerations at a local level.
Minor	Small change in site / asset conditions, which may be raised as local issues but are unlikely to be important in the decision making process.
No Change	No discernable change in site/asset conditions, and is likely to have negligible or no influence, irrespective of other effects.

- 4.5.32 For parameters where the method of assessment necessitates a change in terminology, then the terminology has been described in the relevant section.

Mitigation and residual impacts

- 4.5.33 Within this ES, mitigation measures (i.e. means by which impacts might be removed, reduced or managed) are provided where potentially significant adverse impacts have been identified (i.e. minor, moderate or major). The mitigation might be part of the design or as a measure implemented during the construction, operation or decommissioning phases. It is also noted that, as part of best practice with regard to the development of GWF, mitigation may be considered by GWFL for certain impacts considered of lesser significance.
- 4.5.34 Each impact assessment section then assigns a final significance level (or residual impact) to the impact described, which takes into account the implementation of any stated mitigation measures.
- 4.5.35 Agreed mitigation will form part of the Requirements attached to the DCO for construction and operation of GWF. GWFL have been working with various Regulatory Authorities to develop mitigation proposals prior to this ES submission.

Monitoring

- 4.5.36 Monitoring is necessary where the verification of predicted impacts (and the success of implemented mitigation measures) is required, particularly where levels of uncertainty are identified within this ES. Monitoring programmes are most commonly required during and for a period after construction, but can also be utilised prior to and during operations, dependent on the nature of the impact or mitigation measure under inspection.
- 4.5.37 GWFL anticipates that requirements for pre-, during and post-construction monitoring of GWF will form part of the requirements attached to any future licences required for construction and operation of the wind farm and will work with the Regulatory Authorities in developing an appropriate monitoring campaign.

4.6 Inter-relationships

- 4.6.1 In accordance with IPC scoping advice, the EIA includes an assessment of the inter-relationships of the project (see **Chapter 29 Assessment of Inter-relationships**). The assessment has been undertaken through an analysis of the potential inter-relationships between multiple impacts, from different aspects, to a single receptor. The assessment considers the project lifecycle from construction, through operation to decommissioning, to ensure a robust and holistic impact assessment for each principal receptor (as defined in the Council Directive 85/337/EEC of 27 June 1985 (the EIA Directive)).

4.7 Cumulative Impacts

4.7.1 Cumulative impacts are considered for all phases of the development. This assessment identifies, describes and evaluates:

- The cumulative impacts that are likely to result from the proposed GWF project and GGOWF, as well as other offshore wind farm projects; and
- The cumulative impacts with other projects and activities (such as, aggregate extraction, dredging and disposal of dredged material, shipping, commercial fishing, oil and gas exploration and production as well as coastal and onshore development projects) that have been or will be carried out in the foreseeable future.

4.7.2 In accordance with the cumulative impact discussion within IPC Note 9 (IPC, 2011), and recent advice from the IPC (Appendix 3 of IPC, 2010), other major development in the area will be identified beyond the proposal itself including any associated development. Developments have been identified through consultation with relevant planning authorities and resources on the basis of major developments that are:

- Built and operational projects;
- Projects under construction;
- Ongoing activities (e.g. discharge consents, fisheries) – these may or may not require formal consent;
- Permitted application(s), but not yet implemented;
- Submitted application(s) not yet determined;
- Projects on the IPC's Programme of Projects;
- Projects identified in the relevant Development Plan (and emerging Development Plans - with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited; and
- Projects identified in other plans and programmes (as appropriate) which set the framework for future development consents / approvals, where such development is reasonable likely to come forward.

4.7.3 It is important to note that for the purposes of the EIA, the level of assessment made for 'future projects' has been greatly influenced by, and reflective of, the level of information available on such projects at the time of compilation of this ES. In decision making terms, there is, of course, an important distinction between projects which are operational, under construction or fully consented and those which – at the point of determination – do not have consent. This question is outside the scope of this ES.

4.7.4 Each topic chapter contains a section which identifies the projects which are relevant on a cumulative basis and an assessment of the relevant cumulative impact.

4.8 Habitat Regulations Assessment

4.8.1 EU Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Flora and Fauna (the 'Habitats Directive') provides legal protection for habitats and species of European importance. Article 2 of the Directive requires the maintenance or restoration of habitats and species of interest to the EU in a favourable condition. This is implemented through a network of protected areas referred to as Natura 2000 sites. Natura 2000 sites comprise both Special Areas of Conservation (SAC) and Special Protection Areas (SPA).

4.8.2 Under The Conservation of Habitats and Species Regulations 2010 the competent authority (presently the IPC) must consider whether a plan or project has the potential to have an adverse effect on the integrity of a Natura 2000 site (including candidate and proposed sites). This process is known as Habitat Regulations Assessment (HRA). Under Regulation 61 of the Conservation of Habitats and Species Regulations 2010, 'Appropriate Assessment' (stage two of the HRA) is required for a plan or project, which either alone or in combination with other plans or projects, is likely to have a significant effect on a European site and is not directly connected with or necessary for the management of the site.

4.8.3 HRA is a four stage process (Defra, 2010):

- Stage 1: Screening is the process which initially identifies the likely impacts upon a European Site of a project or plan, either alone or in combination with other projects or plans, and considers whether these impacts may be significant. It is important to note that the burden of evidence is to show, on the basis of objective information, that there will be no significant effect. If the effect may be significant, or is not known, that would trigger the need for an Appropriate Assessment;
- Stage 2: Appropriate Assessment is the detailed consideration of the impact on the integrity of the European Site of the project or plan,

either alone or in combination with other projects or plans, with respect to the site's conservation objectives and its structure and function. This is to determine whether there is objective evidence that adverse effects on the integrity of the site can be excluded. This stage also includes the development of mitigation measures to avoid or reduce any possible impacts;

- Stage 3: Assessment of alternative solutions is the process which examines alternative ways of achieving the objectives of the project or plan that would avoid adverse impacts on the integrity of the European Site, should avoidance or mitigation measures be unable to cancel out adverse effects; and
- Stage 4: Assessment where no alternative solutions exist and where adverse impacts remain. At Stage 4 an assessment is made with regard to whether or not the development is necessary for imperative reasons of overriding public interest (IROPI) and, if so, of the compensatory measures needed to maintain the overall coherence of the Natura 2000 network.

4.8.4 It is important to note that where priority habitats or species are present, the imperative reasons need to be “...*reasons relating to human health, public safety or beneficial consequences of primary importance to the environment, or other reasons which in the opinion of the European Commission are imperative reasons of overriding public interest*”, whereas for non-priority habitats and species, imperative reasons of a social or economic nature may be acceptable, as long as they are considered to be sufficient to override the harm to the site.

4.8.5 In accordance with Regulation 5 (2) (g) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (APFP) and, also IPC Guidance Note 2 on preparation of application documents under section 37 (s37) of the 2008 Act, an HRA Report has been prepared by GWFL to accompany the final application for a DCO. The requirement for an Appropriate Assessment will be determined by the competent authority (the IPC), following assessment of the information presented in this ES and the HRA Report submitted alongside the DCO application. The HRA Report also contains sufficient information to enable the competent authority to carry out an Appropriate Assessment should it determine that one is required.

4.9 Requirement for Decommissioning

4.9.1 Under The Crown Estate Lease and the Energy Act 2004, plans for the decommissioning of the project need to be considered. There are a number of key issues that should be addressed as part of any decommissioning plan, to ensure the reinstatement of the wind farm site and ensure the availability of adequate funds to undertake decommissioning. The Energy Act 2008 updated the decommissioning provisions, strengthening the statutory decommissioning requirements to minimise the risk of liabilities falling to the Government.

- 4.9.2 Throughout this ES the environmental issues relating to the decommissioning activities have been assessed within the relevant technical Chapters. Following award of consent, and prior to the commencement of construction, a decommissioning plan including funding proposals will be agreed with the IPC and The Crown Estate, taking into account the statutory provisions under the Energy Act 2004.

4.10 References

Cefas (2004). Offshore wind farms; Guidance note for Environmental Impact Assessment In respect of FEPA and CPA requirements Version 2 - June 2004

Cefas (2011). Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects. Draft for Consultation

Department of Energy and Climate Change (DECC) (2009) UK Offshore Energy Strategic Environmental Assessment. Leasing for Offshore Wind Farms and Licensing for Offshore Oil & Gas and Gas Storage. Environmental Report

Defra, (2010) UK Marine Policy Statement: Habitats Regulations Assessment. Hartley Anderson, Hyder, Levett-Therivel. Available at <http://www.defra.gov.uk/corporate/consult/marine-policy/100721-marine-policy-hra-report.pdf>

IPC, (2010). Scoping Opinion Proposed Galloper Wind Farm Project August 2010

IPC, (2011). Using the “Rochdale Envelope”. Advice note nine: Rochdale Envelope. February 2011

King, S., Maclean., Iyla., Norman, T. and Prior, A. (2009). Developing guidance on ornithological cumulative impact assessment for offshore wind farm developers. Report commissioned by COWRIE Ltd

Maclean, I.M.D., Wright, L.J., Showler, D.A. and Rehfisch, M.M. (2009) A review of assessment methodologies for offshore wind farms. Report commissioned by COWRIE Ltd

MFA (2007). FEPA licence No. 33097/07/0 for the Greater Gabbard Offshore Wind Farm. Issued on behalf of the Secretary of State for the Environment, Food and Rural Affairs

SSER and RWE NRL, (2010). Galloper Wind Farm Project Scoping Study. June 2010

Defra (2005) Nature conservation guidance on offshore wind farm development