From:	Blue Ireland
To:	Marine
Subject:	Submissions on behalf of Blue Ireland Coalition CLG in respect of Arklow Bank Wind Park Phase 2 (An Coimisiún Pleanála Case Reference: OA27.319864) Response to Request for Further Information
Date:	Wednesday 29 July 2026 20:50:23

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Dear An Coimisiún Pleanála Officers,

Please find attached a submission on behalf of Blue Ireland Coalition CLG (T/A Blue Ireland) in respect of Arklow Bank Wind Park Phase 2 (An Coimisiún Pleanála Case Reference: OA27.319864) Response to Request for Further.

Please confirm receipt and acceptance of this observation (to info@blueireland.org) at your earliest convenience and, please keep us informed of any updates with respect to this development proposal.

Best Regards,

Owen

BI Submission on the Further Information on AB…

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29th July 2026

RE: Submissions on behalf of Blue Ireland Coalition CLG in respect of Arklow Bank Wind Park Phase 2 (An Coimisiún Pleanála Case Reference: OA27.319864) Response to Request for Further Information

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Owen Clarkin

Observation submitted on behalf of Blue Ireland CLG.

Response to Further Information

Arklow Bank Wind Park 2

An Coimisiún Pleanála - Case reference: OA27.319864

29 July 2026.

Submissions or observations must be received by the Commission no later than 29th July 2026

Online: Use the An Coimisiún Pleanála Online Portal (requires your documents saved as a PDF or Microsoft Word file and a credit/debit card for payment).

CONTENTS

INTRODUCTION **3**
1. Consideration of Alternatives **4**
2. Reliance upon the Ecological Sensitivity Analyses **7**
3. Regulation 54 Derogation Application and Annex IV Risk Assessment **9**
(i) The Context: Cumulative Effects and the Concentration of Offshore Wind Development 9
(ii) Failure to Assess the Deterioration or Destruction of Breeding Sites and Resting Places 13
(iii) The Scale of Admitted Disturbance and the Complete Construction Programme 16
(iv) Deliberate Disturbance, Temporary Effects and Mitigation-Induced Displacement 17
(v) Marine Mammal Observer Records 21
(vi) Ecological Characteristics of Arklow Bank, Prey Effects and Combined Project Activities 22
(vii) The Regulation 54 Derogation Tests 26
Test 1: No Satisfactory Alternative 27
Test 2: Public-Interest Justification 29
Test 3: Favourable Conservation Status 32
(viii) Previous Derogations and the Connected History of Disturbance at Arklow Bank 36
(ix) The Proposed 2028–2030 Period and Future Derogation Decisions 40
(x) Species Omitted from the Derogation Application 42
(xi) Authorship, Relevant Expertise and Independent Scrutiny 44
(xii) Further Information Required and Overall Conclusion 47
APPENDICES **51**

INTRODUCTION

Blue Ireland CLG submitted an observation in response to the original application made by Arklow Bank Wind Park (ABWP) for development consent in 2024. That observation gave details of the ecological sensitivity of the site and outlined the reasons why Blue Ireland CLG objected to the grant of consent. We stand by the contents of that observation and continue to object to the grant of consent for this proposed development.

We are supportive of observations made by other members of Blue Ireland CLG, notably South East Coastal Protection Association (SECPA) and Coastal Concern Alliance.

This observation addresses three principal aspects of the Applicant's response to the Request for Further Information:

1. the Applicant's response concerning the consideration of reasonable alternatives, including its reliance upon the historic site-selection exercise, the inherited development area and the grant of a Maritime Area Consent;
2. the Applicant's reliance upon the North-Western Irish Sea and Celtic Sea Ecological Sensitivity Analyses as evidence concerning the comparative ecological sensitivity and suitability of the proposed development area; and
3. the Regulation 54 derogation application and appended Annex IV Risk Assessment included within the further-information response, including the scope of the protected-species offences assessed, the treatment of displacement and mitigation, the assessment of satisfactory alternatives and favourable conservation status, cumulative and repeated disturbance, the proposed duration of the derogation, omitted species and the expertise and independent scrutiny underlying the assessment.

The absence of comment upon any other part of the further-information response should not be interpreted as acceptance of that material. Blue Ireland continues to rely upon its original observation and maintains its objection to the grant of development consent.

1. Consideration of Alternatives

The Request for Further Information stated the following:

6. Chapter 3 of the EIAR, 'Consideration of Alternatives', provides a justification for the location of the proposed development. Table 3.1 provides a summary of the findings of Appendix 3.4 'Arklow Bank Wind Park 2 Constraints Analysis', which examines the suitability of five regions for offshore wind energy development (east, south-east, south-west, west and north). The east coast was identified as the least constrained region within Ireland's Exclusive Economic Zone (EEZ). The applicant is requested to provide greater clarity with regards to what other sites, in addition to the subject site, were considered within the east coast region, and their specific characteristics, as part of the site selection process.

Article 5(1)(d) of the EIA Directive requires"*...a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment.*" This assessment should be undertaken with reference to Population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape (which includes seascape and visual effects); and the interaction between those factors.

Article 5(1)(d) does not impose a free-standing requirement that the competent authority establish that no reasonable alternative to the Proposed Development exists. Rather, it requires the environmental impact assessment report to describe the reasonable alternatives studied by the developer which are relevant to the project and its specific characteristics, and to indicate the main reasons for the option chosen, taking account of the effects of the project on the environment.

An Coimisiún Pleanála must therefore determine whether the alternatives information supplied by the Applicant is sufficient to permit a proper environmental assessment of the option chosen, including whether the reasonable alternatives actually studied have been identified and whether the principal reasons for selecting the proposed option have been explained by reference to their comparative environmental effects.

In the present case, the current development area was selected by the developer in 1999 and was not identified through a contemporary plan-led or strategic environmental assessment process for the project now proposed. Blue Ireland's concern is not that the EIA Directive requires proof that no conceivable alternative exists. It is that the Applicant's response does not appear to demonstrate that a genuine contemporary comparative assessment of reasonable locations and configurations was undertaken before the present development area was treated as fixed. It was in that context that the Commission requested further clarity concerning the east-coast sites considered, their specific

characteristics, the possibility of locating the development further offshore and the influence of the historic lease area and grant of Maritime Area Consent on site-selection.

Before reasonable alternatives can be assessed, the legitimate objectives of the project should be identified at an appropriate level of generality. Those objectives cannot be defined by reference to the inherited lease area itself, since doing so would predetermine the outcome of the alternatives assessment. The relevant question is whether the project's legitimate objectives, including the delivery of offshore renewable generation, could reasonably have been achieved by another location or configuration causing less environmental harm generally and specifically to protected habitats and species.

In the present case, the location of ABWP2 was not selected through a contemporary site-selection exercise undertaken within the current marine planning framework. Rather, the current proposal occupies a location originally selected more than twenty-five years ago under a developer-led Foreshore Act regime using technical and commercial criteria appropriate to that period. The Applicant's current reliance upon that historic, desktop, site-selection exercise must be viewed in its proper context.

The 2001 EIAR (Appendix 1) compared a number of offshore locations principally by reference to engineering feasibility, wind resource, water depth, foundation conditions and grid connection. Although environmental constraints were identified, that exercise was undertaken in a materially different legal, technological and policy context and in relation to a materially different project. The original site-selection exercise is not criticised for failing to undertake the form of comparative environmental assessment now expected. It was an exercise undertaken for the project and circumstances then envisaged. However, it cannot, without substantially more contemporary analysis, demonstrate that the location and configuration now proposed represent an environmentally preferable reasonable alternative for the purposes of the present environmental impact assessment.

The question for An Coimisiún Pleanála is therefore not merely whether the 2001 assessment was appropriate for its time. It is whether the information now before the Commission adequately describes the reasonable alternatives actually studied for the present project and explains the principal reasons for selecting the proposed option, taking account of its environmental effects. The limitations of the historic site-selection exercise are also relevant, but legally distinct, when considering the separate requirement under Article 16 of the Habitats Directive and Regulation 54 that there be no satisfactory alternative to the activity for which a protected-species derogation is sought. That separate issue is addressed below in the section concerning the Regulation 54 application.

The current EIAR does not undertake a fresh comparative assessment of reasonable offshore locations. Instead, following the Request for Further Information from An Coimisiún Pleanála specifically asking what other east-coast sites had been considered, why the project was not located further offshore, and whether the historic lease had constrained site selection, the

applicant revised Chapter 3 to include a summary and re-evaluation of the historic site-selection process. Accordingly, the application does not identify a contemporary search for reasonable alternative locations before the project area was fixed. Rather, it seeks to justify the retention of an inherited location - a distinction that is critical.

The historic transition of ABWP2 into the present planning regime did not itself demonstrate that the location and configuration now proposed were selected following a contemporary comparative assessment of reasonable alternatives relevant to a modern offshore wind development of approximately 800 MW, comprising turbines approaching 280 metres in overall height, within an Annex I sandbank habitat supporting protected marine mammals.

The Department's transition documents (Appendix 2: Departmental Briefing Note, 6 June 2019) demonstrate that the continuation of legacy projects reflected a policy decision concerning how existing applications should be managed during the transition from the former demand-led foreshore regime to a modern marine planning system. They do not demonstrate that the inherited Arklow Bank location was re-examined by reference to reasonable alternative locations or configurations and their comparative environmental effects for the materially different development now proposed.

By the time the transition arrangements were being considered, the position of the legacy projects had materially changed. The Department's briefing records that many applications had been left effectively "in abeyance", and recognised that "difficulties" had arisen in relation to certain legacy projects, including issues concerning leases, sites, defaulted permissions and payments.

By 2019, officials also recognised that all legacy offshore wind applicants intended to alter the number, specification and capacity of their turbines to take advantage of modern technology and acknowledged that environmental assessment requirements had evolved following amendments to the EIA Directive and subsequent case law.

The official documentation, therefore, acknowledged that the project envisaged in 2001 differs materially from that proposed in 2026. However, the transition protocol designed to facilitate the progression of legacy projects through the planning process did not itself provide for a fresh comparative assessment of the materially altered project, its proposed location and its environmental effects.

In response to the Commission's Request for Further Information, the Applicant also relies upon the grant of a Maritime Area Consent (MAC) as part of the planning context for the project, rather than as a determinative answer to the alternatives question. Accordingly, the 'reassessment' is framed principally as a justification for the continued progression of the historic Arklow Bank site, rather than as a genuinely fresh evaluation of alternative locations for the Proposed Development.

An Coimisiún Pleanála must therefore determine, by reference to the contemporary project and the evidence now before it, whether the Applicant has adequately described the reasonable alternatives studied and provided a sufficient environmental explanation for retaining the inherited Arklow Bank location. The historical progression of the project, the existence of the former lease area and the subsequent grant of a Maritime Area Consent cannot, of themselves, answer that question.

In particular, the Applicant's response must enable the Commission to understand whether other locations or materially different configurations capable of achieving the legitimate objectives of the project were genuinely examined; how their environmental effects were comparatively evaluated; and whether the inherited development area predetermined or materially constrained the exercise. The assessment must address potential effects upon biodiversity and protected habitats and species, as well as effects upon coastal communities, the marine environment, landscape, seascape and the other environmental factors required to be considered under the EIA Directive.

2. Reliance upon the Ecological Sensitivity Analyses

As part of its response concerning the relative constraints affecting different regions and locations, the Applicant relies upon the North-Western Irish Sea and Celtic Sea Ecological Sensitivity Analyses and, in particular, upon the absence of overlap between the proposed development area and the potential marine protected area network solutions produced by those analyses. Blue Ireland submits that those materials cannot properly be used as independent evidence that Arklow Bank is of comparatively low ecological sensitivity, that the east coast is less ecologically constrained than alternative regions, or that the proposed development area is environmentally suitable for offshore wind development.

The North Western Irish Sea and Celtic Sea Ecological Sensitivity Analyses relied upon by the Applicant are not suitable tools for determining the comparative ecological sensitivity of the east and south coasts. They were prepared for the specific purpose of identifying potential MPA network solutions for selected ecological features, while minimising overlap with existing and proposed sectoral activities. They excluded species and habitats already falling within the Birds and Habitats Directives, notwithstanding that the European Commission has since confirmed substantial deficiencies in Ireland's marine Natura 2000 network (Appendix 5: European Commission infringement material. Issued: 29 April 2026). The Court of Justice has also recently confirmed that Natura 2000 protection is inherently site-specific: each protected site performs a particular function within the coherence of the network, and its conservation objectives must be specific and precise and serve as a mandatory reference point for assessment (Appendix 9). That further reinforces the need for caution before treating the current pattern of designations, or the absence of overlap with an optimised MPA solution, as a comprehensive indication of the distribution or relative importance of

ecologically sensitive marine areas. Their outputs are also constrained by feature selection, data availability, differing regional datasets and the incorporation of ORE areas as sectoral cost layers. Consequently, absence from the final areas identified as suitable for potential MPAs cannot be treated as evidence of low ecological sensitivity, and the analyses provide no scientifically valid basis for concluding that the east coast is ecologically less constrained than the south coast. Accordingly, the analyses were neither designed nor capable of answering the different question for which the Applicant now seeks to rely upon them: whether the east coast generally, or Arklow Bank specifically, is comparatively less ecologically constrained or environmentally suitable for offshore wind development.

The Applicant's reliance on non-overlap with the ESA's potential-MPA solution is circular. The Arklow Bank project area formed part of the proposed ORE activity layer used in the prioritisation process, and prioritizr was expressly configured to meet selected conservation targets while minimising overlap with areas important to sectoral activities. The resulting avoidance of the Arklow ORE area therefore cannot serve as independent evidence that the site is of low ecological sensitivity or is suitable for offshore-wind development. It is, at least in part, a consequence of the model having been instructed to avoid the development footprint.

Arklow Bank did not fall outside the MPA solution because the ESA proved it was ecologically suitable for wind development. It fell outside, at least partly, because it had already been entered into the model as a wind-development constraint.

The Applicant relies on the absence of overlap between the proposed development and the Western Irish Sea ESA potential MPA solution as evidence of environmental suitability. However, the proposed development area formed part of the offshore renewable energy activity layer used in the conservation prioritisation process. As the prioritisation algorithm was expressly designed to minimise overlap with sectoral activities, including offshore renewable energy, the resulting absence of overlap cannot constitute an independent ecological assessment of the suitability of the ABWP site.

Ecosystem-based planning, as required by the Maritime Spatial Planning Directive (2014/89/EU), requires decisions to consider the structure, functioning and integrity of the marine ecosystem as an integrated whole. A methodology that deliberately excludes significant ecosystem components cannot be relied upon to demonstrate that a particular development site is environmentally suitable or less ecologically constrained than alternative locations.

The Celtic Sea Ecological Sensitivity Analysis further illustrates that potential MPA solutions are sensitive to the inclusion of offshore renewable energy (ORE) activity layers within the optimisation process. The location of proposed MPA networks changes depending on whether ORE is treated as a sectoral constraint, demonstrating that these outputs are

optimisation scenarios rather than objective maps of ecological sensitivity. This confirms that non-overlap between the ABWP site and an optimised MPA solution cannot be relied upon as independent evidence of the site's ecological suitability for offshore wind development.

3. Regulation 54 Derogation Application and Annex IV Risk Assessment

Blue Ireland submits that the Regulation 54 application and appended Annex IV Risk Assessment do not provide a sufficiently complete, precautionary or scientifically coherent basis upon which An Coimisiún Pleanála could conclude that the Proposed Development is capable of implementation consistent with the strict-protection requirements of Articles 12 and 16 of the Habitats Directive and Regulations 51 and 54 of the European Communities (Birds and Natural Habitats) Regulations 2011.

The concerns identified below are not confined to isolated omissions. The methodology adopted in the Annex IV Risk Assessment repeatedly narrows the scope of the strict-protection regime; separates ecologically connected effects into artificial compartments; treats mitigation-induced displacement as evidence of impact avoidance; substitutes population-level modelling for the prior question of whether protected-species offences will occur; and converts acknowledged uncertainty into categorical conclusions of “no pathway” or “no offence”.

These concerns are particularly significant because the Applicant itself accepts that foundation installation may deliberately disturb substantial numbers of cetaceans during each piling event, including up to 1,908 harbour porpoises and 259 bottlenose dolphins, and accepts that reduction in occupied area, relocation and displacement may occur notwithstanding the proposed mitigation.

(i) The Context: Cumulative Effects and the Concentration of Offshore Wind Development

The cumulative assessment presented in the ABWP NIS is extensive. It considers a wide range of existing, consented and proposed projects and includes quantitative modelling of underwater noise disturbance together with cumulative iPCoD population modelling for the five Phase One offshore wind projects.

However, the issue arising in the context of a Regulation 54 derogation application is not simply whether cumulative underwater noise has been modelled. The more fundamental question is whether the assessment adequately addresses the ecological consequences of what is becoming an unprecedented concentration of offshore renewable energy infrastructure within a relatively confined area of Ireland's marine environment.

The east and south-east coast, extending from Dundalk Bay through the Irish Sea to Wexford and onwards towards the Waterford coast, is now the focus of an exceptional concentration of offshore wind proposals and associated infrastructure. In addition to the five Phase One projects incorporated within the iPCoD modelling, the cumulative assessment identifies further Tier 2 and Tier 3 offshore wind developments, including Tonn Nua and the South

Coast DMAP areas (Danu, Manannán and Lí Ban), together with associated ports, cable infrastructure and other offshore projects.

The ecological question therefore extends well beyond the effects of simultaneous piling. It concerns the progressive transformation of a substantial section of the Irish Sea and adjacent Celtic Sea into a major offshore energy corridor through the cumulative presence of:

- multiple wind farm arrays;
- export and inter-array cable systems;
- repeated geophysical and geotechnical surveys;
- construction and maintenance vessel activity;
- recurring UXO clearance;
- sequential construction programmes extending over many years;
- operational underwater noise;
- changes in prey distribution and fisheries activity;
- repeated displacement into progressively smaller areas of undisturbed habitat;
- potential interference with movement patterns between important feeding areas and SACs;
- cumulative habitat fragmentation.

Many of these pathways are considered individually within the NIS. However, the in-combination assessment remains principally an assessment of underwater-noise disturbance rather than an integrated ecological assessment of the consequences of concentrating such extensive offshore industrial development within one interconnected marine ecosystem.

This distinction is particularly important because the NIS repeatedly relies upon evidence that harbour porpoises generally return to affected areas within one or two days after cessation of piling, while acknowledging that cumulative construction activity across multiple nearby projects may extend the period before animals return.

That acknowledgement raises a broader ecological question. An effect that is temporary when considered in relation to a single project may become repeated, sequential, spatially shifting or effectively continuous when construction activity progresses between numerous offshore developments over a prolonged period.

The same concern arises within the Proposed Development itself. Pre-construction surveys, geotechnical works, vessel activity, acoustic deterrent device use, foundation installation, dredging, trenching and cable installation may occur sequentially or within overlapping periods. Even where the effects of an individual activity are characterised as temporary, the

combined construction sequence may delay or prevent effective recovery between successive disturbance events.

The evidence that harbour porpoises may return within one or two days following the cessation of an individual piling event does not, without further analysis, establish that animals will return where another disturbance-generating activity begins before recovery has occurred. Nor does it establish that the same animals will not be displaced repeatedly or that the ecological functions of the affected area will be restored between events.

The assessment should therefore examine:

1. the anticipated interval between successive disturbance-generating activities;
2. whether that interval is sufficient to permit animals to return and resume normal behaviour;
3. whether repeated disturbance may affect the same animals or areas;
4. whether animals returning to the area may encounter continuing vessel activity, prey disturbance or another acoustic source;
5. the duration for which particular parts of Arklow Bank may remain repeatedly or continuously unavailable; and
6. the combined effects of construction activity with operational noise from existing and proposed offshore infrastructure.

Operational underwater noise associated with the Proposed Development should also be assessed by reference to its characteristics, spatial distribution, duration and potential interaction with other existing and proposed sources. Blue Ireland does not assume that operational noise will necessarily result in permanent exclusion. It submits that the Applicant must demonstrate, on the available scientific evidence, whether such noise may contribute to continuing disturbance, masking, altered habitat use or cumulative displacement.

Where the scientific evidence does not permit a confident conclusion concerning recovery, repeated exposure or long-term habitat use, that uncertainty should be identified expressly and addressed precautionarily by An Coimisiún Pleanála. It should not be resolved by assuming that effects described individually as temporary will remain temporary when experienced as part of a prolonged and sequential programme of activity.

Accordingly, the relevant question is not whether harbour porpoises return following completion of piling at ABWP2. Rather, it is whether suitable, productive, comparatively undisturbed and ecologically equivalent habitat remains continuously available while piling, UXO clearance, surveys and construction activity move between multiple projects distributed along the east and south-east coast. The Applicant's assessment does not appear to examine this potential for serial or rolling displacement at a regional scale.

A related concern arises from the scale at which cumulative impacts are evaluated. The quantitative assessment is expressed primarily as a proportion of the entire Celtic and Irish Seas Management Unit population before concluding that harbour porpoise communities associated with SACs throughout the Management Unit will not be significantly affected.

However, a conclusion that the wider Management Unit remains demographically stable does not necessarily demonstrate that there will be no significant cumulative effects on the harbour porpoise communities associated with individual SACs, including Blackwater Bank SAC, Codling Fault Zone SAC and Rockabill to Dalkey Island SAC, nor does it fully address the possibility that cumulative effects may become concentrated within the central Irish Sea where offshore development is itself becoming concentrated.

This point is reinforced by the Applicant's own acknowledgement elsewhere that disturbance estimates expressed as a percentage of the Management Unit are not representative of the numbers associated with Blackwater Bank SAC.

The cumulative population modelling itself is also principally confined to the five Phase One offshore wind projects. While projects such as Tonn Nua and the South Coast DMAP developments are recognised within the cumulative project inventory as Tier 3 developments, they are not incorporated into the detailed iPCoD population modelling that underpins the conclusion that cumulative population effects will remain negligible. The assessment must evaluate the cumulative implications of other authorised and reasonably foreseeable activities insofar as they may affect the same populations and the continuing availability of suitable habitat.

For the purposes of Regulations 51 and 54 of the European Communities (Birds and Natural Habitats) Regulations 2011, Blue Ireland does not suggest that every future offshore development must necessarily be incorporated into the same level of detailed population modelling regardless of the information available concerning it. The concern is that a stable Management Unit trajectory derived principally from modelling of the five Phase One projects cannot, of itself, be treated as determinative of the separate statutory test under Article 16 of the Habitats Directive and Regulation 54.

The relevant Regulation 54 decision-maker must determine whether the disturbance authorised for ABWP2, considered both alone and in combination with other authorised and reasonably foreseeable activities affecting the same populations and available habitat, would be detrimental to maintaining the populations concerned at favourable conservation status in their natural range. That assessment must address the concentration, repetition and duration of disturbance within the Irish and Celtic Seas and cannot be answered solely by reference to the predicted demographic stability of the wider Management Unit under a modelling exercise that does not incorporate all relevant foreseeable developments.

(ii) Failure to Assess the Deterioration or Destruction of Breeding Sites and Resting Places

The Applicant seeks a derogation in respect of deliberate disturbance under Regulation 51(2)(b). It does not seek a derogation in respect of the deterioration or destruction of a breeding site or resting place under Regulation 51(2)(d), and the relevant box in the derogation application form is left unticked.

That exclusion does not appear to be based upon a species-specific assessment demonstrating that breeding sites or resting places are absent from the area affected by the Proposed Development. Nor is it based upon an assessment demonstrating that the ecological functions of any such places will remain unaffected. Instead, the Annex IV Risk Assessment states:

"There is an absence of information on the breeding site and resting places of cetaceans, therefore it is assumed that breeding and resting may occur wherever the species occur."

The Risk Assessment therefore acknowledges that breeding and resting may occur wherever the relevant cetacean species occur and that breeding sites and resting places cannot be excluded from the vicinity of the Proposed Development. However, it then states:

"The breeding site or resting place of cetaceans comprise the water column within which they reside."

On that basis, the Applicant concludes that, because the Proposed Activities will not physically destroy or damage elements of the water column and the water column will remain intact, there is "no pathway" for an offence under Regulation 51(2)(d).

Blue Ireland submits that this applies an unduly narrow physical-destruction test. The continued physical presence of seawater is not equivalent to the continued ecological functionality of a breeding site or resting place. Cetaceans do not breed, rear young, forage, communicate, navigate or rest merely because a volume of water remains physically present around them.

The capacity of an area to continue functioning as a breeding site or resting place may depend upon, among other matters:

- its acoustic conditions;
- prey availability and prey distribution;
- access to feeding, nursery and rearing areas;
- connectivity between offshore, nearshore and coastal waters;
- the ability of animals to communicate and echolocate;
- freedom from repeated exclusion and displacement;

- the energetic cost of avoidance;
- disturbance during sensitive breeding, rearing and migration periods;
- the physical and biological characteristics of the Arklow Bank ecosystem; and
- the cumulative effects of successive surveys, construction operations, existing infrastructure and other plans or projects.

The Risk Assessment does not appear to assess those matters before excluding Regulation 51(2)(d). Instead, it replaces an assessment of ecological functionality with the narrower physical question of whether the water itself will remain present. On that reasoning, an aquatic breeding site or resting place could scarcely ever be affected unless the water were physically removed. Such an approach would deprive the protection afforded to breeding sites and resting places of meaningful application to marine species.

This interpretation is also inconsistent with the case law of the Court of Justice concerning Habitats Directive, Article 12(1)(d). The Court has interpreted "deterioration" as the progressive reduction of the ecological functionality of a breeding site or resting place, and "destruction" as the total loss of that functionality, irrespective of whether the harm is intentional. The legally relevant question is therefore whether the place continues to perform its ecological function, rather than merely whether the physical environmental medium remains present (*Case C-357/20, IE v Magistrat der Stadt Wien, judgment of 28 October 2021, particularly paragraph 48 and the operative part*).

The reasoning is also internally inconsistent. The Applicant relies upon an absence of information to acknowledge that breeding and resting may occur throughout areas occupied by cetaceans, but then uses that same absence of information to support a categorical finding that no pathway for deterioration or destruction exists. Scientific uncertainty cannot properly be used first to acknowledge the possible presence of protected places and then to dispense with further assessment. Where their precise location and use are uncertain, the necessary response is a precautionary and evidence-based assessment of whether the project may impair their ecological function.

This issue is particularly significant because the Applicant expressly accepts that foundation installation may result in a "reduction in the occupied area or the relocation or displacement of the species" notwithstanding the proposed mitigation. However, the Risk Assessment does not then examine whether displacement from an occupied breeding site or resting place, or obstruction of access to such a place, may impair its ecological functionality under Regulation 51(2)(d).

Instead, the same ecological effect is divided into two separate legal compartments: displacement is considered under Regulation 51(2)(b) as disturbance, while Regulation 51(2)(d) is confined to whether the physical water column remains present. That distinction is artificial. The piling noise that causes relocation or a reduction in occupied area may also

make an area used for breeding, rearing or resting temporarily, repeatedly or cumulatively unavailable. Where successive piling events affect overlapping areas, an effect described individually as temporary may amount in practice to prolonged or recurrent exclusion.

The Risk Assessment does not clearly assess:

- whether displaced animals may be excluded from breeding, rearing or resting habitat;
- the duration of exclusion following each piling event;
- the intervals between successive piling events;
- whether animals will be able to return and resume the relevant ecological function;
- whether suitable and ecologically equivalent alternative habitat is available;
- whether displacement will increase energetic demands;
- whether females with dependent young may be particularly vulnerable;
- whether access between feeding, breeding and resting areas may be interrupted; or
- whether the same animals or areas may be affected repeatedly.

It is not sufficient to acknowledge relocation, displacement and reduction in occupied area under Regulation 51(2)(b), while asserting separately that breeding sites and resting places cannot be affected because the physical water column remains in place. Before the Proposed Development can be treated as capable of implementation consistently with Article 12, a precautionary assessment is required of whether breeding sites and resting places will remain continuously capable of performing their ecological functions throughout the complete construction programme.

(iii) The Scale of Admitted Disturbance and the Complete Construction Programme

The scale of disturbance accepted within the Annex IV Risk Assessment is substantial. Following application of the extended ramp-up scenario, the Applicant predicts that each piling event may disturb:

1. up to 1,908 harbour porpoises, stated to represent 3.05% of the relevant management-unit population;
2. up to 259 bottlenose dolphins, stated to represent 3.12% of the relevant reference population;
3. up to 30 common dolphins;
4. up to 35 Risso's dolphins; and
5. up to 50 minke whales.

These figures are not presented as the maximum numbers potentially affected over the complete construction programme. They are expressed as the numbers potentially disturbed during each piling event.

The Proposed Development comprises either 53 or 47 wind turbines, together with two offshore substations and associated cabling and construction activity. The per-event disturbance estimates must therefore be translated into a transparent assessment of the complete sequence of foundation installations.

In particular, the assessment should clearly identify:

1. the maximum number of piling events;
2. the number and location of turbine and offshore-substation foundations requiring piling;
3. the maximum duration of piling at each location;
4. the maximum number of piling days;
5. the anticipated intervals between successive piling events;
6. the degree of spatial overlap between successive disturbance footprints;
7. the potential for repeated exposure of the same animals;
8. the length of time for which particular parts of the development area may remain unavailable;
9. the potential cumulative exposure arising throughout the proposed 2028–2030 construction programme; and
10. the relationship between piling and other simultaneous or sequential project activities.

It is not sufficient to attach a percentage of a broad management-unit or reference population to each individual event without explaining how those events combine across the complete construction programme. An effect on 3.05% of the harbour porpoise management-unit population during each piling event does not become ecologically insignificant merely because each event is described individually as temporary.

Nor does the absence of a modelled long-term population decline answer whether individual animals will be deliberately disturbed, whether the same animals may be exposed repeatedly, or whether occupied areas may be rendered unavailable on a recurrent and/or prolonged basis.

The assessment must therefore distinguish between:

a. the number of animals predicted to be disturbed during an individual piling event;
b. the number of animals that may be affected repeatedly across successive events;
c. the spatial and temporal extent of the area made unavailable during the complete construction sequence; and
d. the ultimate population-level consequences relied upon for the separate favourable-conservation-status test.

Without that complete construction-programme assessment, the per-event figures do not provide a transparent account of the overall disturbance authorised by the proposed derogation.

(iv) Deliberate Disturbance, Temporary Effects and Mitigation-Induced Displacement

The Annex IV Risk Assessment must distinguish between two separate questions.

The first is whether the planned activities, undertaken with knowledge of the likely presence of Annex IV species, will cause deliberate disturbance, displacement or another prohibited effect under Article 12 of the Habitats Directive and Regulation 51.

The second, which arises where a derogation is required, is whether authorising that offence would be detrimental to the maintenance of the populations concerned at favourable conservation status in their natural range for the purposes of Article 16 and Regulation 54.

These questions should not be conflated. Population-level modelling may be relevant to the later favourable-conservation-status test. However, the absence of a predicted change in survival, breeding success, reproductive ability or long-term population trajectory does not demonstrate that no disturbance offence will occur in relation to individual protected animals.

A disturbance may remain deliberate and prohibited even where it is not predicted to alter the long-term trajectory of an entire management-unit population. An approach that uses the absence of a modelled population decline to exclude the occurrence of an Article 12 offence risks replacing the strict protection of individual specimens with a materially weaker population-viability threshold.

This concern arises particularly in the Applicant's treatment of dredging and trenching. The Risk Assessment appears to reason that:

1. the predicted numbers affected by those activities are substantially lower than those affected by foundation installation;
2. the activities will be temporary and mobile;
3. the effects are expected to be recoverable; and
4. iPCoD modelling does not predict a population-level change.

On that basis, the effects are treated as not meeting the definition of deliberate disturbance.

Blue Ireland submits that this does not answer the correct question. The issue is not whether dredging or trenching will affect fewer animals than piling, nor whether a population-level decline is predicted. The issue is whether those activities may deliberately disturb protected animals, displace them from occupied areas, interrupt ecologically important behaviour or combine with other project activities to produce a prohibited effect.

An activity does not fall outside Article 12 merely because another activity within the same project produces a larger disturbance footprint.

“Temporary”, “Localised” and “Recoverable” Effects

The Risk Assessment repeatedly relies upon descriptions such as “temporary”, “localised”, “short duration” and “fully recoverable” when concluding that an admitted behavioural response or displacement will not constitute deliberate disturbance.

Those descriptions do not, without further ecological analysis, determine whether an offence will occur. The assessment must consider the nature and ecological importance of the behaviour interrupted, the timing of the disturbance, its duration, its repetition and its interaction with other activities.

A disturbance lasting a comparatively limited period may nevertheless be ecologically significant where it:

1. interrupts feeding by an animal with high energetic demands;
2. separates or displaces a female and dependent young;
3. interrupts nursing, communication, navigation or resting;
4. causes animals to abandon a preferred or productive feeding area;
5. occurs repeatedly during a prolonged construction campaign;
6. coincides with migration, calving or rearing periods;
7. combines with disturbance from vessels, surveys, dredging, trenching or other projects; or
8. affects an area to which animals might repeatedly return.

An effect described individually as temporary may also become recurrent, prolonged or effectively continuous where successive foundation installations and other activities affect overlapping areas. Whether the animals are expected eventually to return does not, of itself, establish that no offence occurs during the period of exclusion or that repeated displacement is ecologically insignificant.

The assessment should therefore identify the evidence supporting any conclusion that the predicted effects are fully recoverable, including:

1. the anticipated time required for animals to return after each activity;
2. whether return has been demonstrated for the relevant species and type of disturbance;
3. whether animals will return before the next disturbance event begins;
4. whether the same individuals or groups may be displaced repeatedly;
5. whether the affected ecological functions can resume fully following return; and
6. whether suitable habitat remains continuously available during the period of displacement.

Mitigation Must Not Be Used to Redefine Disturbance

The Risk Assessment states that conclusions of no deliberate disturbance are reached by reference to negligible risk and:

"*the implementation of the necessary mitigation measures to reduce disturbance thereby resulting in no deliberate disturbance*."

Blue Ireland submits that the assessment must distinguish clearly between:

a. measures that prevent a protected animal from experiencing a harmful effect; and
b. measures that deliberately induce the animal to move away from the source of that effect.

Acoustic deterrent devices, soft-start procedures and ramp-up procedures are intended to cause animals to leave the vicinity before full-intensity piling commences. The Applicant's own assessment calculates the estimated distances travelled by animals following the consecutive use of acoustic deterrent devices, soft start and ramp up.

Movement induced by an acoustic deterrent device or ramp-up procedure is not evidence that disturbance has been eliminated. It is itself an anticipated behavioural response deliberately produced as part of the mitigation sequence.

The Applicant should not therefore treat avoidance and displacement simultaneously as:

1. mitigation demonstrating that no disturbance occurs; and
2. a behavioural response that justifies seeking a derogation only in relation to full-intensity piling.

The assessment must account for the effects of the complete mitigation and piling sequence, including:

1. activation of acoustic deterrent devices;
2. the soft-start procedure;
3. ramp up;
4. full-intensity piling;
5. pauses and restart procedures; and
6. any repetition of that sequence across successive foundations.

The disturbance footprint does not begin only when maximum hammer energy is reached. If animals are intentionally caused to flee during the mitigation sequence, that displacement must be included in the assessment, and not treated solely as proof that exposure to the subsequent activity has been avoided.

Injury Mitigation Does Not Necessarily Prevent Behavioural Disturbance

Measures such as marine mammal observer watches, acoustic deterrent devices, exclusion zones, soft start and ramp up are principally directed towards reducing the risk that animals will be exposed at close range to sound levels associated with permanent or temporary hearing injury.

Reducing the risk of permanent threshold shift or temporary threshold shift does not, without more, establish that behavioural disturbance will not occur at greater distances.

The assessment must separately examine:

1. behavioural avoidance and displacement;
2. interference with communication and echolocation;
3. masking of biologically relevant sounds;
4. interruption of foraging, resting, breeding or rearing behaviour;
5. exclusion from preferred or productive habitat;
6. energetic consequences of fleeing or relocation; and
7. the cumulative effect of repeated mitigation and construction sequences.

Accordingly, mitigation directed towards preventing physical injury should not be treated as establishing the absence of deliberate disturbance. Nor should displacement induced by the mitigation itself be omitted from the assessment of the offence for which derogation may be required.

Blue Ireland submits that the Annex IV Risk Assessment does not yet provide a sufficiently clear separation between:

a. the occurrence of an offence under Article 12 and Regulation 51;
b. the reduction of injury risk through mitigation;
c. deliberate avoidance or displacement induced by that mitigation; and
d. the later population-level question arising under Article 16 and Regulation 54.

That distinction is necessary before the competent authorities can determine either the full scope of the derogation required or whether the cumulative conditions for granting it have been satisfied.

(v) The Marine Mammal Observer Records Do Not Establish Population Abundance or Ecological Absence

To the extent that the Applicant relies upon Marine Mammal Observer ("MMO") records from previous site-investigation activities, those records must be interpreted having regard to the purpose for which the observations were undertaken and the limitations of visual monitoring.

Visual MMO monitoring is capable of recording near-field animals observed during defined activities and observation periods. It cannot reliably establish the absence of animals from the wider project area or demonstrate that Arklow Bank is of limited importance to marine mammals.

Animals may be:

1. submerged during the relevant observation period;
2. outside the observer's effective detection range;

3. present during darkness;
4. obscured by sea state, weather or visibility conditions;
5. behind or beneath the vessel or observation platform;
6. already displaced before the formal observation watch commences; or
7. present without surfacing during the relevant observation window.

These limitations are particularly significant for harbour porpoise, which are small, comparatively inconspicuous, frequently submerged and difficult to detect consistently through visual observation alone.

The 2023 nearshore MMO report concerned observations associated with three boreholes undertaken from a jack-up barge between 17 July and 14 August 2023. The 2024 report concerned hydrographic and seismic survey operations undertaken under Foreshore Licence FS007555. Neither report appears to have been designed as a systematic assessment of population abundance, seasonal site use or the ecological importance of Arklow Bank.

The GDG reports were prepared in connection with engineering site-investigation activities for Sure Partners Limited and SSE Renewables. That fact does not invalidate the observations recorded. It does, however, mean that the records should be used for the purpose for which their data were collected.

Operational MMO returns are principally compliance and mitigation records associated with particular vessels and activities. They are not equivalent to:

1. systematic line-transect abundance surveys;
2. passive acoustic monitoring extending across complete daily and seasonal cycles;
3. studies designed to determine habitat or site use;
4. prey-distribution and foraging assessments;
5. calving, nursing or rearing studies;
6. assessments of ecological connectivity;
7. studies of seasonal movement or site fidelity; or
8. before-and-after assessments of disturbance, displacement and subsequent return.

Accordingly, low sighting numbers during a short operational campaign cannot rationally be treated as demonstrating that few animals use the project area, that marine-mammal use is ecologically insignificant or that the proposed mitigation will prevent behavioural disturbance.

This is particularly relevant where the previous project documentation described harbour porpoise as:

- distributed throughout the western Irish Sea;
- recorded during every month of the site-specific boat and aerial surveys;
- breeding in Irish waters; and
- displaying seasonal density peaks during late summer and winter.

If reliance is placed upon sparse detections in later MMO reports, the Applicant must reconcile those records with the earlier and broader evidence. That comparison should expressly address differences in survey purpose, methodology, duration, spatial coverage, seasonality, observation conditions and detectability.

The absence of an observation is not the same as evidence of ecological absence. Nor can observations gathered while potentially disturbing activities are already taking place be assumed to represent the undisturbed use of the area.

MMO watches may form an important part of measures designed to reduce the risk of close-range exposure and physical injury. They do not establish that behavioural disturbance, acoustic masking, altered foraging, displacement or exclusion from habitat will not occur at distances substantially greater than the visual observation or mitigation zone.

The competent authorities should therefore avoid relying upon operational MMO returns as evidence:

1. that Arklow Bank supports low numbers of cetaceans;
2. that the area is of limited ecological importance;
3. that breeding, rearing or resting use is absent;
4. that animals are absent during unobserved periods;
5. that displaced animals have returned following previous activities; or
6. that the proposed mitigation will prevent deliberate behavioural disturbance.

Where conclusions concerning abundance, seasonal use, habitat function or displacement are material to the Regulation 51 or Regulation 54 assessment, they must be supported by data and methodologies designed to answer those questions.

(vi) Failure to Integrate the Ecological Characteristics of Arklow Bank, Prey Effects and Combined Project Activities

Arklow Bank is not a generic or ecologically interchangeable portion of the Irish Sea. The Applicant's own physical-environment material describes the bank as an important natural breakwater, composed of mobile medium sand but dynamically stable overall as a result of circulating residual currents. Earlier project material also describes strong currents, sediment transport around the bank and a clockwise circulation pattern.

Those physical characteristics may influence:

1. primary and secondary productivity;
2. fish aggregation and distribution;
3. spawning and nursery functions;
4. prey availability;
5. foraging and feeding opportunities for marine mammals (and birds);
6. movement along and across the bank;
7. underwater sound propagation; and

8. the ecological relationship between the sandbank, surrounding coastal waters and the wider Irish Sea.

However, the Annex IV Risk Assessment does not appear to integrate the physical, benthic, fish and marine-mammal evidence when assessing disturbance, breeding sites, resting places or the availability of alternative habitat.

Its treatment of the "water column" risks presenting the marine environment as ecologically uniform and disconnecting cetaceans from the sandbank, seabed, prey resources and surrounding coastal waters upon which the ecological functionality of the area may depend.

A conclusion that the physical water column will remain present does not demonstrate that the area will remain capable of supporting the ecological requirements of the species. Nor does it demonstrate that another area of water will provide an equivalent alternative if animals are displaced.

Prey Effects

The Risk Assessment does not clearly demonstrate that the areas affected by construction will continue to support the prey resources upon which cetaceans depend.

Foundation installation, dredging, trenching, cable installation, sediment suspension, vessel activity and seabed alteration may affect fish distribution, behaviour and availability to predators. Underwater noise may also displace prey species or alter their behaviour independently of its direct effects upon marine mammals.

Those effects are relevant to:

1. whether a foraging area remains functional;
2. whether displaced animals must expend additional energy locating alternative prey;
3. whether pregnant or lactating females can continue to meet increased energetic demands;
4. whether displaced animals can access habitat offering equivalent prey resources;
5. whether areas associated with rearing or resting remain ecologically viable; and
6. whether animals returning after a disturbance event return to an area whose prey resources and ecological functions have recovered.

The Applicant cannot establish that breeding sites, resting places or occupied habitat remain unaffected without considering the biological resources and ecological processes that make those areas usable. Similarly, it cannot assume that displaced animals will relocate successfully without assessing whether suitable and ecologically equivalent feeding habitat is available elsewhere.

Artificial Separation of Project Activities

The Annex IV Risk Assessment concludes that foundation installation is the only activity expected to result in deliberate disturbance. Other activities - including geophysical and

geotechnical surveys, vessel activity, dredging, trenching, cable installation, electromagnetic fields and accidental pollution - are screened separately and excluded from the scope of the derogation.

Blue Ireland submits that this activity-by-activity approach risks understating the actual disturbance environment experienced by protected species.

Cetaceans will not experience each project activity in isolation according to the separate rows of an assessment table. During the development programme, they may be exposed sequentially or concurrently to:

1. geophysical sound sources;
2. geotechnical investigation works;
3. construction and support vessels;
4. acoustic deterrent devices;
5. soft-start and ramp-up procedures;
6. full-intensity foundation piling;
7. dredging and trenching;
8. cable installation;
9. operational and maintenance vessel traffic;
10. decommissioning activity associated with Arklow Bank Wind Park Phase 1; and
11. other offshore projects and investigations affecting the same marine area and populations.

The assessment must therefore examine the combined disturbance burden generated by the complete project programme. An activity does not become ecologically irrelevant merely because it produces a smaller disturbance range or affects fewer animals than foundation piling.

The assessment should identify:

1. which activities may occur simultaneously;
2. which activities may occur sequentially without sufficient recovery periods;
3. the total duration for which vessels and sound-producing activities may be present;
4. whether animals displaced by one activity may encounter another disturbance source while relocating;
5. whether the same areas will be affected repeatedly;
6. whether prey and habitat effects may persist after the immediate noise source ceases; and
7. how the complete project disturbance burden interacts with other plans and projects.

Dredging, Trenching and the Fleeing-Receptor Assumption

The Applicant's assessment of dredging and trenching appears to rely materially upon the proposition that the predicted numbers affected are approximately 1.5% of those predicted for foundation installation - for example, approximately 30 harbour porpoises compared with 1,908.

That comparison does not establish the absence of deliberate disturbance. The relevant question is whether dredging and trenching may disturb protected animals, impair the use of occupied areas, affect prey resources or combine with other project activities. An effect does not cease to fall within the strict-protection regime merely because a more extensive effect is predicted elsewhere in the same project.

The Risk Assessment also appears to apply a fleeing-receptor assumption when calculating the impact ranges associated with dredging and trenching. Such an assumption requires explicit examination.

A fleeing-receptor model may reduce the calculated acoustic exposure by assuming that the animal moves away from the source. However, the assumed movement is itself a behavioural response. The assessment should not rely upon flight to reduce the predicted exposure while omitting the resulting displacement, interruption of behaviour and energetic cost.

The Applicant should therefore explain:

1. the scientific basis for assuming that animals will flee;
2. the speed and direction of movement assumed;
3. whether all relevant species and age classes are expected to respond in that manner;
4. whether females with dependent young can move at the assumed rate;
5. the distance animals are assumed to travel;
6. the habitat and prey resources available in the direction of movement;
7. the energetic consequences of the assumed flight;
8. whether animals may be moving towards another project activity or disturbance source; and
9. how the assumed displacement has been included in the assessment of deliberate disturbance and cumulative effects.

A modelling assumption that embeds avoidance cannot be used both to reduce the calculated acoustic exposure and to support a conclusion that no relevant behavioural effect occurs. The displacement and ecological consequences inherent in the assumption must themselves form part of the assessment.

Accordingly, Blue Ireland submits that the Annex IV Risk Assessment should be considered as an integrated ecological assessment of the complete development programme and the particular characteristics of Arklow Bank. It should not treat the water column as ecologically

uniform, examine prey effects separately from marine-mammal effects, or screen individual activities in isolation from the combined disturbance environment that the animals will actually experience.

(vii) The Regulation 54 Derogation Tests

This part of the submission concerns the Regulation 54 application and Annex IV Risk Assessment submitted in respect of ABWP2. Article 16 of the Habitats Directive and Regulation 54 establish cumulative conditions that must be satisfied before a derogation from the strict-protection requirements applicable to Annex IV species may be granted.

The relevant decision-maker must be satisfied:

1. that the derogation is sought for one of the permitted purposes specified in Article 16(1) and Regulation 54(2);
2. that there is no satisfactory alternative to the activity for which the derogation is sought; and
3. that the derogation will not be detrimental to the maintenance of the populations of the species concerned at a favourable conservation status in their natural range.

Each requirement is distinct and cumulative. General public-policy support for the project cannot remedy a failure to establish that no satisfactory alternative exists or that the derogation will not be detrimental to favourable conservation status. Equally, an asserted absence of population-level effects does not determine the separate and prior question of whether the proposed activities will give rise to an offence under Regulation 51.

The Regulation 54 process is legally distinct from the planning application. However, the Applicant's own assessment accepts that foundation installation presents a residual risk of deliberate disturbance notwithstanding mitigation. The derogation application therefore concerns an acknowledged protected-species issue arising from a central construction activity and cannot be treated as peripheral to the planning decision.

An Coimisiún Pleanála must accordingly consider whether the project before it is capable of lawful implementation consistently with the strict-protection regime. It should not assume that the present Regulation 54 application, or any future application relating to a later construction year, will necessarily result in a derogation sufficient to authorise the complete construction programme. Blue Ireland therefore comments upon the derogation material included in the further-information response because that material forms part of the Applicant's case that the Proposed Development is capable of implementation.

Test 1: Failure to Demonstrate that There Is No Satisfactory Alternative

The Applicant concludes that monopile foundations are the only technically feasible foundation option for the Proposed Development. It acknowledges that gravity-base foundations may avoid or substantially reduce the underwater-noise effects giving rise to the need for a derogation, but dismisses that option by reference to technical feasibility, cost,

supply-chain availability, carbon emissions and seabed footprint. Suction-bucket jacket foundations are also rejected by reference to the dynamic nature of the seabed.

Blue Ireland submits that this analysis requires particularly careful scrutiny. The "no satisfactory alternative" test under Article 16 and Regulation 54 must begin by identifying the objective of the activity for which derogation is sought and determining whether that objective could be achieved through an alternative that would avoid, or cause less impact upon, the species subject to strict protection. The test should not begin from the assumption that the Applicant's preferred location, project scale, turbine arrangement, foundation design and construction programme are fixed and must all be preserved.

It is therefore not sufficient merely to demonstrate that an alternative would be less convenient, less commercially mature, more expensive, associated with a different environmental footprint or inconsistent with the Applicant's preferred design. Those considerations may be relevant, but they do not dispense with the need for a transparent comparison of alternatives from the perspective of the protected species and the effects for which the derogation is required.

The assessment should transparently compare, insofar as relevant:

1. alternative project locations or development areas;
2. alternative project scales;
3. a reduced number of turbines;
4. alternative turbine and foundation layouts;
5. alternative foundation types, including mixed-foundation solutions where conditions vary across the development area;
6. alternative pile dimensions;
7. lower maximum hammer energies;
8. alternative installation or noise-abatement technologies;
9. seasonal restrictions designed to avoid sensitive periods;
10. a longer or differently sequenced construction programme capable of reducing simultaneous or concentrated disturbance;
11. sequencing designed to avoid periods of particular ecological sensitivity;
12. alternative cable and offshore-substation configurations; and
13. the do-nothing alternative.

The derogation application form itself requires alternatives to be compared by reference to their effects upon the species subject to strict protection and requires the reasons for selecting the proposed approach to be made clear. However, the Applicant's assessment appears substantially to reproduce the reasoning of a conventional project-design alternatives chapter, in which engineering deliverability, commercial considerations, supply-chain constraints and carbon are relied upon to defend the selected option. Without a

separate and transparent protected-species comparison, that does not demonstrate the absence of a satisfactory alternative for the purposes of Article 16 and Regulation 54.

The Applicant states that gravity-base foundations are not technically feasible because of seabed mobility and that suction-bucket jacket foundations would not be feasible because of the dynamic nature of the seabed. However, the Applicant's earlier physical-process material describes Arklow Bank as mobile at bed level but dynamically stable overall due to its physical and hydrodynamic characteristics.

Blue Ireland does not suggest that this description, of itself, proves the technical feasibility of gravity-base, suction-bucket or any other particular foundation solution. Rather, it demonstrates the need for the categorical rejection of lower-noise alternatives to be supported by identifiable, location-specific geotechnical and engineering evidence.

In particular, the following information should be clearly identified or provided:

1. the technical and environmental criteria used in screening foundation alternatives;
2. the geotechnical data relied upon;
3. location-specific evidence concerning seabed mobility and foundation suitability;
4. the engineering studies undertaken concerning gravity-base and suction-bucket feasibility;
5. the assumptions used in comparing capital and operational costs;
6. the vessel, port and supply-chain assumptions relied upon;
7. the methodology and assumptions used in comparing embodied and operational carbon;
8. the assessment undertaken of mixed-foundation solutions;
9. the assessment undertaken of a reduced number of turbines, alternative turbine capacities or a reduced project area; and
10. an explanation of whether foundation alternatives were rejected uniformly across the entire development area or assessed separately at individual foundation locations.

The Applicant should also explain whether the asserted technical constraints apply equally to both project design options and to every proposed foundation location. A conclusion that monopiles are the "only technically feasible" option cannot be treated as determinative merely because it is expressed categorically. It must be demonstrated by the evidence underlying that conclusion.

The same difficulty arises at the broader project level. The Regulation 54 assessment cannot define the objective so narrowly as the construction of the Applicant's preferred 800 MW project, within the inherited Arklow Bank development area, using the selected turbine numbers, foundation type and construction programme. Such a formulation would predetermine the outcome by treating every material element of the chosen option as part of the objective against which alternatives are tested.

The relevant inquiry is whether the legitimate public-interest objectives relied upon by the Applicant could be achieved through another satisfactory approach causing less disturbance or other harm to the species subject to strict protection. That requires genuine consideration not only of alternative foundation designs, but also of location, scale, layout, construction timing and other measures capable of avoiding or materially reducing the need for derogation.

Accordingly, Blue Ireland submits that the material presently provided does not transparently demonstrate that the alternatives were assessed from the perspective required by the strict-protection regime. Nor does it establish, by reference to the underlying technical and environmental evidence, that no satisfactory alternative exists which could achieve the relevant project objectives while avoiding or reducing the effects upon Annex IV species.

Test 2: Failure to Demonstrate the Permitted Public-Interest Justification Relied Upon

The Applicant relies on Regulation 54(2)(c), asserting that the derogation is justified:

"In the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment."

Blue Ireland recognises that the decarbonisation of the electricity system, increased renewable-energy generation, security of supply and reduced dependence upon imported fossil fuels are legitimate and important public-policy objectives. Blue Ireland supports the transition to renewable energy. However, general national support for offshore renewable energy does not, of itself, demonstrate that the particular activity for which derogation is sought satisfies Regulation 54(2)(c).

The assessment must identify the particular public interest served by the activity requiring derogation and explain, by reference to the evidence concerning the contemporary project, why that interest is properly characterised as imperative and overriding. The inquiry must relate to the project actually proposed, the activities that will disturb strictly protected species and the present conservation circumstances of those species. It cannot be resolved in advance merely by citing national renewable-energy policy or the nominal generating capacity of the Proposed Development.

The derogation application relies heavily upon the proposed contribution of approximately 800 MW to Ireland's renewable-energy and climate objectives. It also estimates carbon savings associated with the Proposed Development. Those matters may form part of the public-interest case, but the evidential basis and assumptions underlying them must be made clear.

In particular, the relevant decision-maker should identify whether the principal public interest relied upon is:

1. the displacement of existing fossil-fuel electricity generation;
2. the provision of additional renewable generation to accommodate increasing electricity demand;
3. security of electricity supply;
4. progress towards national renewable-energy and climate targets;
5. beneficial environmental consequences arising from reduced greenhouse-gas emissions; or
6. some combination of those objectives.

The distinction is material because the available information indicates that ABWP2 is closely connected with the development of Echelon's Arklow campus at the Avoca River Business Park, publicly promoted as Ireland's first "Green Energy Park" (Appendix 3: Echelon). The centrepiece of that development is a 220 kV substation being co-developed by Echelon and SSE Renewables to facilitate connection of the campus to the proposed output of Arklow Bank Wind Park Phase 2.

The data-centre development has planning permission for an initial phase involving approximately 90 MW of IT load, with further proposals capable of increasing the scale of the campus substantially. Planning permission has also been granted for extensive on-site standby fossil-fuel generation associated with the development.

Blue Ireland does not suggest that supplying renewable electricity to a data centre is, of itself, an illegitimate purpose. The relevant issue is whether the claimed climate, decarbonisation and security-of-supply benefits of this particular project have been transparently demonstrated on the correct factual basis.

Where the Proposed Development forms part of the infrastructure supporting substantial new electricity demand, the addition of renewable generating capacity cannot be equated with the displacement of an equivalent quantity of existing fossil-fuel generation. Independent expert commentary included at Appendix 4, from Professor Hannah Daly, questions whether increased renewable generation necessarily produces the claimed displacement where electricity demand is simultaneously rising substantially.

The asserted climate benefits should therefore not simply be assumed. The assessment should explain:

1. the anticipated destination and use of the electricity generated by ABWP2;
2. the extent to which the project is expected to displace existing fossil-fuel generation rather than supply additional demand;
3. the assumptions concerning electricity-demand growth used in estimating the project's emissions benefits;
4. the treatment of data-centre demand within those assumptions;
5. the relationship between the Proposed Development and the Echelon Arklow campus;
6. the basis for any claimed contribution to security of supply;

7. the methodology used to estimate the asserted carbon savings; and
8. whether the absence of support for the project through the Offshore Renewable Energy Support Scheme affects the Applicant's explanation of the project's expected contribution to the State's 2030 renewable-energy objectives.

The public-interest assessment must also take account of the conservation interests affected by the derogation. Those include:

- the strict protection afforded to harbour porpoise and other cetaceans;
- the scale and duration of the proposed foundation-installation works;
- the admitted potential for deliberate disturbance, displacement and reduction in occupied area;
- the ecological characteristics and sensitivity of Arklow Bank;
- the potential for repeated and cumulative disturbance;
- the concentration of offshore renewable-energy development within the Irish and Celtic Seas; and
- the reported Unfavourable–Inadequate conservation status of harbour porpoise.

Any uncertainty concerning the affected populations, regional trends, repeated exposure or the ecological consequences of displacement should be addressed expressly. It should not be treated as a basis for reducing the weight afforded to the official conservation-status assessment or for assuming that the asserted benefits of the project must prevail.

The contemporary project also differs fundamentally from the project originally conceived more than twenty-five years ago. The Government recognised in 2019 that legacy offshore-wind developers intended to redesign their projects using substantially fewer but much larger turbines and that the applicable environmental-assessment regime had materially changed. The public-interest case must therefore concern the present project, its current scale, design, construction methods, environmental effects and intended function. It cannot rest simply upon the historical progression of a legacy project into the present planning system.

Finally, even a strong public-interest case cannot cure a failure to satisfy the other cumulative requirements of Article 16 and Regulation 54. It does not demonstrate that there is no satisfactory alternative, nor does it establish that the derogation will not be detrimental to maintaining the populations concerned at favourable conservation status in their natural range. The advanced procedural status of ABWP2 likewise does not prove that this particular project, at this particular location and in its proposed form, is the only means by which Ireland's renewable-energy objectives can be pursued.

Blue Ireland therefore submits that the decision on the derogation must identify precisely the permitted public-interest justification relied upon and demonstrate, by reference to project-specific evidence, why it is sufficient to support the derogation sought. General reliance upon offshore-wind policy, renewable-energy targets and the stated capacity of the

project does not, without that analysis, discharge the requirement under Regulation 54(2)(c).

The material from Professor Hannah Daly referred to above is included at Appendix 4 and is relied upon for the limited proposition that additional renewable generation should not automatically be equated with the displacement of existing fossil-fuel generation where substantial additional electricity demand is being created concurrently.

Test 3: Failure to Demonstrate that the Derogation Will Not Be Detrimental to the Maintenance of the Populations Concerned at Favourable Conservation Status

Regulation 54 requires a positive evidential conclusion that the proposed derogation will not be detrimental to the maintenance of the populations of the species concerned at favourable conservation status in their natural range. This is a distinct and cumulative statutory requirement. It is not satisfied merely because the project is considered to serve an important public interest, because mitigation measures are proposed, or because a population model does not predict a long-term decline.

The Applicant concludes that the proposed derogation will not be detrimental to the maintenance of the relevant cetacean populations at favourable conservation status. That conclusion appears to rest principally upon the propositions that:

1. the principal effect will be temporary behavioural disturbance during foundation installation;
2. the proposed mitigation will substantially reduce the risk of injury and minimise disturbance;
3. only a relatively small proportion of the relevant management-unit or reference population is predicted to be affected during an individual piling event; and
4. the iPCoD modelling does not predict a material adverse change in population trajectory, survival, breeding success or reproductive ability.

Blue Ireland submits that those propositions do not, without further explanation and supporting evidence, demonstrate the positive conclusion required by Regulation 54.

Current Conservation Status of Harbour Porpoise

The scientific context within which the statutory test must be applied is particularly important. NPWS's 2025 Article 17 assessment records harbour porpoise as having an overall conservation status of Unfavourable–Inadequate (see Appendix 7 and 8). It identifies uncertainty in population trends, evidence suggesting regional declines and range constriction, an estimated population below the Favourable Reference Population, existing anthropogenic pressures and the prospect of increasing pressure associated with offshore renewable-energy development.

Independent commentary by the Irish Whale and Dolphin Group on the ObSERVE Phase II survey results, included at Appendix 6, describes the available evidence as indicating a

harbour porpoise “population under pressure” and emphasises the need for a precautionary approach to underwater noise associated with offshore wind development.

These matters do not, of themselves, determine the derogation application. They do, however, establish the conservation context in which the Applicant’s evidence must be evaluated. Where the competent conservation authority’s own assessment identifies an unfavourable conservation status, regional concerns, acknowledged uncertainty and increasing anthropogenic pressures, the evidential burden is not reduced. The Applicant must demonstrate, by robust and transparent scientific evidence, why the disturbance authorised by this particular derogation would nevertheless not be detrimental to maintaining the populations concerned at favourable conservation status.

The application contains detailed assessments of underwater-noise propagation, estimated disturbance ranges and proposed mitigation. It is considerably less clear how those assessments are translated into the positive statutory conclusion. Demonstrating that mitigation reduces injury risk or disturbance does not, of itself, demonstrate that the residual disturbance is compatible with maintaining the populations concerned at favourable conservation status.

Reliance upon Broad Management-Unit Percentages

The Applicant expresses the predicted effects substantially by reference to percentages of broad management units or reference populations. Such figures may be relevant to one part of the conservation-status assessment, but they cannot substitute for an examination of the location, repetition and ecological circumstances of the effects.

Reliance upon a broad management-unit denominator risks obscuring:

1. the concentration of effects within Arklow Bank and adjacent coastal waters;
2. the repeated exposure of animals occurring locally;
3. potential effects upon groups or individuals exhibiting site fidelity;
4. effects upon females and dependent young;
5. seasonal differences and peaks in the use of the development area;
6. the ecological importance and productivity of the Arklow Bank habitat;
7. repeated displacement from overlapping or successive construction activities; and
8. cumulative displacement associated with other Irish Sea projects.

The fact that the predicted number of animals affected during an event represents a comparatively small percentage of a broad management-unit population does not establish that the affected area is interchangeable or ecologically unimportant. Nor does it establish that the same animals will not be exposed repeatedly.

A management-unit percentage is therefore not a complete answer to the question whether local habitat use and function will be impaired, whether occupied areas will be repeatedly

rendered unavailable, or whether animals displaced from Arklow Bank will have access to suitable and ecologically equivalent habitat elsewhere.

This concern is reinforced by the fact that the predicted disturbance figures are expressed per piling event rather than as the maximum number of animals affected across the complete construction programme. The assessment must therefore explain how the event-level percentages relate to repeated foundation installation, overlapping disturbance footprints and cumulative exposure over the entire period of works.

Reliance upon iPCoD Population Modelling

The Risk Assessment relies upon iPCoD outputs indicating that harbour porpoise, minke whale and bottlenose dolphin populations are expected to remain stable or increase and that the predicted disturbance will not result in material changes in survival, breeding success, reproductive ability or population trajectory.

Population modelling may be relevant to the Regulation 54 test. However, the absence of a modelled population decline is not equivalent to proof that the derogation will be non-detrimental. The model outputs must be assessed by reference to their structure, inputs, assumptions, uncertainty and sensitivity to alternative assumptions.

The following matters should therefore be clearly disclosed and critically evaluated:

1. the structure and version of the population model used;
2. the population data and reference populations adopted;
3. the density estimates applied within and around the project area;
4. the demographic parameters used;
5. the assumptions concerning the duration of each disturbance event;
6. the assumed period and extent of recovery following disturbance;
7. the treatment of repeated exposure of the same animals;
8. the treatment of cumulative and sequential projects;
9. the assumed relationship between disturbance and survival, reproduction or other vital rates;
10. the uncertainty ranges attached to the model inputs and outputs;
11. the sensitivity analyses undertaken;
12. whether the model assumes that displaced animals successfully relocate;
13. whether the availability and ecological equivalence of alternative habitat are assessed;
14. whether prey effects and the energetic costs of avoidance are incorporated; and
15. whether the population estimates and conservation-status information used are current and precautionary.

In particular, the assessment should explain whether the modelling assumes that displaced animals can relocate without material energetic, feeding, reproductive or survival

consequences. If successful relocation is assumed rather than demonstrated, a stable modelled trajectory cannot also be relied upon as independent evidence that suitable alternative habitat is available and that displacement is harmless.

Where substantial biological uncertainty remains, a central, median or most-likely model trajectory cannot by itself demonstrate compliance with the precautionary requirement. The competent authorities should not treat the asserted absence of a predicted population decline as equivalent to proof that the derogation will not be detrimental.

The Article 12 Offence and the Article 16 Test Must Remain Distinct

The population-level assessment must also be kept distinct from the prior question of whether a protected-species offence will occur. The application appears, in relation to certain activities, to rely upon the absence of a predicted population-level effect as a reason for concluding that no deliberate-disturbance offence arises.

Those are separate legal and ecological questions. The absence of a modelled adverse effect upon the long-term trajectory of an entire management-unit population does not establish that individual Annex IV animals will not be deliberately disturbed, displaced or excluded from occupied areas.

Population-level modelling is relevant when determining whether a derogation would be detrimental to favourable conservation status. It does not replace the prior assessment of whether the planned activity, undertaken with knowledge of the likely presence of protected animals, will cause a prohibited disturbance or other effect under Regulation 51.

Conclusion on Favourable Conservation Status

The application does not clearly demonstrate:

1. how the predicted residual disturbance is compatible with maintaining the populations concerned at favourable conservation status;
2. how that conclusion has been reached in light of the Unfavourable–Inadequate status reported for harbour porpoise;
3. how local, repeated and seasonally concentrated effects at Arklow Bank have been addressed;
4. how the per-event disturbance estimates have been translated into an assessment covering the complete construction sequence;
5. how repeated exposure and cumulative regional disturbance have been incorporated;
6. how the assumptions and uncertainties within the iPCoD modelling affect the statutory conclusion; or
7. why acknowledged uncertainty can safely support a positive conclusion that the derogation will not be detrimental.

Accordingly, while the Applicant has presented detailed modelling and mitigation proposals, Blue Ireland submits that the material does not transparently demonstrate the positive proposition required by Regulation 54: that the derogation will not be detrimental to maintaining the populations of the species concerned at favourable conservation status in their natural range, a status that is already recorded as being 'unfavourable/under pressure'.

(viii) Previous Derogations and the Connected History of Disturbance at Arklow Bank

The Regulation 54 application identifies four previous cetacean derogations associated with the Arklow Bank site:

1. DER-CETACEAN-2024-127;
2. DER-CETACEAN-2023-58;
3. DER-CETACEAN-2023-33; and
4. DER-CETACEAN-2022-148.

The application states that the numbers of animals affected were returned to NPWS. However, the identification of the previous derogation numbers and the submission of individual returns do not, without further analysis, amount to a cumulative assessment of the disturbance history of the site.

The application does not present, in one transparent account:

1. the particular activities authorised under each derogation;
2. the dates and duration of the authorised activities;
3. the geographic areas affected;
4. the sound-producing equipment and operating parameters used;
5. the species and numbers observed;
6. the number and duration of MMO watches and the total observation effort;
7. the extent of operations undertaken during darkness, poor visibility or adverse weather;
8. whether passive acoustic monitoring was employed;
9. the occurrence of shutdowns, delays or other mitigation interventions;
10. whether activities authorised under different derogations overlapped spatially or temporally;
11. whether the same areas or animals may have been affected repeatedly; and

12. how the results and experience of those earlier activities have informed the present assessment and mitigation proposals.

Arklow Bank has therefore been subject to a succession of intrusive site-investigation campaigns and is now proposed to undergo a substantially more intensive construction programme. Those activities should be considered as a connected history of disturbance affecting the same sandbank ecosystem and potentially the same animals. They should not be treated as unrelated licensing events merely because they were authorised separately.

The cumulative question is not confined to whether the earlier activities produced an identifiable population-level decline. Successive investigations may have:

- displaced animals repeatedly from the same or overlapping areas;
- altered patterns of use of the bank;
- affected feeding opportunity;
- habituated or sensitised animals to vessel and acoustic activity;
- created overlapping or successive periods of disturbance; and
- contributed to the environmental baseline against which the proposed construction effects must now be assessed.

Earlier Arklow documentation recognised that cumulative effects may arise from the combined action of past, present and reasonably foreseeable activities and that completed activities may remain relevant as part of the existing environmental baseline. The present derogation application does not appear to apply that principle transparently to the Applicant's own succession of surveys and earlier derogations.

DER-CETACEAN-2024-127

The application includes DER-CETACEAN-2024-127 in its list of earlier derogations but does not explain its subsequent legal or procedural history.

Blue Ireland understands that DER-CETACEAN-2024-127 became the subject of judicial-review proceedings. The precise status, outcome and consequences of those proceedings should be confirmed by reference to the relevant court record before any definitive conclusion is reached. At a minimum, the Applicant should disclose:

1. that the earlier derogation became the subject of legal proceedings;
2. the outcome of those proceedings;
3. whether the derogation remained operative;
4. whether any legal or procedural defects were conceded or identified;
5. whether the activities associated with the derogation proceeded; and

6. how the present application differs from, or addresses any issue arising from, the earlier decision-making process.

A bare list of previous derogation numbers may create the impression of an unqualified history of prior authorisations. That presentation would be incomplete if one of the identified derogations was subsequently withdrawn, set aside, quashed or otherwise materially affected by legal proceedings.

Blue Ireland does not invite An Coimisiún Pleanála to determine the legal effect of those proceedings without the relevant record. It submits that the Applicant's reliance upon the history of previous derogations must be complete and accurate and that any material legal history should be disclosed.

Arklow Bank Wind Park Phase 1 and Its Foreseeable Decommissioning

The Annex IV Risk Assessment records that Arklow Bank Wind Park Phase 1 consists of seven turbines and associated cabling, has reached the end of its operational life and is entering a process concerning its decommissioning and removal.

The cumulative assessment should therefore address:

1. the continuing operation and maintenance of Arklow Bank Wind Park Phase 1;
2. associated vessel movements and underwater noise;
3. the proposed timing of decommissioning works;
4. the removal of turbines and foundations;
5. cable-removal, cable-protection and seabed works;
6. sediment disturbance;
7. the relationship between the decommissioning programme and ABWP2 construction; and
8. the possibility of simultaneous or closely sequential disturbance.

The existing wind farm should not be treated solely as static background infrastructure. Its decommissioning is a reasonably foreseeable activity affecting the same sandbank ecosystem and potentially the same marine-mammal receptors.

If the decommissioning of Phase 1 overlaps with, or occurs shortly before or after, the construction of Phase 2, the assessment must consider whether animals displaced by one activity will have sufficient opportunity to return and resume normal ecological functions before being affected by the next.

Other Regional Plans and Projects

The broader regional concentration of offshore development is addressed in subsection (i) above. For the purposes of the Regulation 54 assessment, the issue must be considered through a genuine cumulative-disturbance analysis rather than through a list of projects followed by separate conclusions that each project's effects are negligible.

The assessment should identify relevant completed, authorised and reasonably foreseeable activities within the disturbance and movement ranges of the affected species, including, where applicable:

- offshore-wind construction and site investigations;
- subsea cables and interconnectors;
- port, harbour and coastal-infrastructure works;
- dredging;
- seismic, geophysical and geotechnical surveys;
- Arklow Bank Wind Park Phase 1 decommissioning;
- Codling and Dublin Array activities; and
- other Irish Sea projects capable of affecting the same management-unit populations.

It should then assess:

1. the potential for temporal overlap;
2. repeated exposure of the same animals;
3. spatially shifting disturbance;
4. the availability of suitable and comparatively undisturbed habitat;
5. the possibility that animals displaced from one project may encounter disturbance from another;
6. cumulative effects upon prey and foraging opportunity; and
7. the combined duration for which important areas may be unavailable.

A series of effects described separately as temporary and recoverable may become prolonged, recurrent or effectively continuous when successive surveys, construction works, decommissioning operations and regional projects affect an interconnected marine environment.

Accordingly, Blue Ireland submits that the present application does not provide a sufficiently transparent assessment of the connected history of past disturbance at Arklow Bank, the foreseeable effects of Phase 1 decommissioning and the combined effects of other relevant activities upon the availability of undisturbed habitat.

(ix) The Proposed 2028–2030 Period and the Need for Future Derogation Decisions

The Regulation 54 application identifies a proposed derogation period extending from 2028 to 2030. However, the application form itself expressly states:

"A derogation will only be issued with a start and end date within a calendar year."

On the face of the application form, the present application cannot support a single derogation authorising activities throughout 2028, 2029 and 2030. At most, any derogation issued on foot of the application could have start and end dates within one calendar year.

If disturbance-generating works are intended to continue in later calendar years, further Regulation 54 decisions would therefore appear to be required. Those later decisions would provide an opportunity for the Regulation 54 decision-maker to consider, in light of the circumstances then existing:

1. the construction works actually completed during the preceding year;
2. the actual number, location and duration of piling events;
3. the hammer energies and installation methods actually employed;
4. Marine Mammal Observer and passive acoustic monitoring records;
5. the effectiveness of the mitigation measures implemented;
6. the species and numbers observed;
7. any evidence of displacement, delayed return or repeated exposure;
8. changes in the conservation status or scientific understanding of the affected species;
9. cumulative effects arising from other projects or activities;
10. changes to the proposed construction sequence; and
11. whether the cumulative conditions for granting a further derogation remain satisfied.

The planning application, by contrast, seeks permission for a multi-year construction programme. The disturbance-generating activities proposed for later calendar years would therefore depend upon further Regulation 54 decisions.

Those later decisions remain unresolved and will necessarily depend upon evidence and circumstances that are not presently available, including the results of earlier construction and monitoring, changes in regional project activity and any new information concerning the affected species.

An Coimisiún Pleanála should therefore address how the complete Proposed Development is said to be capable of implementation consistently with Article 12 and Regulation 51 where:

1. the present derogation application cannot authorise the complete 2028–2030 construction programme;
2. the activities to be undertaken in each calendar year are not clearly separated;
3. any derogation applications required for subsequent calendar years have not yet been made or determined;
4. the conditions imposed upon later derogations may differ from those presently anticipated;
5. monitoring may identify effects greater or different from those predicted;
6. a later application may be restricted or refused;
7. construction sequencing, piling methods or hammer energies may change; and
8. later phases may overlap with disturbance arising from other projects.

Blue Ireland does not suggest that the need for further derogations for later calendar years necessarily prevents the Commission from determining the planning application. The concern is that the existence of the present application cannot be treated as demonstrating that the entire construction programme has secured, or is presently capable of securing, the required strict-protection authorisation.

Nor should the Commission assume that later derogations will necessarily be granted on the same terms, or at all. Such an assumption would pre-empt the distinct statutory assessment required in each later year and would disregard the purpose of considering updated monitoring, mitigation, scientific and cumulative-effects information.

The Applicant should therefore be required to clarify:

1. the precise calendar year for which the present derogation is sought;
2. the particular activities proposed to be undertaken during that year;
3. the number and locations of the foundations proposed to be installed during that period;
4. the activities that will require separate applications in later years;
5. how the construction programme would respond if a subsequent derogation were delayed, restricted or refused;
6. whether piling or other disturbance-generating works can be separated into independently implementable calendar-year phases; and
7. how the Commission should assess the environmental and legal implications of a project whose later construction stages depend upon future statutory decisions.

Until those matters are clarified, the proposed period of 2028–2030 should not be presented as though it were the duration of a single available derogation or as though the strict-protection authorisation required for the complete construction programme had already been resolved.

(x) Species Omitted from the Derogation Application

The Regulation 54 application identifies dolphin, whale and porpoise as the species groups for which derogation is sought. The relevant boxes concerning otter and marine turtles are not selected.

The omission of a species from the application form does not, of itself, demonstrate that no offence under Regulation 51 is capable of arising. The Applicant must provide a reasoned and evidence-based assessment of the relevant species and project pathways before concluding that no derogation is required.

Otter

The complete Proposed Development is not confined to the offshore array. It includes export cables extending towards the coast, a nearshore cable corridor and working area, landfall activities and associated vessel and construction operations.

The assessment of otter must therefore connect the offshore, nearshore, intertidal and coastal components of the Proposed Development. It should not proceed upon an assumption that otter use is confined to terrestrial or freshwater habitat.

Otters may use:

1. coastal and nearshore waters;
2. intertidal habitat;
3. estuaries and river mouths;
4. beaches and rocky shore;
5. nearshore feeding areas;
6. routes connecting freshwater, estuarine and marine habitats; and
7. coastal breeding sites and resting places.

The Applicant should identify the evidence relied upon to exclude the possibility of an offence under Regulation 51 in relation to otter. The assessment should address, where relevant:

1. the location and extent of otter surveys;
2. the timing and seasonal coverage of those surveys;

3. coastal and nearshore records of otter activity;
4. holts, couches, resting places and commuting routes;
5. disturbance from landfall and cable-corridor works;
6. vessel movements and construction noise;
7. artificial lighting;
8. obstruction or alteration of access routes;
9. effects upon prey resources;
10. pollution and accidental-release pathways;
11. habitat fragmentation or severance; and
12. cumulative effects arising from the offshore, nearshore and onshore elements of the project.

Until that connected assessment is presented, the omission of otter from the derogation application cannot be treated as self-validating. The relevant question is not merely whether the Applicant has chosen to seek a derogation for otter, but whether the evidence demonstrates that the project will not give rise to an offence requiring one.

Marine Turtles

The box concerning marine turtles is likewise left unticked.

Blue Ireland does not contend, on the basis of the presently available material alone, that a derogation for marine turtles must necessarily be granted or sought. However, the absence of a selected box cannot replace a reasoned screening assessment of whether any relevant Regulation 51 pathway exists.

The Applicant should identify the evidence relied upon to exclude effects upon marine turtles, including, where relevant:

1. regional occurrence and stranding records;
2. the potential presence of occasional or migratory individuals;
3. whether the project area or associated vessel routes intersect areas used by such individuals;
4. vessel-strike or collision risk;
5. underwater-noise effects;
6. entanglement risk;
7. pollution and marine-debris pathways;

8. artificial lighting;
9. construction and operational activities; and
10. cumulative effects with other marine activity.

The assessment should make clear whether marine turtles were screened out because the evidence demonstrated that no relevant pathway exists, or whether they were omitted because their occurrence was considered infrequent. Infrequency of occurrence does not, without further analysis, demonstrate the absence of a potential offence in relation to an individual strictly protected specimen.

Accordingly, Blue Ireland submits that the Applicant should provide a complete, species-specific and pathway-specific explanation supporting the exclusion of otter and marine turtles from the Regulation 54 application. Until that assessment is available, An Coimisiún Pleanála should not treat the unticked boxes as demonstrating that the strict-protection requirements applicable to those species have been fully addressed.

(xi) Authorship, Relevant Expertise and Independent Scrutiny

The identity, qualifications and respective responsibilities of the persons responsible for the Regulation 54 application and the Annex IV Risk Assessment require clarification.

The derogation application identifies Marc Walshe as the person or ecologist submitting the application on behalf of the Applicant. The revised alternatives chapter describes Mr Walshe as a Consents Manager with qualifications in environmental engineering, renewable energy, planning and environmental law. It does not identify him as a specialist in marine-mammal ecology or bioacoustics.

The same material identifies Aoibhín Flanagan as a Consents Manager with qualifications in environmental science, environmental engineering and business management.

Blue Ireland does not question the professional standing or general competence of either individual. The issue is whether the particular specialist conclusions relied upon in the Regulation 54 application and Annex IV Risk Assessment were prepared and independently reviewed by persons with clearly identified and relevant expertise.

Those conclusions concern, among other matters:

1. cetacean breeding sites and resting places;
2. the ecological functionality of occupied areas;
3. behavioural disturbance and displacement;
4. underwater acoustics and bioacoustics;
5. population modelling and the interpretation of iPCoD outputs;

6. prey ecology and habitat use;
7. the effectiveness and disturbance consequences of mitigation;
8. the availability and ecological equivalence of alternative habitat;
9. cumulative and repeated exposure; and
10. the application of the Article 12 and Article 16 tests to the ecological evidence.

The Applicant should therefore provide a clear statement identifying:

1. the author or authors of each substantive section of the Annex IV Risk Assessment;
2. the qualifications and relevant experience of each author;
3. the persons responsible for the underwater-noise and bio-acoustic assessment;
4. the persons responsible for the marine-mammal ecological assessment;
5. the persons responsible for the population modelling and interpretation of its outputs;
6. the persons responsible for assessing breeding sites, resting places, prey and habitat functionality;
7. the persons who reviewed and approved the technical conclusions;
8. whether any independent specialist review was undertaken; and
9. the extent to which the person signing or submitting the application independently verified the underlying technical conclusions.

The inclusion of names within a general statement of authorship or authority does not, without more, establish who formulated, reviewed or verified the critical ecological conclusions.

Independent Scrutiny by the Competent Authorities

A substantial portion of the evidence relied upon has necessarily been prepared by the Applicant, its consultants or contractors for the purposes of obtaining consent and demonstrating compliance. That is normal within the planning and derogation processes. It does, however, require the competent authorities to examine the evidence independently rather than simply adopting the Applicant's terminology, assumptions or conclusions.

In particular, neither An Coimisiún Pleanála nor the Regulation 54 decision-maker should accept without independent examination:

1. the "water column" as a complete definition of a cetacean breeding site or resting place;

2. an effect described as “temporary” as necessarily insignificant or incapable of constituting deliberate disturbance;
3. an effect described as “recoverable” as equivalent to the absence of an offence;
4. avoidance or displacement as proof that mitigation has prevented disturbance;
5. broad management-unit percentages as proof that local effects are insignificant;
6. stable modelled population trajectories as proof that no detrimental effect can occur;
7. the submission of previous derogation returns as proof that cumulative effects have been assessed;
8. sparse operational MMO records as evidence of ecological absence or low site use;
9. the Applicant’s preferred engineering option as proof that no satisfactory alternative exists; or
10. the omission of a species from the application form as proof that no Regulation 51 pathway arises.

Independent scrutiny should include examination of the underlying data, assumptions, methodologies, uncertainty, sensitivity analyses and the logical steps connecting the scientific material to the legal conclusions asserted.

The relevant authorities must themselves determine:

1. the complete range of Regulation 51 offences that may arise;
2. the activities and species for which derogation may be required;
3. whether the three cumulative conditions under Regulation 54 are satisfied;
4. whether acknowledged scientific uncertainty has been addressed precautionarily; and
5. whether the complete Proposed Development is capable of lawful implementation consistently with the strict-protection regime required by the Habitats Directive.

Blue Ireland therefore submits that the Applicant should identify clearly the specialist authors and reviewers responsible for the critical ecological conclusions and that those conclusions should be subjected to demonstrably independent evaluation by the competent authorities before any reliance is placed upon the Regulation 54 application or Annex IV Risk Assessment.

(xii) Further Information Required and Overall Conclusion

The Applicant’s own assessment accepts that foundation installation will present a residual risk of deliberate disturbance notwithstanding the proposed mitigation. The Regulation 54

application is therefore not peripheral to the planning decision. It concerns an acknowledged protected-species offence arising from an essential construction activity.

An Coimisiún Pleanála must accordingly determine whether the project before it is capable of implementation consistently with the strict-protection requirements of Article 12 of the Habitats Directive and Regulation 51. The substance of that issue should not be deferred to a later derogation process while the existence of the present, unresolved derogation application is simultaneously relied upon as reassurance that the issue has been addressed.

The application presently before the Regulation 54 decision-maker:

1. seeks a derogation only in respect of deliberate disturbance under Regulation 51(2)(b);
2. excludes deterioration or destruction of breeding sites and resting places under Regulation 51(2)(d) through an unduly narrow "water column" analysis;
3. does not transparently assess the ecological functionality of breeding sites, resting places and occupied habitat;
4. treats mitigation-induced avoidance and displacement as evidence that disturbance has been prevented;
5. does not clearly translate per-event disturbance estimates across the complete construction programme;
6. relies substantially upon broad management-unit percentages and population modelling without fully exposing the local, repeated and cumulative effects;
7. does not provide a complete account of the history of previous derogations and disturbance at Arklow Bank;
8. proposes a period extending from 2028 to 2030 notwithstanding the identified calendar-year limitation;
9. depends upon future derogation decisions for construction activities proposed in later calendar years;
10. omits otter and marine turtles without a sufficiently clear species-specific explanation; and
11. does not identify with sufficient clarity the specialist authorship and independent review of the critical marine-mammal conclusions.

In those circumstances, Blue Ireland submits that An Coimisiún Pleanála cannot safely rely upon the present Regulation 54 application or Annex IV Risk Assessment as demonstrating that the Proposed Development is capable of implementation in accordance with Articles 12 and 16 of the Habitats Directive.

At a minimum, the Applicant should be required to provide:

1. a revised assessment of Regulation 51(2)(d), based upon the ecological functionality of breeding sites and resting places rather than solely upon the continued physical presence of the water column;
2. species-specific assessments of breeding, rearing and resting use within the areas potentially affected by the Proposed Development;
3. an integrated assessment of prey availability, foraging habitat, ecological connectivity and the physical and biological characteristics of Arklow Bank;
4. a complete construction-sequence assessment identifying every proposed foundation-installation event and the associated disturbance footprint;
5. an assessment of repeated and cumulative exposure across all turbine and offshore-substation foundation installations;
6. an assessment of acoustic deterrent devices, soft start, ramp up and restart procedures as potential disturbance-generating activities in their own right;
7. an explanation of the distinction applied between mitigation directed towards preventing physical injury and measures capable of causing behavioural avoidance or displacement;
8. a transparent account of the structure, inputs, assumptions, uncertainty ranges and sensitivity analyses underlying the iPCoD modelling;
9. an explanation of how local, repeated and seasonally concentrated effects at Arklow Bank have been addressed alongside broad management-unit population estimates;
10. a consolidated assessment of the four previous derogations, the activities authorised, the associated monitoring returns and the potential for repeated disturbance;
11. accurate disclosure of the legal and procedural history of DER-CETACEAN-2024-127;
12. a cumulative assessment of the continuing operation and foreseeable decommissioning of Arklow Bank Wind Park Phase 1;
13. a genuine cumulative-disturbance assessment of other relevant Irish and Celtic Sea plans and projects, including temporal overlap, repeated exposure and the availability of undisturbed habitat;
14. a strict-protection-specific assessment of satisfactory alternatives under Article 16 and Regulation 54;
15. the evidence supporting the rejection of lower-noise foundation types, mixed-foundation solutions and alternative installation methods;

16. an assessment of whether reduced project scale, an altered layout, fewer turbines, reduced hammer energies, seasonal restrictions or different construction sequencing could avoid or reduce the need for derogation;
17. clarification of the precise calendar year and activities to which the present Regulation 54 application relates;
18. an explanation of how future derogation decisions for later calendar years interact with the multi-year planning permission sought and how the project would respond if a later derogation were restricted, delayed or refused;
19. a complete connected assessment of potential Regulation 51 pathways affecting otter across the offshore, nearshore, intertidal and coastal parts of the Proposed Development;
20. a reasoned assessment of potential Regulation 51 pathways affecting marine turtles;
21. clear identification of the authors, technical specialists and reviewers responsible for each material component of the Annex IV Risk Assessment; and
22. demonstrably independent evaluation by the competent authorities of the underlying evidence, methodologies, assumptions, uncertainties and legal conclusions.

The central methodological concern may be stated simply. The Annex IV Risk Assessment acknowledges that breeding and resting may occur wherever the relevant cetaceans occur; that such places cannot be excluded from the vicinity of the Proposed Development; that an individual piling event may disturb up to 1,908 harbour porpoises and 259 bottlenose dolphins; and that reduction in occupied area, relocation and displacement may occur notwithstanding mitigation.

It nevertheless excludes Regulation 51(2)(d) principally because it characterises the protected place as the physical water column and concludes that the water column will remain intact.

That reasoning does not provide a coherent or precautionary application of the strict-protection requirements. The continued existence of seawater does not demonstrate the continued ecological functionality of a place used for breeding, rearing or resting. Nor does it demonstrate that animals deliberately displaced from such an area will have continuous access to suitable and ecologically equivalent habitat.

The concern is compounded by the treatment of acknowledged displacement as mitigation, the reliance upon event-level and management-unit figures, the incomplete assessment of repeated exposure, and the unresolved need for future derogation decisions covering later calendar years.

Blue Ireland therefore respectfully requests that An Coimisiún Pleanála require the identified information and undertake its own complete and precautionary assessment of whether the Proposed Development is capable of lawful implementation under the strict-protection regime. In the absence of that information and assessment, the Commission should not conclude that the Regulation 54 application and Annex IV Risk Assessment have resolved the acknowledged risks arising under Article 12 of the Habitats Directive. Neither can it conclude that the project can be lawfully consented unless issues relating to site selection and consideration of alternatives raised in this observation, and other related issues raised by others, are transparently and effectively resolved.

APPENDICES

Appendix 1 — Relevant extracts from the 2001 ABWP environmental assessment documentation, including the site-selection and consideration-of-alternatives material relied upon in this observation.

Appendix 2 — Departmental Briefing Note dated 6 June 2019 concerning the transition arrangements for legacy offshore-wind projects.

Appendix 3 — Echelon Arklow Green Energy Park material, including material concerning the Arklow campus, the proposed 220 kV substation and the relationship with Arklow Bank Wind Park Phase 2.

Appendix 4 — Professor Hannah Daly material concerning data-centre electricity demand, renewable generation and the displacement of fossil-fuel generation.

Appendix 5 — European Commission, April 2026 infringements package: *"Commission calls on Ireland to complete its network of marine Natura 2000 sites"*, infringement reference INFR(2026)2051.

Appendix 6 — Irish Whale and Dolphin Group, *"Porpoises Under Pressure in Irish Waters"*, commentary on the ObSERVE Phase II survey results.

Appendix 7 — NPWS, *Article 17 Habitats Conservation Assessments 2025- Volume 1*.

Appendix 8 — NPWS, *Article 17 Habitats Conservation Assessments 2025- Volume 3*: harbour porpoise species-assessment extract.

Appendix 9 — Court of Justice of the European Union, judgment of 16 July 2026 in Joined Cases C-27/25 and C-356/25, *SU and Wild Ireland Defence CLG v An Coimisiún Pleanála and Others; Paddy Massey v An Coimisiún Pleanála and Others*, concerning site-specific conservation objectives under Article 6(3) of the Habitats Directive

Appendix 1 - RFI Observation

DIRECT PLANNING APPLICATION TO AN BORD PLEANÁLA

in respect of

Arklow Bank Wind Park Phase 2 - RFI

Bord Pleanála Case Reference: OA27.319864

Submissions on Behalf of Blue Ireland Coalition CLG

Blue Ireland Coalition CLG, Garadice House, 3-4 Fairview, Dublin 3, Ireland.

	Date of Record	Brief Description	No. of Pages	Include in AIE Yes/No	Decision: Grant/Part Grant/Refuse
77	15/02/2011	Attachment EIS - Arklow Bank	411	yes	Grant

77

ENVIRONMENTAL IMPACT ASSESSMENT

ARKLOW BANK WIND PARK

FINAL REPORT

JUNE 2001

User is Responsible for Checking The Revision Status Of This Document

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TABLE OF CONTENTS

PAGE

PREAMBLE **1**

SITE SELECTION 1
SITE LAYOUT 1
PROJECT CONSTRUCTION 4
OPERATION OF THE WIND PARK 5
DECOMMISSIONING 6
ALTERNATIVES CONSIDERED 6

1. INTRODUCTION **7**

1.1. BACKGROUND TO WIND ENERGY DEVELOPMENT IN IRELAND, EUROPE AND THE REST OF THE WORLD 7
1.1.1. Status of the Industry in Ireland 7
1.2. BACKGROUND TO THE PROPOSED DEVELOPMENT 7
1.2.1. Benefits and Costs of Wind Energy 8
1.3. POLICY & LEGISLATION 9
1.3.1. Global Policy 9
1.3.2. European Renewable Energy Policy 11
1.3.3. Irish Policy 12
1.4. PLANNING POLICY GUIDELINES 15
1.4.1. Department of the Marine and Natural Resources: Offshore Electricity Generating Stations – Note for Intending Developers 15
1.4.2. The Marine Institute – Assessment of Impact of Offshore Wind Energy Structures on the Marine Environment 17
1.4.3. European Wind Energy Association – Best Practice Guidelines for Wind Energy Development 17
1.4.4. Countryside Council for Wales – Policy on Wind Turbines 18
1.4.5. BirdWatch Ireland's Policy on Wind Farms 19
1.5. STATUTORY REQUIREMENTS 19
1.6. EIS METHODOLOGY 22
1.6.1. Structure of the EIS 22
1.6.2. Data Sources 24
1.6.3. Assumptions 24
1.7. PRE-SUBMISSION CONSULTATIONS 26
1.8. CONTRIBUTORS 27

TABLE OF CONTENTS

PAGE

2. DESCRIPTION OF THE PROPOSED DEVELOPMENT 28

2.1. THE STUDY AREA 28
2.2. THE SITE 28
2.2.1. Wind Resource 29
2.2.2. Water Depth 30
2.2.3. Distance to Shore and to Grid Connection 32
2.2.4. Area Available for Development 32
2.2.5. Wave, Current and Tidal Climate 33
2.2.6. Sea Bed Conditions 34
2.2.7. Environmental Issues 35
2.2.8. Military Restrictions 35
2.2.9. Visual Impact 35
2.2.10. Petrochemical Installations and Pipelines 35
2.2.11. Power and Telecommunications Cables 35
2.2.12. Aggregate Extraction 36
2.2.13. Shipping 36
2.2.14. Aviation Activities 36
2.2.15. Fishing Activities 36
2.2.16. Summary of Factors Influencing Site Choice 37
2.3. THE PROPOSED DEVELOPMENT 37
2.3.1. Turbine Design 38
2.3.2. Foundation 41
2.3.3. Turbine Layout 53
2.3.4. Grid Connection Point 54
2.3.5. Route for Connection to Shore 57
2.4. CONSTRUCTION PHASE ON SHORE 59
2.4.1. Employment Onshore 59
2.4.2. Traffic Onshore 61
2.4.3. Onshore Material Requirements 62
2.4.4. Temporary Onshore Structures and Facilities 62
2.4.5. Onshore Wastes, Residues, and Emissions 64
2.5. CONSTRUCTION PHASE OFF SHORE 65
2.5.1. Employment Off Shore 66
2.5.2. Shipping Traffic 66
2.5.3. Material Requirements Off Shore 67
2.5.4. Temporary Off Shore Structures/Marine Plant 67
2.5.5. Off Shore Wastes, Residues, and Emissions 68
2.6. OPERATIONAL PHASE 69
2.6.1. Employment 71
2.6.2. Traffic 71
2.6.3. Material Requirements 71
2.6.4. Wastes, Residues, and Emissions 72
2.6.5. Life Span 73
2.7. DECOMMISSIONING 73

TABLE OF CONTENTS

PAGE

3. ALTERNATIVES CONSIDERED 76

3.1. ALTERNATIVE LOCATIONS 76
3.1.1. West Coast Sites 76
3.1.2. Off East Cork/West Waterford Coast 79
3.1.3. East Coast Sites 79
3.2. ALTERNATIVE SITES ONSHORE 80
3.3. ALTERNATIVE CONNECTION POINTS TO THE NATIONAL GRID 81
3.4. ALTERNATIVE ROUTES FOR CONNECTION TO SHORE 81
3.5. ALTERNATIVE TURBINE LAYOUTS 81
3.6. ALTERNATIVE TURBINE TYPES 82
3.6.1. Alternative Turbine Manufacturers 82
3.6.2. Direct Drive Machines 82
3.6.3. Multibrid Technology 83
3.6.4. Turbines Designed for Off Shore Locations 83
3.7. ALTERNATIVE FOUNDATIONS 86
3.7.1. Floating Structures 86
3.8. ALTERNATIVE SOURCES OF POWER 88
3.8.1. Brown Power 88
3.8.2. Other Green Electricity Sources 88
3.9. DO NOTHING ALTERNATIVE 89

4. HUMAN BEINGS 90

4.1. HUMAN BEINGS IN THE EXISTING ENVIRONMENT 90
4.1.1. Noise 90
4.1.2. Traffic 95
4.1.3. Shipping, Navigation, Undersea Cables and Pipelines 95
4.1.4. Recreational Activities 99
4.1.5. Aviation 100
4.1.6. Commercial 100
4.2. CHARACTERISTICS OF THE DEVELOPMENT WHICH COULD IMPACT ON HUMAN BEINGS 100
4.2.1. Noise 100
4.2.2. Traffic 101
4.2.3. Health & Safety 102
4.2.4. Socio-Economic Impacts 104
4.2.5. Shipping, Navigation and Undersea Cables and Pipelines 105
4.3. CONSEQUENCES 108
4.3.1. Oil spillage due to Collision 108
4.3.2. Oil spillage due to cable damage from anchors - external cables 108
4.3.3. Recreational Activities 108
4.3.4. Aviation 109
4.3.5. Commercial Fishing 109
4.4. MITIGATION MEASURES 109
4.4.1. Noise 109
4.4.2. Traffic 109
4.4.3. Health & Safety 110
4.4.4. Socio-Economics 111
4.4.5. Shipping, Navigation and Undersea Cables and Pipeline 111
4.4.6. Recreational Activities 111
4.4.7. Aviation 112
4.4.8. Commercial Fishing 112

TABLE OF CONTENTS

PAGE

5. PHYSICAL ENVIRONMENT 113

5.1. EXISTING ENVIRONMENT 113
5.1.1. Bathymetry *115*
5.1.2. Hydrography *115*
5.1.3. Sedimentology *116*
5.1.4. Waves *117*
5.1.5. Currents *118*
5.2. CHARACTERISTICS OF THE DEVELOPMENT WHICH COULD IMPACT ON THE ENVIRONMENT 119
5.3. MITIGATION MEASURES TO REDUCE THE IMPACT ON THE PHYSICAL ENVIRONMENT 119

6. AIR & CLIMATE 122

6.1. CLIMATE IN THE EXISTING ENVIRONMENT 122
6.2. POTENTIAL IMPACTS OF THE DEVELOPMENT ON CLIMATE 126
6.3. MITIGATION MEASURES 127

7. CULTURAL HERITAGE/ARCHAEOLOGY 128

7.1. INTRODUCTION 128
7.2. ARCHAEOLOGICAL DESK BASED STUDY 128
7.3. ASSESSMENT REPORT SUBMARINE WRECK 130
7.4. GEOPHYSICAL SURVEYS 131
7.5. RESULTS OF GEOPHYSICAL SURVEY 131
7.6. IMPACT OF THE PROPOSED DEVELOPMENT ON ARCHAEOLOGY 133
7.7. MITIGATION MEASURES 133

8. COMMERCIAL FISHERIES WITHIN THE STUDY AREA 134

8.1. INTRODUCTION 134
8.2. REVIEW OF EXISTING INFORMATION 134
8.2.1. Arklow Fisheries *134*
8.2.2. Finfish *135*
8.2.3. Shellfish *143*
8.3. GROUND FISH AND JUVENILE PLAICE SURVEY 152
8.4. FISH EGGS AND LARVAL SURVEY 153
8.5. POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT 157
8.5.1. Short term *157*
8.5.2. Long term *158*
8.6. MITIGATION MEASURES PROPOSED BY THE DEVELOPER 160
8.7. REFERENCES 161

TABLE OF CONTENTS

PAGE

9. MARINE BENTHOS 162

9.1. INTRODUCTION 162
9.2. BENTHIC FLORA AND FAUNA IN THE EXISTING ENVIRONMENT 162
9.2.1. Summer Sampling 163
9.2.2. Results of Summer Sampling (June 2000) 165
9.2.3. Autumn Benthic Sampling 171
9.2.4. Results of the Autumn Sampling 171
9.2.5. Spring Benthic Sampling (April 2001) 181
9.2.6. Results of the Spring Sampling 181
9.3. BIOTOPES 189
9.3.1. June 2000 Survey 189
9.3.2. September 2000 Survey 189
9.3.3. April 2001 Survey 189
9.3.4. Biotope Descriptions 191
9.4. LITTORAL SURVEY 197
9.5. RESULTS OF LITTORAL FAUNA AND FLORAL SURVEY 198
9.5.1. Landfall A 198
9.5.2. Landfall B 199
9.6. DISCUSSION ON THE BENTHIC FLORA AND FAUNA 199
9.7. IMPACTS OF THE DEVELOPMENT ON THE MARINE BENTHOS 204
9.7.1. Temporary Impacts During Construction 204
9.7.2. Impacts During Operations 205
9.8. MITIGATION MEASURES 206
9.9. REFERENCES 207

10. BIRDS 209

10.1. BACKGROUND 209
10.1.1. The Main Issues Relating to Seabirds and Marine Mammals 209
10.2. DESCRIPTION OF THE PROPOSED DEVELOPMENT 210
10.2.1. Proposed Development Site 210
10.3. DESCRIPTION OF THE EXISTING ENVIRONMENT 212
10.3.1. Introduction 212
10.3.2. The Arklow Bank's surroundings 213
10.3.3. Birds of the Irish Sea 213
10.3.4. Offshore Conservation Status 213
10.4. ECOLOGY OF THE ARKLOW BANK IN RELATION TO BIRDS AND MARINE MAMMALS 221
10.4.1. Observations during this project 221
10.5. CONSERVATION DESIGNATIONS AND THE ARKLOW BANK 222
10.5.1. Main Conservation Designations 222
10.5.2. Current Designation Status of the Arklow Bank 222
10.5.3. Designations around the Arklow Bank 223
10.5.4. Conservation Requirements in Designated Areas 223

TABLE OF CONTENTS

PAGE

10.6. FIELD SURVEY 224
10.6.1. Survey Methodology 224
10.6.2. Survey Boat 226
10.6.3. Survey Routes 226
10.6.4. Survey Schedule 227
10.7. DATA HANDLING 230
10.8. RESULTS & DISCUSSION 231
10.8.1. Survey Effort and Raw Numbers Recorded 231
10.8.2. Correction Factors and Definition of Bird Units 234
10.8.3. Bird Species Accounts 235
10.9. ADDITIONAL SURVEY TRIPS TO SEARCH FOR GULL AND ZOOPLANKTON CONCENTRATIONS 274
10.9.1. Preliminary surveys of other banks – methods 274
10.9.2. Preliminary surveys of other banks – results and discussion 275
10.9.3. Preliminary assessment of Planktonic Prey on the Arklow Bank - Methods 276
10.9.4. Results of the Preliminary Assessment of Planktonic Prey on the Arklow Bank 277
10.10. EFFECTS OF WIND FARMS ON BIRDS AND MARINE MAMMALS 279
10.10.1. Impacts on Birds from Terrestrial Wind Farms 279
10.11. IMPACTS OF MARINE WIND FARMS ON BIRDS 280
10.11.1. Assessment of Impacts of Existing Wind Farms on Seabirds 280
10.11.2. Assessment of Impacts on Seabirds from Proposed Offshore Wind Farms 282
10.11.3. Rodsand in Denmark 284
10.11.4. Scroby Sands in England 284
10.11.5. Possible Impacts of Offshore Wind Farms on Non-Seabird Species 286
10.12. GUIDELINES ON ECOLOGICAL RISK ASSESSMENT OF OFFSHORE WIND FARMS 287
10.13. LIKELY IMPACTS OF THE ARKLOW BANK WIND PARK ON SEABIRDS 289
10.13.1. Introduction 289
10.13.2. Birds 289
10.14. MONITORING OF LIKELY IMPACTS ON SEABIRDS 292
10.15. MEASURES TO MITIGATE EFFECTS OF WINDFARMS ON BIRDS 293
10.16. CONCLUSIONS 294
10.17. REFERENCES 295
10.18. ACKNOWLEDGEMENTS 303

11. MARINE MAMMALS 309

11.1. INTRODUCTION 309
11.1.1. Harbour Porpoise 309
11.1.2. Other Cetaceans 310
11.1.3. Conservation status of Irish Sea Cetaceans 310
11.1.4. Seals 311
11.2. MARINE MAMMALS AND REPTILES IN THE EXISTING ENVIRONMENT 311
11.2.1. Harbour Porpoise (Figures 11.1 & 11.2) 311
11.2.2. Risso's Dolphins 312
11.2.3. Seals and Turtles 312
11.3. IMPACTS OF OFFSHORE WIND FARMS ON MARINE MAMMALS 314
11.3.1. Horns Rev in Denmark 314
11.3.2. Blyth Harbour Offshore Wind farm 315
11.3.3. Scroby Sands Offshore Wind farm 315
11.4. IMPACTS OF THE DEVELOPMENT ON MARINE MAMMALS 315
11.5. MONITORING OF LIKELY IMPACTS ON MARINE MAMMALS 318
11.6. REFERENCES 319

TABLE OF CONTENTS

PAGE

12. NON-LIVING RESOURCES 320

12.1. SAND AND GRAVEL 320
12.2. COAL 322
12.3. OIL/GAS 323
12.4. HEAVY MINERAL DEPOSITS 323
12.5. WAVE/TIDAL POWER 325
12.6. CONCLUSIONS 325

13. LANDSCAPE AND VISUAL IMPACTS 326

13.1. SCOPE AND OBJECTIVES 326
13.2. OUTLINE OF PROCEDURE 326
13.3. DESCRIPTION OF PROPOSED DEVELOPMENT AND SITE 327
13.4. USE OF ZONE OF VISUAL INFLUENCE TO DEFINE EXTENT OF STUDY AREA 328
13.4.1. ZVI Methodology 329
13.5. GENERAL DESCRIPTION OF LANDSCAPE CONTEXT OF THE PROPOSED WIND FARM SITE 331
13.5.1. Landform and Water 331
13.5.2. Vegetation and Land Use 333
13.5.3. Structures 334
13.6. DESIGNATIONS 337
13.6.1. Wicklow County Development Plan 337
13.6.2. Wexford County Development Plan 338
13.6.3. Blue Flag Beaches 340
13.7. IDENTIFICATION OF VIEWSHED REFERENCE POINTS AS A BASIS FOR ASSESSMENT 341
13.8. SENSITIVITY OF VRPS 344
13.9. OVERVIEW OF TYPICAL LANDSCAPE IMPACT OF WIND FARMS 346
13.9.1. Research on public perceptions of wind farm developments 347
13.9.2. International observations regarding wind farm development 348
13.9.3. Anecdotal Evidence regarding Perceptions of the Proposed Scheme 349
13.10. CLASSIFICATION OF LANDSCAPE IMPACT 350
13.11. IMPACTS COMMON TO ALL VIEWSHED REFERENCE POINTS 351
13.11.1. Number of turbines 351
13.11.2. Layout of Turbines 352
13.11.3. Alternative Randomised Layout 353
13.11.4. Turbine Height 353
13.11.5. Colour of Turbines 353
13.11.6. Service Modules 354
13.11.7. Lighting 354
13.12. LANDSCAPE ASSESSMENT FROM VRP'S 355
13.12.1. Methodology used to produce the photomontages 355
13.12.2. Photomontages Depicting the Proposed Development in Inclement Weather 356
13.13. SUMMARY LANDSCAPE IMPACT 381
13.14. PROPOSED MITIGATION MEASURES 383
13.15. BIBLIOGRAPHY 383

14. ELECTROMAGNETIC EFFECTS 385

14.1. INTRODUCTION 385
14.2. POTENTIAL IMPACTS OF THE PROPOSED WIND PARK DEVELOPMENT 385
14.3. ELECTROMAGNETIC FIELDS AND FISH 386
14.4. PROPOSED MITIGATION MEASURES 387

TABLE OF CONTENTS

PAGE

15. MATERIAL ASSETS 388

16. INTERACTION OF THE FOREGOING 389

17. MONITORING PROGRAMMES 391

17.1. INTRODUCTION 391
17.2. MONITORING PROGRAMME FOR BIRDS 394
17.3. MARINE BENTHOS 395
17.4. NOISE 395
17.5. WATER QUALITY 395

TABLE OF FIGURES

PAGE

FIGURE 1: LOCATION OF ARKLOW BANK 2
FIGURE 2: PROPOSED TURBINES AND CABLE ROUTES 3
FIGURE 1.1: EXTENT OF STUDY AREA 21
FIGURE 1.2: EIS METHODOLOGY 23
FIGURE 2.1: PREDICTED WIND CONTOURS AT 50 M AMSL 30
FIGURE 2.2: MONOPILE FOUNDATION 43
FIGURE 2.3: GRAVITY FOUNDATION 45
FIGURE 2.4: TRIPOD FOUNDATION 48
FIGURE 2.5: ON SITE SUBSTATION 55
FIGURE 3.1: IRISH OFF SHORE ENERGY RESOURCE AT 50 M WATER DEPTH WITHIN 12 NAUTICAL MILE LIMIT 77
FIGURE 4.1: NOISE MONITORING LOCATIONS 91
FIGURE 4.2: DEFINITION OF NAVIGATIONAL ROUTES IN THE VICINITY OF ARKLOW BANK. 97
FIGURE 4.3: YEARLY COLLISION FREQUENCIES DIVIDED INTO SHIP CLASSES FOR THE WIND PARK CONSIDERING ALL SHIP COLLISIONS 106
FIGURE 7.1: LOCATION OF ANOMOLIES 132
FIGURE 8.1: MAP OF THE SOUTHERN IRISH SEA WITH WHELK FISHING SECTORS 147
FIGURE 8.2: MUSSEL SEED BEDS IN THE VICINITY OF ARKLOW BANK 148
FIGURE 8.3: LIVE WEIGHTS OF THE SIX LARGEST FISHERIES FROM 1996 TO 1999 LANDED INTO ARKLOW PORT 151
FIGURE 8.4: VALUES OF THE SEVEN LARGEST FISHERIES FROM 1996 TO 1999 LANDED INTO ARKLOW PORT 152
FIGURE 8.5: LOCATION OF IRISH SEA/CELTIC GROUNDFISH SURVEY SITES 154
FIGURE 9.1: BENTHIC FLORA AND FAUNA SAMPLING LOCATIONS, SUMMER 2000 164
FIGURE 9.2: BENTHIC FLORA AND FAUNA SAMPLING LOCATIONS 172
FIGURE 9.3: SPRING 2001, BENTHIC SAMPLING LOCATIONS 182
FIGURE 9.4: MAIN BIOTOPES ON THE ARKLOW BANK AND STUDY AREA 190
FIGURE 10.1: MAP OF THE ARKLOW BANK AREA AND THE SURVEY ROUTES 211
FIGURE 10.2: RED-THROATED DIVER NUMBERS 237
FIGURE 10.3: RED-THROATED DIVERS DENSITIES 238
FIGURE 10.4: FULMAR NUMBERS 240
FIGURE 10.5: FULMAR DENSITIES 241
FIGURE 10.6: MANX SHEARWATER NUMBERS 242
FIGURE 10.7: MANX SHEARWATER DENSITIES 243
FIGURE 10.8: GANNET NUMBERS 245
FIGURE 10.9: GANNET DENSITIES 246
FIGURE 10.10: SHAG NUMBERS 247
FIGURE 10.11: SHAG DENSITIES 248
FIGURE 10.12: LITTLE GULL NUMBERS 250
FIGURE 10.13: LITTLE GULL DENSITIES 251
FIGURE 10.14: KITTIWAKE NUMBERS 253
FIGURE 10.15: KITTIWAKE DENSITIES 254

TABLE OF FIGURES

PAGE

FIGURE 10.16: COMMON GULL NUMBERS....256
FIGURE 10.17: COMMON GULL DENSITIES....257
FIGURE 10.18: COMMON/ARCTIC TERN NUMBERS....258
FIGURE 10.19: COMMON/ARCTIC TERN DENSITIES....259
FIGURE 10.20: GUILLEMOT NUMBERS....261
FIGURE 10.21: GUILLEMOT DENSITIES....262
FIGURE 10.22: RAZORBILL NUMBERS....264
FIGURE 10.23: RAZORBILL DENSITIES....265
FIGURE 10.24: CUMULATIVE BIRD USAGE....267
FIGURE 10.25: CUMULATIVE BIRD USAGE ALONG THE FIVE SECTIONS OF THE ARKLOW BANK (BIRD UNITS)....268
FIGURE 10.26: AVERAGE BIRD USAGE ALONG THE FIVE SECTIONS OF THE ARKLOW BANK (NOS. OF BIRDS)....269
FIGURE 10.27: BIRDS FLYING ABOVE 7 M AS A PROPORTION OF ALL BIRDS OBSERVED IN FLIGHT....270
FIGURE 10.28: BIRDS FLYING ABOVE 7 M AS A PROPORTION OF ALL BIRDS OBSERVED IN FLIGHT OVER THE BANK....271
FIGURE 10.29: AVERAGE NUMBERS OF GUILLEMOTS AND RAZORBILLS IN DIFFERENT SECTIONS OF THE BOX, AUGUST 2000-JUNE 2001....272
FIGURE 10.30: ZOOPLANKTON SAMPLING LOCATIONS ALONG THE ARKLOW BANK....278
FIGURE 11.1: HARBOUR PORPOISE NUMBERS....313
FIGURE 11.2: HARBOUR PORPOISE DENSITIES....313
FIGURE 12.1: DISTRIBUTION OF SEA BED SEDIMENTS....321
FIGURE 12.2: LOCATION OF MINERAL RESOURCES....324
FIGURE 13.3: VISIBILITY TO BOTTOM OF ROTATION....330
FIGURE 13.4: VISIBILITY TO NACELLE/HUB HEIGHT....330
FIGURE 13.5: DEGREE OF VISIBILITY....331
FIGURE 13.7: PUBLIC ACCEPTANCE OF WIND ENERGY....349

LIST OF TABLES

PAGE

TABLE 1.1: DATA SOURCES....25
TABLE 2.1: GRAVITY FOUNDATION MATERIAL – 5 M WATER DEPTH....50
TABLE 2.2: GRAVITY FOUNDATION MATERIAL – 15 M WATER DEPTH....51
TABLE 2.3: GRAVITY FOUNDATION MATERIAL – 30 M WATER DEPTH....51
TABLE 2.4: MONOPILE FOUNDATION MATERIAL....51
TABLE 2.5: TRIPOD FOUNDATION MATERIAL....53
TABLE 2.6: FOUNDATION SUMMARY....60
TABLE 2.7: ESTIMATE OF DIRECT EMPLOYMENT TO DEVELOP OFF SHORE WIND PARKS[13]....62
TABLE 2.8: MATERIAL QUANTITIES FOR CONSTRUCTION OF PROPOSED ON SHORE CABLE ROUTES....64
TABLE 2.9: ON SHORE CONSTRUCTION WASTE TYPES AND SOURCES....67
TABLE 2.10: MATERIAL QUANTITIES FOR CONSTRUCTION OF PROPOSED OFF SHORE CABLE ROUTES....94
TABLE 4.1: AMBIENT NOISE MONITORING RESULTS*....95
TABLE 4.2: TRAFFIC COUNTS....98
TABLE 4.3: ANNUAL NUMBER OF MOVEMENTS ON EACH OF THE ROUTES....105
TABLE 4.4: YEARLY SHIP COLLISION FREQUENCIES FOR THE WIND PARK....107
TABLE 4.5: TOTAL ANCHOR FREQUENCIES FOR THE CABLE CONNECTION FROM ARKLOW BANK AND TO THE SHORE....122
TABLE 6.1: MONTHLY AND ANNUAL RAINFALL AVERAGES, MM (1951 – 1980)....123
TABLE 6.2: LONG TERM AVERAGE POTENTIAL EVAPOTRANSPITATION,....124
TABLE 6.3: DUBLIN AIRPORT MONTHLY AND ANNUAL MEAN AND EXTREME VALUES (71 M A.S.L 1961 – 1990)....125
TABLE 6.4: CASEMENT AERODROME MONTHLY AND ANNUAL MEAN AND EXTREME VALUES (71 M A.S.L 1961 – 1990)....126
TABLE 6.5: ANNUAL EMISSIONS FOR THE GENERATION OF ELECTRICITY BY VARIOUS PLANT (T)....127
TABLE 6.6: EXTERNAL COSTS OF POWER GENERATION....132
TABLE 7.1: PARAMETERS OF THE ANOMALOUS GEOPHYSICAL SIGNATURE IDENTIFIED IN THE PRELIMINARY INTERPRETATION....136
TABLE 8.1: FIGURES FOR FISH (DEMERSAL, PELAGIC AND SHELLFISH) LIVE WEIGHT LANDINGS INTO ARKLOW PORT FROM 1996 TO 1999....137
TABLE 8.2: FIGURES FOR FISH (DEMERSAL, PELAGIC AND SHELLFISH) VALUES (IR£) INTO ARKLOW PORT FROM 1996 TO 1999....138
TABLE 8.3: LIVE WEIGHT (TONNES) OF ALL FISH LANDINGS INTO ARKLOW, CLOGHERHEAD AND HOWTH PORTS....138
TABLE 8.4: VALUES (IR£) OF ALLFFISH LANDINGS INTO ARKLOW, CLOGHERHEAD AND HOWTH PORTS....139
TABLE 8.5: TIMES OF YEAR, CATCH METHODS AND LOCATIONS OF COMMERCIAL FISHERIES ON THE ARKLOW BANK....148
TABLE 8.6: THE PERCENTAGE OF WHELKS LANDED INTO ARKLOW AND WICKLOW....150
TABLE 8.7: LANDINGS FOR WHELKS FROM DIFFERENT SECTORS AND PORTS ON THE SOUTH-EAST COAST OF IRELAND FROM 1996-1999....155
TABLE 8.8: SPECIES AND NUMBERS OF FISH CAUGHT FROM THE IRISH SEA/CELTIC SEA GROUNDFISH SURVEY 1998-1999....165
TABLE 9.1: SITE LOCATIONS AND DETAILS OF SUBTIDAL DREDGE SITES, SUMMER 2000....166
TABLE 9.2: LIST OF SPECIES OR HIGHER TAXA RECORDED FROM EACH SITE,....168
TABLE 9.3: LOCATION AND DURATION OF FISH TRAWLS, JUNE 2000....

LIST OF TABLES

PAGE

TABLE 9.4: LIST OF SPECIES COLLECTED IN THE FISH TRAWLS, JUNE 2000 169
TABLE 9.5: LOCATIONS, POSITIONS AND TIMES OF PLANKTON, TEMPERATURE AND SALINITY SAMPLES 169
TABLE 9.6: ZOOPLANKTON SPECIES FROM THE SUMMER SAMPLING SURVEY P=PRESENT 170
TABLE 9.7: PHYTOPLANKTON SPECIES FROM THE SUMMER SAMPLING SURVEY 171
TABLE 9.8: SITE LOCATIONS AND DETAILS SUBTIDAL DREDGE SITES, SEPTEMBER 2000 173
TABLE 9.9: LIST OF SPECIES OR HIGHER TAXA RECORDED FROM EACH SITE, ... 173
TABLE 9.10: LOCATION AND DURATION OF FISH TRAWLS 175
TABLE 9.11: LIST OF FISH SPECIES COLLECTED IN THE TRAWLS, SEPTEMBER 2000 176
TABLE 9.12: LIST OF INVERTEBRATE AND ALGAE COLLECTED IN TRAWLS, SEPTEMBER 2000 176
TABLE 9.13: LOCATIONS, POSITIONS AND TIMES OF PHYTOPLANKTON, TEMPERATURE AND SALINITY SAMPLINGS 178
TABLE 9.14: LIST OF ZOOPLANKTON SPECIES RECORDED FROM EACH SITE, SEPTEMBER 2000 179
TABLE 9.15: LIST OF PHYTOPLANKTON SPECES RECORDED SEPTEMBER 2000 180
TABLE 9.16: TEMPERATURE AND SALINITY MEASUREMENTS FROM THE PLANKTON SAMPLING SITES 180
TABLE 9.17: SITE LOCATIONS AND DETAILS OF SUBTIDAL DREDGE SITES, APRIL 2001 181
TABLE 9.18: LIST OF SPECIES OR HIGHER TAXA RECORDED FROM EACH SITE, APRIL 2001 183
TABLE 9.19: LOCATION AND DURATION OF FISH TRAWLS, APRIL 2001 185
TABLE 9.20: LIST OF FISH SPECIES COLLECTED IN THE TRAWLS, APRIL 2001 185
TABLE 9.21: LOCATIONS, POSITIONS AND TIMES OF PHYTOPLANKTON, TEMPERATURE AND SALINITY SAMPLES, APRIL 2001 185
TABLE 9.22: LOCATIONS, POSITIONS AND TIMES OF ZOOPLANKTON SAMPLES, APRIL 2001 186
TABLE 9.23: TEMPERATURE AND SALINITY MEASUREMENTS FROM THE PLANKTON SAMPLING SITES, APRIL 2001 186
TABLE 9.24: LIST OF INVERTEBRATE AND ALGAE COLLECTED IN THE TRAWLS, APRIL 2001 187
TABLE 9.25: LIST OF ZOOPLANKTON SPECIES RECORDED, APRIL 2001 188
TABLE 9.26: LIST OF PHYTOPLANKTON SPECIES RECORDED, APRIL 2001 188
TABLE 10.1: SURVEY CONDITIONS AND COVERAGE (JULY 2000 – JUNE 2001) 228
TABLE 10.2: SAMPLE DATA ENTRY TEMPLATE FOR MAIN BIRD SPECIES 230
TABLE 10.3: RAW NUMBERS OF COMMONER SEABIRDS RECORDED ON ALL DAYS 232
TABLE 10.4: RAW NUMBERS OF OTHER SEABIRDS RECORDED 232
TABLE 10.5: CORRECTION FACTORS 233
TABLE 10.6: BIRD UNIT (BU) THRESHOLDS 233
TABLE 10.7: ADDITIONAL SURVEY TRIPS IN WINTER OF 2000/2001 274
TABLE 10.8: BIRDS AND MARINE MAMMALS OBSERVED ON BANKS N AND S OF ARKLOW, JANUARY 2001 275
TABLE 10.9: NUMBER OF ZOOPLANKTON TAXA LARGER THAN 3MM FROM THE ARKLOW BANK, JANUARY (J1-J3) AND FEBRUARY (F1-F10) 2001 277
TABLE 10.10: WORST CASE SUMMARY OF EFFECTS ON BIRDS AND MARINE MAMMALS 291
TABLE 11.1: NUMBERS OF MAMMALS AND REPTILES RECORDED 314
TABLE 11.2: WORST CASE SUMMARY OF EFFECTS ON MARINE MAMMALS 318
TABLE 13.1: QUANTITATIVE COMPARISON OF VIEWSHED REFERENCE POINTS 342
TABLE 13.2: ANALYSIS OF LANDSCAPE SENSITIVITY AT VIEWSHED REFERENCE POINTS 345
TABLE 13.3: ESTIMATED ORDER OF IMPACT UPON LANDSCAPE FROM VRP'S 381
TABLE 17.1: ENVIRONMENTAL MONITORING AND REPORTING 392

LIST OF APPENDICES

Appendix 1	Copy of letter and List of Consultees
Appendix 2	List of Attendees at Arklow Bay Hotel and Bay View Hotel Public Meetings
Appendix 3	Agenda for Public Meetings and Press Releases
Appendix 4	Replies received from Statutory Bodies, Non-Government Organisations and the Public
Appendix 5	Preliminary Engineering Design
Appendix 6	Turbine Layouts
Appendix 7	Ship Collision Report
Appendix 8	Socio-Economic Study
Appendix 9	Site Investigation Report – Fugro Ltd.
Appendix 10	Effect of Wind Farm Structures on the Arklow Bank – Murphy Dollard Report
Appendix 11	Baseline Archaeological Report
Appendix 12	Submarine Wreck Report
Appendix 13	Geophysical Report
Appendix 14	Commercial Fisheries Report
Appendix 15	Marine Benthos Report

PREAMBLE

eirtricity is a privately owned supplier of green electricity. Sure Partners Ltd. (a wholly owned subsidiary of ***eirtricity***) has applied to the Department of the Marine and Natural Resources (DoMNR) for a foreshore lease to erect a wind park on the Arklow Bank. This environmental impact assessment has been prepared in support of this application.

This section of the environmental impact assessment details a brief description of the project. Further details on construction materials, construction methodology, wind park layout and onshore cable connections are given in relevant sections.

Site Selection

The proposed wind park development will be situated on the Arklow Bank. The bank covers an area approximately 27 km long and 2.5 km wide. The bank is located approximately 13 km from the shore. The location of the Arklow Bank is shown in Figure 1.

Site Layout

The wind park will consist of 200 turbines of tower height up to 100 m and rotor diameter of up to 120 m. The minimum distance between sea level and the turbine blade tip will be 40 m. The turbines will each have a capacity to generate a minimum of 2 MW. Each phase of the development will erect a number of turbines that will be interconnected via undersea cable to site substations. From here they will be connected via an undersea cable to the shore. These site substations will be built on shore and set out on the bank when required. There will be a requirement for possibly three site substations.

Wind turbines will be placed in a row pattern to have a uniform appearance when observed from land. The location of the wind turbines, and submarine cables is shown in Figure 2.

Figure 0.1: Location of Arklow Bank

Figure 0.2: Proposed Turbines and Cable Routes

Brief Project Description

The wind turbines will be of the three-bladed type with conical steel towers. The entire wind turbine will be white or grey in colour. The wind turbines will be erected on a phased basis and associated site substations will be erected for each of the phases.

Foundations for the proposed wind park will either be piled or gravity based structures. From the site substation platforms a submarine cable of approximately 11 km-14 km will connect to the Arklow 220 kV substation. Marine power cables will be fitted with substantial armour to withstand any high mechanical stresses during installation and potential disturbance during operations. All cables will be scoured/dug down into the sea floor to a depth of up to 2.0 m.

To improve the safety of navigation and to protect the wind generators themselves, it is proposed to equip the wind park with warning lights in accordance with the guidelines set down in the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) and in agreement with the Commissioner of Irish Lights.

Project Construction

Project construction will commence in 2002 and will be complete by 2007. During the construction and installation phases, it will be necessary to include land areas in the project.

Construction of the site substations and gravity foundation caissons (in the event of them being used) will be carried out at Arklow Port or other suitable ports. All other materials, e.g. the turbines and the rotors, etc. will probably be brought in by sea through Arklow Port.

During construction work at sea, the installation components can be shipped from Arklow Port to the Bank for fitting. Working areas at sea will be established and marked in accordance with the IALA Maritime Voyage System (MVS) and in agreement with the Commissioner of Irish Lights. Local radio navigation warnings will be given in advance of and during the construction of the offshore wind park and the laying of the power cables to the shore.

During the operational phase of the wind park, a service building located close to the quays in Arklow Harbour will be required to store stocks for spare parts, etc.

Operation of the Wind Park

It is estimated that construction of the wind park will commence in April of 2002 with the erection of the first stage of the development. All of the turbines erected during this stage of the development will be connected to a site substation which ultimately will be connected via an undersea cable to the shore and connected to the Arklow substation.

Construction work on the bank may continue until 2007. Upon completion of each stage, commissioning of that set of turbines will be undertaken. During the construction phases and the operation of the wind park, there will be significant shipping traffic and boat traffic in the area of the Arklow Bank and on the navigation routes to and from Arklow Harbour. Frequency and types of boats that will be used during construction cannot be accurately determined as it will depend upon the foundation type, turbine type and difficulties encountered during the construction of the wind park. It is expected that barges and jack-up platforms will be used for the construction of the foundations. A ship or barge with a suitable lifting crane will be required for the erection of the turbines. In addition, smaller boats for transporting people and other services will also be required.

While the wind turbines will be designed for the least possible maintenance, it is expected that several service intervals of between 6 to 12 months will be required. This will also increase shipping and boating in the area.

Weather conditions will have an influence on the construction and maintenance operations of the wind park. It is expected that much of the construction and maintenance will be carried out during the summer months. Extra staff will be employed during servicing to ensure that the service of the turbines is complete in as short a time as possible.

The site substation will be unmanned and will only require minimum maintenance. This maintenance will be carried out as part of the overall servicing of the wind park. The substations may have a helicopter deck that will allow for transporting personnel to and from the wind park.

It is estimated that when the Arklow Bank wind park development is complete, it will supply 520 MW of power to the shore. Initially, the turbines will have a minimum rating of 2 MW each but as turbine technology improves, this may increase.

Decommissioning

It is expected that the wind park will last until the end of the century. During this period turbines will be replaced and upgraded on an ongoing basis. The decision to replace or upgrade turbines will be based on an economic/commercial evaluation and advances in turbine technology. It is expected that the normal life of a turbine would be approximately 20 years. The wind turbines and site substations can be taken down and removed for recycling after use. Depending upon the type of foundation used, these will either be removed (gravity foundations) or cut below sea bed level. The underground cables will either be left in-situ or removed for recycling.

Alternatives Considered

Alternative types of turbines, foundations and cable routes to shore have been examined by the developer. These alternatives are discussed in the relevant sections of this environmental impact statement.

However, a number of alternative sites have been examined by the developer for a proposed wind park. An initial desktop study was undertaken by Sure Partners Ltd. using Admiralty Charts and ESB national grid maps. Criteria such as distance from the shoreline, connectability to the national grid, environmentally sensitive areas, onshore visual impacts and expected sea conditions. The developers had been investigating this project between 1997 and 2000 and on the 3rd August 2000, a foreshore licence was issued to Sure Partners Ltd.

1. INTRODUCTION

1.1. Background to Wind Energy Development in Ireland, Europe and the Rest of the World

European fixed price or fixed premium schemes have continued to fuel high wind energy growth in Europe, where 90% (3,075 MW) of new global capacity was installed in 2000. This is especially true of Germany and Spain, where 2,443 MW was installed last year.

By the end of 2000, approximately 17,000 MW wind energy was installed globally. It is considered that worldwide installation will reach 20,000 MW later this year, making wind energy the world's fastest growing power source. The EU has around two-thirds of global installed capacity, and around half of EU capacity is in Germany, at 6113 MW by the end 2000. Growth in the European wind energy market has been so strong and steady that the European Wind Energy Association (EWEA) has raised its goal for the region by 50%, from 40,000 MW of installed capacity by 2010 to 60,000 MW.

1.1.1. Status of the Industry in Ireland

Currently 2 % of Irelands energy requirements are met using renewable resources. The majority of this energy comes from hydroelectric schemes. There are currently 18 wind farms in Ireland, contributing 118 MW to the national grid.

With one of the best wind regimes in Europe, Ireland has the potential to supply 19 times its present electricity requirements.[1]

The ESB have predicted that, in order to meet demand, approximately an extra 1,000 MW* of additional generating capacity will be required by 2006.[2]

1.2. Background to the Proposed Development

* under a high economic growth scenario, such as exists currently, and with a median availability of plant.

There is a clear need for additional electricity generating capacity. Wind energy can provide a substantial proportion of this requirement, and at a competitive cost. Wind energy is an indigenous fuel. Its use will improve the balance of payments, increase security of fuel supply, and give fuel price stability.

Moreover, wind energy is one of Ireland's most important energy resources. It is important that such resources are exploited to the benefit of the country. Offshore wind energy is an asset to be developed as much as any gas or oil field, and should be developed to the maximum benefit of the country.

1.2.1. Benefits and Costs of Wind Energy

Benefits of Wind Energy Development

The benefits of wind energy include the following:

- provision of much needed electrical capacity;
- zero greenhouse gases emitted to the atmosphere, and contribution towards attainment of Kyoto targets;
- abatement of other pollutants, and environmental protection;
- reduction of importation of energy, use of indigenous resources, security of energy supply, and improvement of the balance of payments;
- energy price stability;
- contribution to sustainable development; and
- for a project of the size proposed, increased local employment.

Costs of Wind Energy Development

The costs associated with wind energy include both economic and environmental costs:

- *Economic Cost*

  The cost of wind energy is influenced by technical factors such as the wind speed at the site, wind turbine availability, position of the turbines and by the cost and structure of financing arrangements.
  The cost of generating electricity from the wind is made up primarily of the capital cost, with operational costs generally being very low.

However, the cost of wind energy development at good sites compares favourably with conventional fuel generation costs. Incorporating subsidies paid to fossil fuel providers and external costs into the comparison shows wind energy development to be probably the cheapest means available for the generation of electricity in Ireland.

- *Environmental Cost*

The environmental costs can include habitat loss, noise and visual impacts. These will all be discussed in greater detail in the following chapters. Generation of electricity from the wind, unlike other energy technologies, involves no pollutant emissions to the air, land or water.

1.3. Policy & Legislation

1.3.1. Global Policy

The burning of fossil fuels results in the release of greenhouse gases such as carbon dioxide (CO_2). These gases contribute to the phenomenon of climate change.

In January 2001, the Intergovernmental Panel on Climate Change released the "*IPCC WGI Third Assessment Report - Summary for Policymakers (Shanghai Draft 21-01-2001 20:00).*"[3]

The summary stated that additional data, more rigorous evaluation of their quality, and comparisons of different sources of data have led to greater understanding of climate change. Its findings included the following:

- An increasing body of observations gives a collective picture of a warming world and other changes in the climate system;
- Emissions of greenhouse gases and aerosols due to human activities continue to alter the atmosphere in ways that are expected to affect the climate;
- There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities; and
- Anthropogenic climate change will persist for many centuries.

In "*Ireland's Environment – a Millennium Report*,"[4] the Environmental Protection Agency (EPA) identifies climate change as one of the most serious environmental problems facing Ireland at the present time. It states that "European governments accept that climate change is the gravest threat to the world's sustainable development, public health, and future prosperity, and that it requires immediate counter-measures." International, national and local policy has been adopted to meet the challenges arising from climate change. In the past ten years a number of international conferences have been held in relation to these issues namely Rio (1992) and Kyoto (1997).

Rio Conference (1992)

At the 1992 United Nations Conference on the Environment and Development held in Rio de Janeiro, 154 counties signed a UN climate convention. These countries agreed to adopt measures to reduce greenhouse gas (particularly carbon dioxide) emissions.

Kyoto Protocol (1997)

Following the World Summit Conference held in Kyoto, Japan in 1997, nations that signed up to the Protocol agreed to take actions to control, reduce or limit their emissions of the six main greenhouse gases (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride).

The Kyoto Protocol (1997) was born out of the United Nations Framework Convention on Climate Change, 1992 (UNFCCC). Legally binding targets were set for greenhouse gas emission reductions of 5% overall, for developed countries for the period 2008 – 2012.[5] The EU has agreed to reduce its emissions of the six greenhouse gases by 8% below 1990 levels by the period 2008 – 2012. Within this EU target, Ireland has agreed to limit its production of these gases to 13% above 1990 levels by the same period. Ireland, together with its EU partners, plans to ratify the Kyoto Protocol by 2002. Notwithstanding the current US position on the Kyoto Protocol, the EU is nonetheless firmly committed to meeting its obligations.

1.3.2. European Renewable Energy Policy

White Paper – Energy for the Future: Renewable Sources of Energy

Europe currently meets less than 6% of its energy requirements from renewable energy, and relies on imports to meet 50% of its energy requirements. The European Commission's White Paper "*Energy for the Future: Renewable Sources of Energy*"[6] sets out a strategy to obtain 12% of energy in the EU from renewable sources by 2010. In the White Paper this 12% share of total renewable energy in the gross inland energy consumption has been translated into a specific share for consumption of electricity in the EU of 22.1%.

Campaign for Take-Off

Campaign for Take-Off[7] (CTO) is the EU's Action Plan for the implementation of the White Paper. It sets a target for the development of 10,000 MW of large wind farms by 2010, and furthermore, sees this as being only 25% of the feasible wind energy development by that time. It is not considered that any public financing will be needed for the 30,000 MW remaining installed capacity providing that a fair access to the European grids for the wind turbines is guaranteed. It is considered that additional help is needed only for the less favourable or unconventional applications.

Investments necessary to achieve the goals of the CTO are seen as having to come primarily from the private sector and through the development of policies at Member State level.

Proposed EU Directive on Renewable Energy Electricity

The proposed EU Directive on Renewable Energy Electricity[8] has as strategic objectives:

- the creation of a framework for the medium-term, significant increase of renewable energy generated electricity in the EU and to facilitate its access to the internal electricity market; and
- the promotion of electricity from renewable sources as a high Community priority.

The proposed Directive suggests an indicative target of doubling the share of renewable energy sources from 6% to 12% in the energy balance in the EU by 2010. The European Council endorsed this objective in 1998.

The increased use of electricity from renewable sources would also constitute an important part of the actions that will be necessary to meet the commitments to reduce greenhouse gas emissions made by the EU in Kyoto.

The proposal obliges Member States to establish individual targets for future consumption of electricity from renewable energy sources (RES-E). To encourage the development of renewable energy projects, EU funding is available through a number of schemes (e.g., the Energie sub-programme of the 5th Framework Programme for Research and Development).

EU Green Paper on European Strategy for Security of Energy Supply[9]

The EU Green Paper on European Strategy for Security of Energy Supply was prepared in response to the observable fact of Europe's growing future energy dependence. The aim of the Green Paper is to initiate a debate on the security of energy supply.

One of the three main points to emerge from the Green Paper was that at present, the European Union is not in a position to respond to the challenge of climate change and to meet its commitments, notably under the Kyoto Protocol.

The report stated that renewable sources of energy have considerable potential for increasing security of supply in Europe. Developing their use, however, will depend on very substantial political and economic efforts. The report states that these efforts will only succeed if they are accompanied by a real policy of demand geared to rationalising and stabilising energy consumption.

The report went on to say that in the medium term, renewable energy is the only source of energy in which the European Union has a certain amount of room for manoeuvre in increasing energy supply in the current circumstances.

1.3.3. Irish Policy

Irish Renewable Energy Policy

In a report published by the EPA in August 2000, "*Emissions to Air – 1990 to 1998,*"[10] it is stated that Ireland's emissions were already higher in 1998 than the limits agreed for 2010 under the Kyoto Protocol. The EPA stated that the major contributory factor in this increase was a 30% increase in carbon dioxide emissions since 1990. Ireland could be faced with stiff fines from the EU for a breach of targets.

Recent forecasts from the Department of the Environment estimate that net emissions in the period 2008 – 2010 will have increased by 35 - 40% based on a business as usual scenario. This is approximately three times the target agreed at Kyoto.

Against this backdrop, there is clearly a need to utilise renewable sources of energy if Ireland is to sustain current rates of economic development. Wind energy affords the opportunity to provide a sustainable and economically viable method of helping to meet the country's energy needs while also meeting the Kyoto targets.

Until February 2000, the primary means of selling electricity from a wind farm was the Alternative Energy Requirement Competition (AER). AER 1 (1994) and AER 3 (1997) were relevant to wind energy. AER is a competitive tendering process run by the Department of Public Enterprise. AER 5 was announced in May 2001.

The available market has expanded with deregulation of the electricity market in February 2000. While for the time being, brown electricity suppliers can supply only the large industrial users (i.e., 30% of the electricity market), green suppliers have access to the whole Irish electricity market. This will further encourage the development of Ireland's renewable energy resources.

In the 1999 "*Green Paper on Sustainable Energy*,"[11] a target of 500 MW renewable energy development by 2005 was set, mainly expected to come from wind energy. The Renewable Energy Strategy Group was established as a result of the Green Paper, and has made a number of recommendations in its "*Strategy for Intensifying Wind Energy Deployment*"[12] to develop the renewable energy industry in Ireland.

The Minister of the Environment's National Climate Change Strategy[13] was published on 2nd November 2000. It addresses a range of different issues, however, in relation to renewable energy specifically, it states that "the maximisation of renewables capacity is essential towards meeting our Kyoto Protocol target...The cost of renewable energy compared with the cost of energy derived from fossil fuels will fall with the introduction of carbon/energy taxes and the emissions trading systems, under both of which renewable energies would not suffer any price impact.

"The market for renewable energy is being improved further by the development of a market for "Green Electricity," open to all purchasers of electricity, who will be able to purchase electricity which is produced using renewable forms of electricity as its primary source. The work of the Renewable Energy Strategy Review Group in its recently published report *Strategy for Intensifying Wind Energy Development* [sic] dealing with the electricity market, the electricity network and spatial planning will be critical in ensuring the expansion of wind energy projects."

Irish Offshore Energy Policy

In July 2000, the Department of the Marine and Natural Resources published "*Offshore Electricity Generating Stations – Note for Intending Developers.*" This policy document outlined the procedure for the development of offshore generating stations, including wind farms. "Offshore" comprises the foreshore and the waters between the twelve nautical mile limit and the outer extremity of the Exclusive Economic Zone of Ireland. The foreshore covers the area from the ordinary high water mark to the twelve nautical mile limit, and includes tidal creeks and rivers.

Investigation of offshore sites for suitability is addressed under a licensing procedure. Phase 1, which requires a foreshore licence, concerns site suitability investigation, including preparation of an environmental impact statement (EIS). All necessary authorisations and licences required for the future development are to be acquired at this stage (e.g., authorisation to construct a generating station, a licence to generate electricity, and planning permission and wayleaves for on-shore aspects of the development). This licence does not commit the developer to proceeding with construction and operation, nor the Department of the Marine to issuing a Foreshore Lease.

The construction and operation of offshore electricity generating stations is addressed under a leasing procedure. Phase 2, which requires such a foreshore lease, concerns construction and operation of the development, following on from Phase 1.

Irish Environmental Legislation

Under the European Communities (Environmental Impact Assessment) (Amendment) Regulations, 1999 (S.I. No. 93 of 1999), the preparation of an EIS is mandatory for wind energy developments with more than 5 turbines or greater than 5 MW capacity.

The items to be included in an EIS is set out in Article 25 (Second Schedule) of S.I. No. 93 of 1999.

1.4. Planning Policy Guidelines

1.4.1. Department of the Marine and Natural Resources: Offshore Electricity Generating Stations – Note for Intending Developers

Foreshore Licences

Foreshore Licences are generally valid for four years, and are not normally subject to extension. Applications for a licence are permitted from several applicants at the same site; however, the first applicant has prior rights to development.

Foreshore Licences are granted at a nominal rent of €5 per annum, subject to a deposit of €100,000, which is returned provided that the licence is worked satisfactorily, reporting requirements are complied with, and a valid application for a foreshore lease to construct and operate a generating station is made within twelve months of the expiry of the licence, or alternatively, provided evidence is produced that the site is unsuitable for electricity generation using the type of generation proposed at the time of application for the licence.

Where a licensee has only secondary rights over an area, the deposit will be refunded on an application being made for a foreshore lease by the applicant with prior rights over that area.

Holders of foreshore licences are required to provide the Department of the Marine with summary copies of all information gained in respect of the site every two months. A progress report on preparation of the EIS, planning permission for land based activities, licences and authorisations required from the Commission for Electricity Regulation, etc. The Department of the Marine may also require further reports on any particular issue of interest.

Licensees are required to consult widely and on an on-going basis with interested parties, including where appropriate the port authority, local authorities, Commissioners of Irish Lights, fishing interests, local interests, the Irish Aviation Authority, An Taisce, BirdWatch Ireland, the Irish Wildlife Trust, Eircom, Esat, etc. Dúchas, in particular, should be consulted with in detail.

Licences are non-transferable, and the sale, trading, or assignment of licences is not permitted. A lease may be applied for at any time while the foreshore licence is current.

Environmental Issues

The assessment of the visual impact of the proposed development is to form part of the EIS. For offshore wind energy developments, tubular towers are preferred. It is the policy of the Department of the Marine to consult with relevant local authorities with regard to visual impact. Guidance is given on taking photographs for photomontages.

The attention of developers is also drawn to the document "*European Best Practice Guidelines for Wind Energy Development*,"[14] published by the European Wind Energy Association, with the support of the European Commission. Certain sections of this document are appropriate for use or adaptation in the context of offshore development of wind energy.

Specific information to be provided in the EIS is listed in the document. However, this is not intended to be a legal definition of all the requirements of an EIS. The "*Advice Notes on Current Practice (in the Preparation of Environmental Impact Statements)*,"[15] and the "*Draft Guidelines on the Information to be Contained in Environmental Impact Statements*"[16] by the Environmental Protection Agency provide further guidance.

Foreshore Leases

Applicants for a foreshore lease must have held a foreshore licence for the site investigation, and must make a valid application for the lease within twelve months of the expiry of the licence. A valid application must also be accompanied by evidence that the applicant holds all required authorisations or licences from the Commission for Electricity Regulation, as well as evidence of all necessary planning permissions for onshore works. An EIS should also accompany the application.

Further, a business plan, including a description of sources of capital, covering the period of construction and the first five years of operation, is required. A tax clearance certificate must also be submitted. Full quarterly management accounts and an annual report and accounts for the generating station are required.

A nominal commercial rent of either €3,800 per MW per annum, or a percentage of the gross annual revenue (2 – 2.5%) will be sought. Rents will be subject to review every five years. The maximum period of a lease will generally be 60 years. However, the withdrawal, expiry, or other loss of a valid authorisation, licence, or permission will cause the lease to lapse.

The lease area includes the foreshore on which the foundation of each turbine is sited, together with an area five metres from the foundation, and the area covered by cables connecting turbines to the grid, and five metres on either side of the cables. No activity will be permitted in the vicinity of the leased area that would interfere with the effective operation or safety of the turbines.

The lease will be subject to compliance with all laws, and in particular, with all legal instructions issued by Dúchas.

1.4.2. The Marine Institute – Assessment of Impact of Offshore Wind Energy Structures on the Marine Environment[17]

This desk study examines the impact of offshore wind turbines on the marine environment, being confined to examining the "below the water" impacts. It does not examine potential impacts on birds or on visual aspects.

The study found that offshore wind energy developments built to date have had little negative impact on the marine environment. The loss of physical seabed habitat during the operational phase of a wind farm is minimal; however, disturbance during construction should be minimised.

It was also found that changes due to offshore wind farm development may be positive. Habitat protected from trawling may become a refuge for young and spawning fish, and thus provide benefits to the fish populations beyond the immediate exclusion area, resulting in improved catches. Where the construction of artificial reefs is considered in the project design, this can act as a mechanism to improve fish stocks.

The study makes reference to the draft contents list for EISs for offshore wind farms issued by the Department of the Marine and Natural Resources, and elaborates on each of the matters listed.

1.4.3. European Wind Energy Association – Best Practice Guidelines for Wind Energy Development

This document explains the steps that should be taken to develop a successful wind energy project. It gives an overview of the various aspects that play a role in the development of wind energy projects, covering technical, environmental, and planning considerations.

While developed specifically for land based wind farms, sections of the document are appropriate for use in the development of wind energy offshore, which is recognised in the Department of the Marine's *"Offshore Electricity Generating Stations - Note for Intending Developers."*

Advice is given on initial site selection and project feasibility, including assessment of information that may be available for use in a desk study, such as published reports on the wind resource. Areas to be investigated include the suitability of the wind resource, access to the electricity grid, access to the site for construction, ground conditions, contra-indications (such as flight paths, telecommunications links, etc.), availability of finance, and environmental considerations.

Environmental considerations involve assessment of the visual aspect, noise, shadow flicker, visual domination, reflected light, cultural heritage, recreational use of the site, telecommunications, proximity to airports or restricted areas, etc. A process of consultation with interested parties and the local community is also recommended.

1.4.4. Countryside Council for Wales – Policy on Wind Turbines

The Countryside Council for Wales' (CCW) *"Policy on Wind Turbines"* [18] examines best practice development of both land and sea-based wind turbines. Its recommendations for offshore wind energy developments relate to the Irish Sea, and thus, also have relevance for Irish offshore wind farms.
Possible effects of offshore wind energy development are identified as being: off-shore bird movements, marine ecology, sedimentation and wave erosion patterns, physiographic features on the sea bed, views from the shore (particularly from designated areas adjoining the coast), coastal footpaths and other vantage points, on tourism and recreation including sailing, fishing and sight-seeing trips, and on the local fishing economy and other activities. The associated infrastructure, such as cabling, onshore grid connections, sub-stations and access-ways would need to be considered.

The Countryside Council for Wales supports offshore wind turbines in principle, but will normally oppose proposals that:

- pose a significant threat (on or beyond the site) to birds, marine creatures and their habitats, physiographic features and coastal geomorphology;
- cause significant detriment to landscape or seascape quality and amenity as viewed from land (particularly from National Trails or coastal footpaths), from sea, or across in-shore waters and estuaries;
- spoil the natural beauty of a tidal estuary;
- risk damage to coastal, intertidal or submerged archaeological sites, including historic wrecks.

CCW will also oppose proposals that would seriously affect the quality of views from, or quality of visitor experience within, a National Park, AONB or Heritage Coast.

A checklist for wind turbine development, including offshore development, is provided at the end of the document.

1.4.5. BirdWatch Ireland's Policy on Wind Farms

BirdWatch Ireland's "*Policy on Wind farms*" was published in February 2001.[19] BirdWatch Ireland supports the production of electricity from wind where wind farms are sensitively located. It recommends that all wind farms should be subject to environmental assessment prior to approval. The report identifies an urgent need for studies on the potential impacts of wind farms on birds, and states that monitoring programmes at existing and proposed wind farms are required to address this need.

The document also states that there should be a presumption against siting wind farms in, or adjacent to Important Bird Areas (IBAs), Special Protection Areas (SPAs), other formally designated sites, seabird concentrations and other sensitive bird sites.

In relation to collision with turbines, the report states that, "while this issue is controversial, most studies suggest that the collision risk to birds is not sufficiently great to present a threat to local populations, except under exceptional circumstances." In relation to disturbance of birds, it states that "the disturbance effects of wind farms on birds have not been proved conclusively and are likely to vary by site and by species. There is some evidence which suggests that bird species avoid certain wind farm sites...however, many other studies have shown no disturbance effects at all." In relation to habitat loss, it is stated that "for off-shore wind farms the turbines may result in changes to the local sediment pattern which may lead to habitat changes in the vicinity of the wind farm, with possible knock-on effects on fish and invertebrate populations. However it must be recognised that wind farms typically occupy only a small proportion of a site area."

A number of recommendations are made in respect of mitigation measures that can be used to reduce the impact of a wind energy development on birds. These include a recommendation of the use of solid towers, and the avoidance of construction during the breeding season.

1.5. Statutory Requirements

The Department of the Marine and Natural Resources (DoMNR) in their document entitled "Offshore Electricity Generating Stations – Note for Intending Developers" state that an Environmental Impact Statement is required for a foreshore lease for the construction and operation of offshore electricity generating stations. The purpose of this EIS is to provide the Minister for the Marine and Natural Resources with relevant information to enable a decision to be made on a project in the full knowledge of the projects significant impacts on the environment.

The note also states that the general information to be included in an EIS is set out in Article 25 (Second Schedule) of the European Communities (Environmental Impact Assessment) Amendment Regulations, 1999 (S.I. No. 93/1999).

The study area for this environmental impact statement is illustrated in Figure 1.1.

Figure 1.1: Extent of Study Area

1.6. EIS Methodology

This environmental impact statement was prepared to report on the findings of the environmental assessment that was carried out for this project. The stages of the environmental impact assessment (EIA) process were as follows:

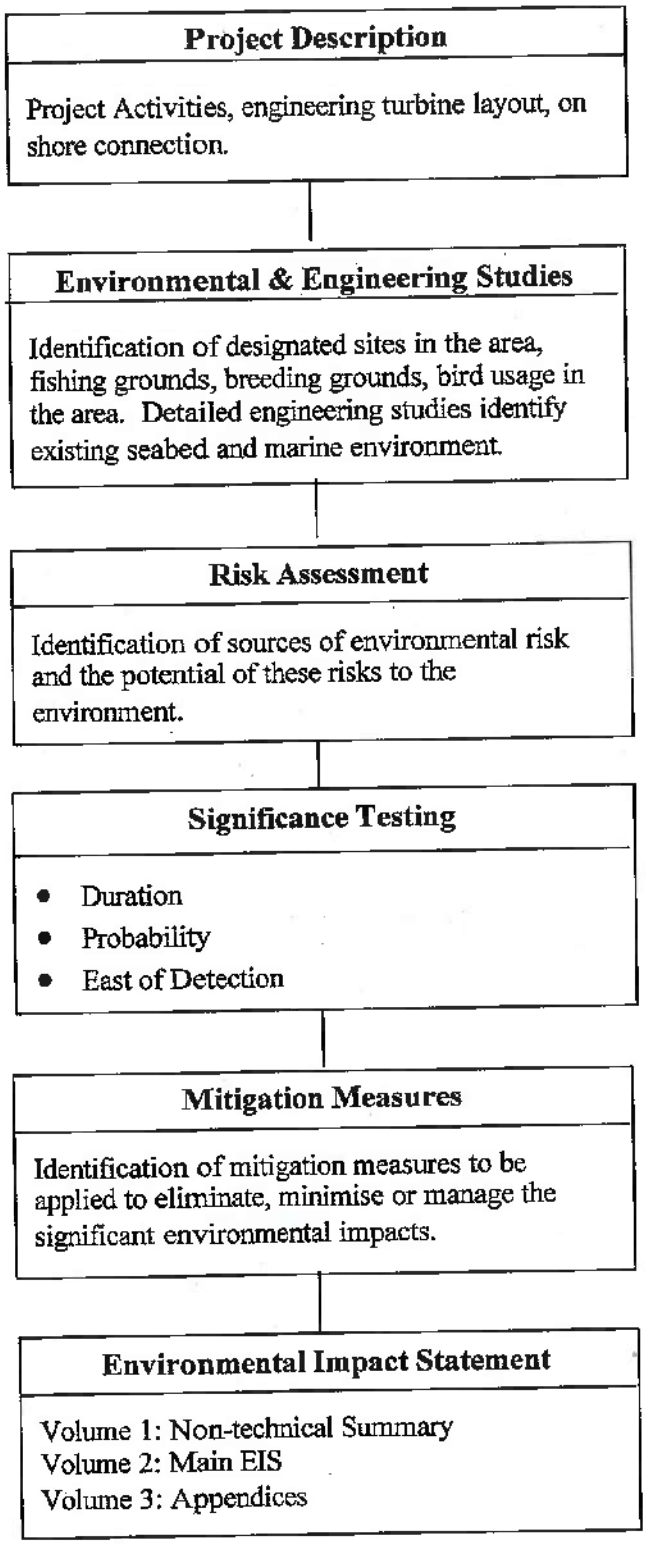
- A description of the proposed development;
- Review and identification of the main activities of the project which could be associated with discharges and emissions during normal operations;
- Environmental data gathering to identify the key physical parameters and the biological components in the marine environment within the study area;
- Appraisal of designated sites within the study area, identifying the presence and location of proposed natural heritage areas, special areas of conservation, special protection areas and blue flag beaches within the study area;
- Impact Assessment, identifying potential environmental effects including residual effects that are described in terms of major, minor, long-term or short-term or cumulative;
- Determination of mitigation measures, identifying mitigation measures that would be applied to the project to eliminate or minimise the impact on the environment.

The environmental impact assessment methodology is detailed in Figure 1.2.

1.6.1. Structure of the EIS

The EIS contains four volumes. Volume 1, the Non-technical Summary provides a summary of data contained in the Main EIS (Volume 2) in non-technical language. Volume 2 is the Main Report and Volumes 3 and 4 are the collation of all specialist reports and copies of correspondence with the statutory bodies and individuals.

Figure 1.2 EIS Methodology



1.6.2. Data Sources

This environmental impact statement has been prepared by using existing data on the Arklow Bank, project specific investigation data and site specific engineering data where available. A summary of the data sources used in the preparation of this EIS is detailed in Table 1.1.

Due to the nature of the project, the extent and nature of the construction activities and commissioning, operation and decommissioning, it is necessary to place the potential effects of each of the phases of the project into context. The evaluation of significance considers 5 elements for each individual impact. These include quantity, frequency, the severity of the consequences, of emissions or accidents, the ease of detection and controls that are in place to minimise an impact.

Based on the significance testing, mitigation measures are proposed to address the environmental impacts of any identified discharges. While the environmental assessment has been carried out using the available information on turbine technology, foundations and construction methodology, full technical details of construction etc. have not been determined. This is to allow tenderers for the construction to put forward their own designs and methodology.

While this list is extensive it is not limited to all the mitigation measures that can be put in place and it will be up to the contractor to determine the most efficient mitigation measures possible. In addition, the client's representative will identify areas where mitigation measures will need to be initiated.

1.6.3. Assumptions

Based on the technical and site investigation information that was available during the preparation of this EIS, every reasonable effort has been made to accurately predict the effects of the proposed wind park on the Arklow Bank and surrounding areas.

Site investigation work is still ongoing and until contractors determine the best foundation type, turbine type, etc. all environmental impacts will not be accurately known. As a consequence this EIA has been undertaken to presume the worst case scenarios to determine the environmental effects.

Table 1.1: Data Sources

1.7. Pre-Submission Consultations

During the preparation of this EIA, a letter describing the project was sent to various statutory bodies, non-government organisations (NGOs) and interested parties. A copy of this letter and the consultees is given in Volume 3, Appendix 1.

In addition to the scoping letter, Sure Partners Ltd., a wholly owned subsidiary of eirtricity held a public meeting at the Arklow Bay Hotel on the 10th of October 2000 and in the Bay View Hotel, Courtown, on the 29th May 2001. A list of the attendees at the public meetings is appended in Volume 3, Appendix 2. The purpose of the public meetings was to introduce the proposed wind park development to the public, statutory bodies and other non-government organisations. The meetings provided updates on the findings of the environmental impact assessment fieldwork, photomontages and descriptions of the need for renewable energy in Ireland. The agenda for the meetings is given in Volume 3, Appendix 3.

Replies from the Statutory Bodies, Non-government Organisations and the public are given in Volume 3, Appendix 4.

Meetings were held with BirdWatch Ireland on the 5th March and the 30th May to describe the findings of the birds surveys within the study area, the Irish Whale and Dolphin Group on the 7th of June and Duchas on the 22nd May 2001.

1.8. Contributors

This EIS was prepared by Fehily Timoney & Co., Core House, Pouladuff Road, Cork. Specialist subcontractors employed with reference to specific portions of the study were as follows:

- Ecoserve, Dublin – Marine Flora and Fauna Sampling and Identification.
- Coveney Wildlife Consulting Ltd. – Bird and Marine Mammal Surveys.
- Management for Archaeology Underwater Ltd., Tullamore, Co. Offaly – Marine Archaeology.
- MosArt, Landscape and Architectural Design, Wicklow – Visual Impact.
- Macroworks Ltd., Dublin – Photomontages.
- Fugro Ltd., Hertfordshire – Geotechnical Site Investigations.
- ESBi, Dublin, On-shore connection investigations.
- Enterprise Ireland, UCC – Investigations on the effects of the Wind Farm structures on the Arklow Bank seabed.
- Ramboll, Denmark – Construction, foundation and turbine type investigations.
- KHSK Economic Consultants – Socio Economic Assessment.

2. DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1. The Study Area

The study area is the 5 km area surrounding the Arklow Bank. In general, the Irish Sea is shallow, with water depths less than 100 m. Tidal currents are strong, and the annual temperature range is narrow, varying from 7 – 14 °C. The seabed is composed on the whole of coarse sediments of compact sand, with gravel, shell, and/or cobbles in varying proportions. Strong currents result in the waters in most of this area being well mixed vertically, and commonly having high levels of suspended matter. The high turbidity limits plant growth, and benthic algae are rare below 10 m depth.

2.2. The Site

The Arklow Bank is situated 13 km off shore, to the east of Arklow, and covers an area of approximately 27 km long and 2.5 km wide. The area of the bank shallower than 20 m below chart datum (BCD) is 29.7 km^2, of which 14.9 km^2 is shallower than 10 m BCD. The shallowest part of the bank is 2 m BCD, sloping down to the east to depths exceeding 40 m BCD and to the west to 30 m BCD. A detailed bathymetric survey of the bank is shown in Figure 2.

The Arklow Bank was chosen through a process of examining a range of issues, each of which influenced the final decision. These included:

- wind resource
- water depth
- distance to shore and to grid connection
- area available for development
- wave, current and tidal climate
- sea bed conditions
- environmental issues
- military restrictions
- visual impact
- petrochemical installations and pipelines
- power and telecommunications cables
- aggregate extraction areas

- shipping activities
- aviation activites, and
- fishing activities.

2.2.1. Wind Resource

Figure 2.1[20] illustrates predicted wind contours at 50 m average mean sea level (amsl) within the 12 nautical mile limit off shore. The wind regime is expected to be very good.

A wind monitoring mast was erected on the Arklow Bank in December 2000, and commissioned in January 2001. (See Plate 2.1.) An anemometer and a wind vane are installed at each of the 40 m, 30 m, and 20 m levels, and wind speed and direction are being recorded at each of those heights above mean astronomical tide. The mast has a mass of 30 t, and is situated in 5 m of water. It is supported by a 15 m pile driven into the sea bed. Preliminary examination of the data available confirms expectations to date.

Relationships between wind speed, turbulence and fetch are highly complex. In off shore areas, it is generally thought that, compared to on shore, wind speeds will be higher, with a smaller wind gradient, and less turbulence. This means that it should be possible for off shore wind turbines to have higher energy outputs and suffer less fatigue loading, thereby to have a longer life.

Turbulence intensity is the ratio between the standard deviation of wind speed and the wind speed. Turbulence at sea is generally less than on shore. In off shore regions, turbulence intensity is higher at low wind speeds, then decreases as wind speeds increase to about 12 ms^{-1}, and then begins to increase in response to increasing wave height.[21] Turbulence intensity is expected to decrease linearly with height. It is also expected to decrease with increasing distance from the coast. Research suggests that after 20 km or so, fetch turbulence intensity reaches a level (around 0.08 at 45 m in height, if no coastal effects are present) beyond which it will not decrease substantially with increasing fetch; however, further analysis is required.

Figure 2.1: Predicted Wind Contours at 50 m amsl

Plate 2.1: Wind Monitoring Mast

2.2.2. Water Depth[22]

The bathymetric survey carried out showed the sea bed levels along the north south ridge of the Arklow Bank varying between 0.6 and 4 m relative to lowest astronomical tide (LAT). The water depth increases rapidly on the east and west flanks, with slopes of around 6° on the eastern side of the bank and water depths down to 20 to 30 m, and a slope of around 4° westward from the bank crest.

This relatively shallow water allows an economic choice of foundation, which in deeper water would become prohibitive in terms of cost.

2.2.3. Distance to Shore and to Grid Connection

A harbour within reasonable distance for installation and maintenance activities is a requirement. These facilities are likely to be provided at Arklow, which is 13 km from the site. Grid connection possibilities likely to be in the vicinity of Arklow substation, and the various options are further discussed in section 2.2.4.

2.2.4. Area Available for Development

Given the expense of wind turbine construction off shore, compared to on land, economies of scale are a vital prerequisite for development. The potential for a development of 200 turbines confers a significant advantage on the Arklow Bank site.

2.2.5. Wave, Current and Tidal Climate

The Arklow Bank has a morainic ridge at its core. It is probably undergoing some reworking and is covered by a layer of mobile sand. The morainic ridge was deposited by glacial activity probably during the last glacial age (pre 12,000 BP) with the mobile sands probably forming following relative sea level rise post-10,000 BP.

Breaking waves and strong currents contribute to a vigorous environment at Arklow Bank. While this is expected to pose certain challenges in terms of construction and scheduling of work, it is not anticipated that it will jeopardise the proposed development.

This is discussed at greater length in Chapter 5.

2.2.5.1 Tides

The spring tidal amplitude in the region of the Arklow Bank is expected to be approximately 0.5 to 1 m.

Storm surges may lead to an increase in surface elevation up to 0.75 to 1.0 m for a 50 year event. For the 100 year event, the surges may be 0.8 to 1.05 m. Using the methods outlined in the above document, the highest mean water level for Arklow Bank with a return period of 50 years has been calculated as 3.51 m above LAT. For the 100 year event, the level is 0.06 m higher.

2.2.5.2 Waves

Wave heights in Irish waters can get very large in exposed areas, but the land offers considerable protection to the Irish Sea, and therefore less wave energy will penetrate these areas. In general, there is a reduction in wave height as the water depth decreases, however, waves may be focused by refraction as they pass into shallower water. In very shallow coastal waters, the effect of sea bed friction and wave breaking also act to reduce wave heights. Finally, tidal levels and currents can affect wave conditions at a particular site.

For the Arklow Bank, significant wave heights are calculated as approximately 8 to 9 m. By comparing these wave heights to the bathymetry for the Arklow Bank, it is evident that a large portion of the waves break when reaching the bank.

2.2.5.3 Currents

The Arklow Bank is subjected to strong currents with evidence of sand transport northwards to the landward side of the bank and southwards to the seaward side of the bank.

It appears the currents up to 1 to 1.2 ms^{-1} during spring tide may be observed. During storm surge events, currents of up to 0.5 ms^{-1} can occur.

However, across the bank, currents of 2.0 ms^{-1} have been measured. The directions of these currents are typically east to west, or west south west to east north east.

2.2.5.4 Summary Wave, Current and Tidal Climate

While a rigorous and challenging environment is anticipated at the site, this will not prove a precluding factor in the development of the wind park.

2.2.6. Sea Bed Conditions

The action of large waves with long wavelengths will extend far below the sea surface. Waves can be affected by the sea bed in depths of more than 200 m, and this may disturb sea bed sediments throughout the continental shelf region resulting in movement of soft sediments. In general, sediment transport is dominated by tidal currents in deeper water (> 15 m) and by wind generated waves in shallow water (< 5 m).[23]

Long term trends (over centuries) usually indicate increasing sea bed depths, especially in near shore areas where increases of the order of a few mm per year may be expected in waters of 20 m depth. In storm conditions, very rapid short term changes (of the order of 10 m) may be experienced on sand banks in shallow water. In addition, local scour and liquefaction problems may be experienced at some sites, particularly in the surf zone. Off shore wind parks are more likely to be affected by morphological changes than to cause them directly.

The sea bed sediments of the Arklow Bank comprise sand that becomes more coarse to the north of the site, whereas the material around the edges of the bank is composed predominantly of more granular material (gravel), especially to the east of the bank. Further, the core of the bank is believed to be composed of sand and gravel.

Given the distance between turbine foundations, it is expected that any changes in the sea bed due to the proposed development will be minimal or negligible. It is entirely

possible that, while very low in magnitude, such changes may prove stablising in their influence, rather than otherwise.

2.2.7. Environmental Issues

The site is not a designated Special Area of Conservation (SAC), Special Protection Area (SPA), or a proposed Natural Heritage Area (pNHA). Neither are there any scenic or other such designations in the vicinity of Arklow Bank.

2.2.8. Military Restrictions

This site is not located in a restricted military area; neither are there any such areas in the vicinity of the site.

2.2.9. Visual Impact

In comparison to many coastal landscapes in Ireland, the immediate context for the area in the vicinity of Arklow is a human made landscape character. Beaches such as Brittas Bay are popular and have a high amenity value; however, in a national context, the character of this whole coastal zone is not as high as examples elsewhere (e.g., the Beara Penninsula, the Giant's Causeway). Much of the eastern coastal area is a heavy commuter belt with a high density population. Rural areas are intensively farmed. There is little of the unspoiled, wilderness character that can be seen in other parts of the country. No matter where turbines are sited, they will be visible from some location. Given this practicality, the choice of site off Arklow is a good one in visual terms.

2.2.10. Petrochemical Installations and Pipelines

There are neither any petrochemical installations nor pipelines installed on or in the vicinity of the Arklow Bank.

2.2.11. Power and Telecommunications Cables

There are no power or telecommunications cables on or in the vicinity of the Arklow Bank.

2.2.12. Aggregate Extraction

No licences for exploration for or extraction of aggregates have been awarded for the Arklow Bank by the DoMNR.

2.2.13. Shipping

There are no shipping lanes in the vicinity of the Arklow Bank, and there are no restrictions on activities in the area. According to the Harbour Master in Arklow,[24] large vessels normally pass to the east of the Arklow Bank, except during periods of poor weather. There are a small number of yachts based at Arklow that sometimes sail to the north end of the Bank. Local traffic also passes to the west of the Bank, where there is plenty of draft and no restrictions. The Harbour Master stated that there is almost no activity at the Bank, because it is a dangerous location due to shallow water and wave action.

2.2.14. Aviation Activities

The Irish Aviation Authority (IAA) and Sea and Air Rescue were consulted in relation to the proposed development. No information has been received from them to indicate any difficulty. There are aerodromes at Brittas Bay, Co. Wicklow, and at Newcastle, Co. Kildare. Due to the distance to these facilities, it is not anticipated that any difficulties will arise due to the development of the wind park.

The co-ordinates of each of the turbines will be given to the Irish Aviation Authority. This information will therefore be available during search and rescue operations. Lights will be fixed to the turbines as considered appropriate by the IAA.

2.2.15. Fishing Activities

The construction of the wind park and laying of cables, and decommissioning, is considered likely only to have a temporary impact on fisheries and shellfish seed beds. The operation of the wind park is considered likely to have no impact, or, in the case of scour protection being laid, to have a positive impact in these areas by providing an artificial reef. The location of the turbines is not considered likely to interfere with normal fishing activities, because boats do not fish the bank itself.

2.2.16. Summary of Factors Influencing Site Choice

There are a limited number of sites that exhibit all the requirements for a good wind resource, suitable water depth, and proximity to shore and grid connection. Not only is the Arklow Bank one of these such sites, but it can be considered superior to many others in terms of its expected wind resource, and the area available for development.

Other factors examined may be considered potential precluding factors (e.g., designation as an SPA, SAC, etc.). None of these issues examined give cause to eliminate Arklow Bank as a choice of site.

In conclusion, Arklow Bank has important advantages as a potential wind park site, and no strong disadvantages, compared to some other potential sites.

2.3. The Proposed Development

The wind park will consist of 200 turbines with tower heights of up to 100 m and rotor diameters of up to 120 m. The minimum distance between sea level and turbine blade tip will be 40 m. The turbines will each have a capability to generate a minimum of 2 MW.

Project construction will commence in 2002 and will be complete by 2007. The development will be completed in phases, the first beginning in April 2002 with the installation of the foundations. Phase one, for 60 MW, is likely to be located in the middle of the Arklow Bank, and will supply the 110 kV line. Construction of this phase is anticipated to be complete by September 2002, with commissioning taking place in October 2002.

Each phase of the development will erect a number of turbines that will be connected via undersea cables to site substations. From here they will be connected via an undersea cable to the shore. There will be a requirement for up to three substations on site.

Wind turbines will be placed in a row pattern to have a uniform appearance when observed from land. The turbines are placed at separation distances of 350 m between turbines in a row, and 500 m between rows, although the final layout of the turbines may be influenced by the presence of archaeological finds or by engineering assessment. The location of the wind turbines, site substations and submarine cables are shown in Figure 2.

2.3.1. Turbine Design

The specification given for the wind turbines is based on the current available models. Turbine design is changing rapidly at present, and it is difficult to indicate a more exact specification at this stage. However, even the new designs do not vary in their essential physical features from existing machines. See the drawings in Appendix 5.

2.3.1.1 Turbine Components

The turbines will be of the generic three bladed, tubular tower model with horizontal axis. The rotor blades are bolted to the central hub, which is connected to a gear box located in the nacelle, or directly to a generator in the case of direct drive machines. The blades are mounted upwind of the rotor.

The blades are made of glass fibre reinforced polyester. Onshore, they generally turn at 20 to 30 revolutions per minute (rpm), depending on wind speed and make of turbine. Where larger blade diameters are used on shore, they typically operate at a lower rotational speed, of about 10 to 20 rpm. This is in order to keep blade tip speed about the same so that noise levels do not increase.

In general, larger blade lengths are proposed for use off shore. However, in this context, noise related restrictions which affect on shore wind farms do not necessarily apply, as they arise from concern about additional noise nuisance. A higher rotation speed will result in additional power output. Although this may give some increase in the sound power level, if it is adopted at Arklow Bank, it will not be significant to onshore receptors.

The generator, electrical components, and control unit of the turbine are also located in the nacelle. Earthing and isolation protect these components from lightening strikes. The nacelle protects all of these elements, and is formed by a glass fibre reinforced polyester hood that is sound insulated, ensuring minimal noise emissions.

Each turbine will generate electricity at 690 volts, depending on the machine chosen. The transformer at each turbine will step up the voltage, likely to 33 kV. The turbine transformer may be located at the base of the tower, on the tower platform, or within the nacelle. The turbines will be connected by cable laid on the sea bed to the site substations, and from the site substations by underwater electrical cables to the shore, joining the national grid at 110 or 220 kV.

2.3.1.2 Turbine Operation

Start-up is generally achieved at a wind speed of 2 to 5 ms^{-1}, with optimum power generation at generally between 12 to 16 ms^{-1}. The turbines generally shut down at wind speeds greater than 25 ms^{-1}, although some machines are designed to operate at up to 30 ms^{-1}.

The yaw mechanism turns the nacelle and blades into the wind, the movement of which is controlled by sensors that monitor wind direction.

It should be noted that, on shore at least, wind turbines are often guaranteed to have an availability of 95 %, and in operation this figure is generally closer to 98 %.

***Power Control*[25]**

The turbine may be stall or pitch regulated, with mechanical disk and tip air brakes.

Stall controlled wind turbines have the rotor blades bolted onto the hub at a fixed angle. The geometry of the rotor blade profile is aerodynamically designed to ensure that the moment the wind speed becomes too high, it creates turbulence on the side of the rotor blade that is not facing the wind. This stall prevents the lifting force of the rotor blade from acting on the rotor.

On a pitch controlled turbine, when the power output becomes too high, the blade pitches the rotor blades slightly out of the wind, reducing power output to the desired level. Conversely, the blades are turned back into the wind when the wind drops again.

An increasing number of larger wind turbines (1 MW and up) are being developed with an active stall power control mechanism. This combines features of pitch and stall machines. As with pitch control it is largely an economic question whether it is worthwhile to pay for the added complexity of the machine, when the blade pitch mechanism is added.

2.3.1.3 *Tower Installation and Access*

The tower of the turbine is a conical steel tube, with triple paint finish. It is delivered to site in 3 or 4 sections. The first section is bolted onto the steel base, which is cast into the foundation. The second section is bolted to the first, the third to the second, and, if applicable, the fourth to the third. The base of the tower is likely to be about 8 m in diameter, tapering to around 5 m or so where it is attached to the nacelle. The tower is accessed from the platform by a galvanised steel hatch door. Access to the platform is via a ladder from a boat.

The control unit is located inside the base of the tower. From here an internal ladder leads up to the nacelle. There are intermediate floors between the tower base and the nacelle.

The turbines may be coloured white or grey to blend into the skyline and seascape background. A grey or white colour scheme is generally recommended by most guidelines for on shore wind energy development to minimise visual impact (Department of the Environment – "*Wind Farm Development – Guidelines for Planning Authorities*;" the Scottish Office Environment Department - *PAN 45*; Department of the Environment Welsh Office – *PPG22*; Countryside Council for Wales – "*Policy on Wind Turbines*"). One of the criticisms of these colour schemes on shore is that the contrast with the surrounding countryside can be to strong at the base of the machine. This is not likely to be an issue off shore. Multiple coating also protects the turbines from corrosion.

2.3.1.4 *Turbine Marinisation*

Marinisation of wind turbines may include, but is not limited to the following:

- air tight tower and nacelle
- de-humidifying system
- heat-exchanging cooling systems for the gearbox and generator
- off shore corrosion protection
- permanent crane in nacelle for small components
- detachable crane stored on shore for larger components
- navigational aids controlled by visibility sensors and twilight relay, and
- electrical storm identification system.

2.3.2. Foundation

Considerable experience has been acquired in the design and installation of wind turbines on shore. Further, extensive experience in the design of off shore structures has been gained through the oil and gas industry, which is of immense advantage in the development of this new industry. Nonetheless, there are a number of factors that present new design challenges for off shore wind turbine foundations.

The design life span of the foundation will be based on many criteria, such as location, environment, purpose of structure, design codes and standards, rules and regulations, etc. In the case of off shore wind structures the design life is normally taken as being around 20 years, although it may be more.

Three possible foundation types are being considered. It is not possible at this stage to specify which of these types or variations on these types will be used in the development. The final choice of foundation will be determined by the depth of the water, the sediment characteristics, the erosion potential and economic considerations. The foundation type, and the construction methodology chosen, will be the decision of the contractor, and will be agreed in advance with the DoMNR.

An outline engineering design report was prepared by Ramboll, Denmark and is presented in Appendix 5, Volume 3. This report was used for the basis of our discussions.

2.3.2.1 Monopile Foundation Structure

Monopile foundations have been used at Lely (1994) and Dronten (1996) off shore wind parks in the Netherlands, and at Bockstigen-Valar (1997) and Utgrunden (2000) in Sweden.

A monopile foundation typically consists of a large diameter steel cylinder of up to 4.2 m diameter, with a wall thickness of 40 to 80 mm, and is installed 15 to 40 m into the sea bed (although the piles can be constructed using concrete). The mass of a pile is typically in the range of 200 to 400 tonnes, depending on the water depth. Heavy duty equipment is necessary to install the piles into the sea bed. This foundation type is not suitable for locations that contain large boulders, although, if an obstruction is encountered during installation, it is possible to drill or water jet down to the obstruction and remove it. While variable sea bed conditions may have to be contended with, this is not considered likely to pose serious difficulties at this site. In very stiff soils or rock, or soil with obstacles making it unsuited to driven piles, the monopiles can be placed in pre-drilled holes, and grouted into position. Figure 2.2 and Appendix 5 show an example.

The connection between the turbine and the foundation will be approximately 10 m above the average sea level, and the access platform will be located at this level. The tower is bolted on to a flange on top of the monopile.

The piles can be driven into the sea bed. A noise prediction model shows that, due to the distance to shore, noise from pile driving is not predicted to increase ambient noise levels on shore. This is discussed further in Chapter 4. However, it is likely that the piles will be installed by vibration, which would have lower noise emissions still. This method could well be suitable for the soil conditions at Arklow Bank. As an intermediate solution, the piles could be driven a certain distance, and then vibrated for the remainder of its length. The piles can be installed by cranes operating from either a jack-up or a floating barge.

The monopile provides stability against environmental forces primarily by horizontal earth pressures on the pile. A monopile at 10 m water depth typically has a total length of 30 m (depending on soil conditions) to prevent "toe kick" and thereby tilting of the tower.

Monopiles can be constructed at almost any near shore location, e.g., a shipyard or factory, and be towed by tug or carried on barges for transportation to the construction site. They are relatively simple and inexpensive to produce compared to concrete gravity foundations.

Monopile foundations have the advantage of reduced wave loading due to a smaller waterline. With respect to obstruction of water flow on the Arklow Bank, monopiles will cause the least impact of the three foundation types examined.

Figure 2.2: Monopile Foundation

In general, this simple design requires minimal sea bed preparation, and scour protection can be easily accommodated if needed, although it is often not required. Scour protection can be employed around the base of the foundation, or alternatively, can be considered in the pile design by making the piles longer. Where scour protection is used, regular inspection and possible maintenance is required; where scour is incorporated into the pile design, inspection is only required following heavy storm. Inspection frequency may be further reduced on gaining experience concerning scour conditions at the turbine location.

All off shore steel structures require an additional thickness of steel due to corrosion. A cathodic protection system with sacrificial anodes or impressed current could be considered instead, but are generally not preferred for cost reasons. Corrosion has not generally been found to be a serious problem at off shore wind parks, with protection operating sufficiently well.

Compared to a gravity foundation, a monopile is a slender and flexible type of foundation. This means that the turbine tower can be designed as a "soft" solution, thereby providing savings in the steel required for the tower. In water depths of greater than 10 to 15 m, however, flexibility may become high, and special solutions are required.

2.3.2.2 Gravity Foundation Structure

Concrete Caissons

Concrete caissons, or gravity foundations, have been successfully used since the early stages of off shore wind park development. Vindeby (1991), Tunø Knob (1995), and Middelgrunden (2000) off shore wind parks in Denmark all feature concrete gravity foundations. Such foundations use their inertia and the capacity of the soil material to resist forces applied to the structure.

The concrete gravity foundation design is based on a steel bottom plate, with a hollow cylindrical upstand, and a central concrete cylinder onto which the turbine tower is bolted (see Figure 2.3 for an example). They may be cylindrical, polygonal, square, or rectangular in shape. The foundation is placed on a pre-prepared bed of compacted, crushed stone, and an area of approximately 20 to 25 m diameter and about 4 m in depth must first be dredged. Gravity bases require to be protected against deep scour, by placing layers of stones and boulders on the sea bed surrounding the structure; however, placing the bottom plate beneath the sea floor minimises the need for scour protection. Scour protection is likely to provide an artificial reef for development of marine life.

Figure 2.3: Gravity Foundation

Ballast material typically comprises hydraulic sand or iron ore. Various other materials, e.g., concrete, gravel, olivine (a very dense mineral), etc., are also suitable for the ballast. The heavier the ballast chosen, the more the steel can be reduced. Site specific cost factors will determine a final choice for the contractor.

This type of structure is designed with the objective of avoiding tensile loads between the support structure and the sea bed. These foundations are characterised by their small penetration of the sea bed compared to the width of the foundation base, and they rely predominantly on compressive contact with the supporting stratum.

The caisson foundation is built in dry dock, at a site with good access to a navigable river or harbour, and is floated to its final destination before being lowered into place by a crane on a barge. Water and compressed air jets are used to bed the structure into its final position. The bottom is sealed with concrete and the enclosure is filled with the ballast material to achieve the necessary mass. As the concrete caisson generally has a high self weight, a relatively large crane barge is required for installation. For water depths below 5 m, access channels may be required to allow transportation of the barges to the turbine site.

Typical dimensions for a concrete gravity foundation at water depths of 5 m, 15 m and 30 m water depth, are foundation base diameters of 17.5 m, 22 m and 26 m, and a weight between 910 and 2,200 tons purely for the concrete (i.e., 2,300 to 8,500 tons including ballast high density sand). The dimensions of the pre-dredged hole are typically a diameter of 22 m to 30 m, and a depth of 6 to 8 m.

Using traditional concrete foundation techniques the cost of the completed foundation is approximately proportional with the water depth squared - the quadratic rule.[26] The water depths at Vindeby and Tunø Knob vary from 2.5 m to 7.5 m. This implies that each concrete foundation has an average weight of some 1,050 t. According to the quadratic rule the concrete platforms tend to become prohibitively heavy and expensive to install at water depths above 10 metres.

Provided the gravity foundation and scour protection are not fully buried in the sea bed, the gravity foundation will provide a greater obstacle to existing water flows than other foundation solutions; however, it should be noted that its dimensions are nonetheless very small compared to the distance between machines.

Steel Caisson

A variation on the concrete gravity foundation structure is the ballasted steel gravity structure. This consists of a steel upstand and base, which is ballasted with a high density material when installed. (See Figure 2.3.) The lower mass allows the quicker transportation and installation of the foundations.

A ballasted steel structure has the advantage that it is easy to produce, transport, and install. The waste of material in construction is low. No welding or grouting is required off shore. The foundation can be removed completely, or repositioned, if needed. However, these structures can be also sensitive to scouring in sandy locations such as the Arklow Bank, or where sea bed mobility is high. Therefore the sea bed around the foundation base will normally need to be protected against erosion by placing rocks around the perimeter. This type of foundation also requires the sea bed to be prepared prior to installation, i.e., levelling the sea bed and placing a layer of crushed rock. Steel foundations require coating and either a sacrificial design thickness or cathodic protection.

The steel gravity foundation is comparable to the concrete gravity foundation with respect to dimensions and ballasted mass. The foundation panels can be fabricated in a factory and can be assembled on shore. Such foundations can be used on all types of sea bed. Manufacturing may take place on a quay instead of a dry dock, as the steel caisson can easily be lifted by crane barge.

Unlike concrete caissons, the cost penalty of moving to larger water depths is minimal compared to traditional concrete foundation, because the foundation base does not have to increase in size proportion to the water depth to support loads due to wave or ice pressure. To date, the concrete solution has been preferred, due to high steel prices; however, increased water depths make the steel solution more attractive.

Tripod Foundations

Foundations on tripods have not yet been applied to wind turbines, but currently this kind of structure has been used for some 10 off shore oil and gas installations in the Danish North Sea and the Persian Gulf, and it has been found to be very advantageous (see Figure 2.4 and Appendix 5 for an example).

Figure 2.4: Tripod Foundation

The tripod foundation constitutes a circular central column, with a diameter of up to 6.0 m, being supported by a steel tripod structure. This section of the structure is around 30 m in length. Thus, it has been found not to be compatible with low water depths, as it is not desirable to have braces projecting above the water surface, due to the possibility of collision with service vessels and leisure craft. The tripod is supported by three piles of approximately 1.5 m in diameter, which are driven or vibrated up to 35 m into the sea bed, depending on the sea bed conditions.

The material thickness of the column and pipes is 20 mm to 90 mm, and the mass of a tripod, including J-tubes, anodes and access ways, is typically in the range of 420 to 470 tonnes. The weight of the 3 piles is around 115 tonnes. The turbine is installed on a flange on top of the centre column. The tripod provides stability against the environmental actions primarily through compression and tension in the piles.

The corrosion allowance required in the wall thickness of the pile is reduced, as the diameter of the pile is less. Also, the hydrodynamic load is reduced for this type of pile. However, the punching shear capacity of the connections between the upper braces and the centre column is increased. Further, the spreading of the legs requires a tilt adjustment piece to the central tower, unless the sea bottom has been carefully surveyed and the foundation placed accordingly.

As for monopile foundations, scour protection can be employed around the base of the foundation, or alternatively, can be considered in the pile design by making the piles longer. Where scour protection is used, regular inspection and possible maintenance is required; where scour is incorporated into the pile design, inspection is only required following heavy storm. Inspection frequency may be further reduced on gaining experience concerning scour conditions at the turbine location.

The tripod and the piles can be constructed in almost any near shore location, e.g., a shipyard or a factory, and are loaded on to barges for transportation to the wind park site. No preparation of the sea bed is necessary. It is often possible to remove obstacles encountered during piling. The piles can be installed by cranes operating from a jack-up or a floating barge. To control the exact location of the piles, a template is applied to keep the piles in position during the driving or vibration. Following the installation of the piles, the tripod is installed via the pile sleeves, directly on top of the piles. To properly secure the connection between the piles and the tripod structure, the void between the pile and the sleeve is either grouted or a firm connection is established via a controlled expansion of the pile towards the sleeve.

An important feature of the tripod foundation is the possibility of tuning the eigen frequency (frequency of oscillation) of the structure to fit the actual soil conditions, water depth, and environmental forces. This means that the applicable intervals of the functional water depths and forces for the tripod are much larger than for the gravity and the monopile foundations.

Multi-piled foundations featuring more than three piles are also possible.

With respect to obstruction of water flow, the tripod concept, with and without scour, is considered a solution midway between the gravity and monopile foundations.

2.3.2.3 Foundation Material Data

Depending on the choice of foundation concepts and the water depth the need for raw materials will vary considerably. Tables 2.1 to 2.5 provide estimates of the amounts of steel, concrete, gravel, and stone required for 200 wind turbines at various water depths for different turbine foundation types:

Table 2.1: Gravity Foundation Material – 5 m Water Depth

Gravity foundation 5 m water depth	Steel [t]	Concrete [m^3]	Stone [m^3]	High density sand (olivine) [m^3]
Nacelle, tower and rotor	60,000	-	-	-
Foundation		76,000	-	114,000
Preparation of sea bed	-	-	45,000	-
Scour protection	-	-	290,000	-
Total	60,000	76,000	335,000	114,000

Table 2.2: Gravity Foundation Material – 15 m Water Depth

Gravity foundation 15 m water depth	Steel [t]	Concrete [m^3]	Stone [m^3]	High density sand (olivine) [m^3]
Nacelle, tower and rotor	60,000	-	-	-
Foundation	-	128,000	-	264,000
Preparation of sea bed	-	-	68,000	-
Scour protection	-	-	410,000	-
Total	60,000	128,000	478,000	264,000

Table 2.3: Gravity Foundation Material – 30 m Water Depth

Gravity foundation 30 m water depth	Steel [t]	Concrete [m^3]	Stone [m^3]	High density sand (olivine) [m^3]
Nacelle, tower and rotor	60,000	-	-	-
Foundation	-	184,000	-	520,000
Preparation of sea bed	-	-	92,000	-
Scour protection	-	-	540,000	-
Total	60,000	184,000	632,000	520,000

Table 2.4: Monopile Foundation Material

Monopile foundation	5 m water depth Steel [t]	15 m water depth Steel [t]
Nacelle, tower and rotor	60,000	60,000
Foundation	39,000	77,000
Total	99,000	137,000

Table 2.5: Tripod Foundation Material

Tripod foundation	15 m water depth Steel [t]	30 m water depth Steel [t]
Nacelle, tower and rotor	60,000	60,000
Foundation	108,000	116,000
Total	168,000	176,000

Steel

The cheapest way to protect submerged steel structures against corrosion is cathode protection, i.e. to use sacrificial anodes. However, the monopile is subject to large vibrations during pile driving, so anodes would have to be installed off shore after driving. Therefore for the monopile foundation, the best corrosion protection is a sacrificial thickness of steel, preferably combined with a 100 % coating. Due to the nature of the corrosion allowance of the steel, this method is only valid for structures with a limited lifetime.

Other types of corrosion protection are metalisation and enforced current protection. Metalisation of the structure gives a combination of coating and cathode protection. However, the technology to perform such a thick layer is not developed as yet. Enforced current protection of the structure is a very cheap protection method, but the power control is not satisfactory from a structural point of view. While lack of current leads to corrosion, an over protection will lead to hydrogen brittleness in the structure.

Experience shows that a combination of cathode protection, coating and corrosion allowance is the best way to protect the splash zone of a structure against corrosion.

Concrete

Corrosion of reinforcement in a concrete structure in an aggressive marine environment is a well known deterioration process. This can be addressed by one or more of the following techniques:

- removal and replacement of the chloride contaminated concrete. This traditional technique is difficult and expensive off shore.
- injection of larger cracks with acrylic resins or polyurethane and surface treatment. the latter technique is not possible under water, and the former is very difficult and expensive. furthermore, while this reduces the ingress of chlorides, it does not reduce the corrosion process.
- cathodic protection. this is a modern electro-chemical method with either sacrificial anodes or impressed current, which, during the last decade is becoming more widely accepted as a cost effective repair technique.

The use of pre-stressed concrete could also assist in preventing cracks on the surface.

2.3.2.5 Foundation Summary

Selection of the optimum foundation concept(s) for the Arklow Bank wind park is influenced by further factors. In the table below, the concepts previously described are reviewed with respect to the prime factors. For each factor the suitability of each foundation concept has been assessed leading to a score of 1 (less suitable), 2 (suitable) and 3 (more suitable):

Table 2.6: Foundation Summary

Factor	Foundation Concept		
	Gravity	Monopile	Tripod
Flexibility cf. production facility	1	3	2 - 3
Flexibility cf. distance facility to site	1	3	2 - 3
Ease of transportation	1	3	2 - 3
Dredging of access channels	1	3	2 - 3
Levelling of seabed	1	3	3
Dredging of foundation hole	1	3	3
Pile driving	n.a.	3	3
Vibration	n.a.	2-3	3
Flexibility cf. scour protection	1	2 - 3	2 - 3
Impact on water flow	1	3	2 - 3
Suited for shallow water cf. structure	3	3	1
Suited for medium water cf. structure	2 - 3	3	2 - 3
Suited for deeper water cf. structure	1	1	3
Suited for shallow water depths cf. price	2 - 3	3	1
Suited for medium water depths cf. price	2	3	2
Suited for deeper water cf. price	1	1	3

As can be seen from the above table, the optimum foundation concept for shallow to medium deep waters, approximately 5 m to 15 m, is the monopile, whereas the optimum foundation concept for the medium to deeper waters is the tripod foundation, approximately 15 m to 30 m; however, the gravity foundation has the advantage of being proven technology in similar situations.

2.3.3. Turbine Layout

A number of turbine layouts were considered for the proposed development. That chosen is turbine layout 1 (see Appendix 6). This regular, uniform layout was chosen with regard to minimising visual impact. The alternative turbine layouts are discussed in section 3.5.

2.3.4. Grid Connection Point

2.3.4.1 On Site Substations

The substation platform is envisaged as a steel superstructure placed approximately 14 m over the mean water level (MWL), with a height of approximately 7 m and a span dimension of approximately 20 m x 28 m. (See Figure 2.5.)

This substation platform will have vertical cladding in order to create reasonable shelter on the platform. A helicopter deck may be placed on the top of the structure, approximately 23 m above the MWL, with a diameter of approximately 20 m.

The support to the substation platform will consist of up to four foundation piles with a diameter of between 1 m and 2 m, or gravity structures. The final type of foundation will be determined by the sea bed characteristics at the location, erosion potential and economic considerations, and will be the decision of the contractor, as agreed with the DoMNR.

The site substation may accommodate a number of technical installations such as:

- main switchboard
- medium voltage/high voltage (MV/HV) transformers
- circuit breaker
- control and communication equipment
- emergency diesel generator and diesel oil tanks (double wall)
- seawater fire extinguishing equipment
- personnel and service facilities
- helicopter deck (without fuel storage)
- pillar crane, and
- lifeboat/man overboard boat.

The site substations will not be permanently manned. They will be used for maintenance and operations purposes to accommodate a maximum of 14 persons at a time, for shorter maintenance visits. Basic accommodation may be provided for an emergency stay of 6 persons, where longer periods of time are required to be spent, by fewer staff members. The personnel and service module may house a galley, bunks, common room, first-aid room, washing and toilet facilities. A workshop may be provided for basic maintenance and repairs. The eventual platform design is subject to engineering and operation and maintenance requirements. Sewage effluent will be accumulated and transported on shore, where it will be disposed of into the sewerage system by a licenced waste contractor. The procedures involved will be controlled by the environmental management and detailed in the waste management plan.

Figure 2.5: On Site Substation

Due to the physical proportions of the turbine array on the Arklow Bank wind park, which is relatively long and narrow, there will probably be a need for up to three site substations. The number of substations will be determined so as to minimise the power losses from transmission at medium voltage. The high voltage power cables are used to transport the generated power to shore.

2.3.4.2 Marine Cables

A submarine cable of approximately 11 km - 14 km will connect the site substations to the grid in the vicinity of Arklow.

Specialist cable laying barges and marine equipment will be used for laying the marine cables to the onshore connection. A vessel having a propulsion positioning maintenance system will be preferred. Marine power cables are generally fitted with substantial armour to withstand the high mechanical stresses during installation and potential disturbance during operations. These cables normally include a communications core and are specially designed to ensure both longitudinal and radial watertightness. Because of the length of the cable involved, sea bed splices will not be required.

The contractor has the alternative to lay the cables directly on to the seabed or to bury them. It is most likely that the cables to shore, which carry the entire wind park output, will be buried to prevent them being damaged by passing vessels, wave action, and scour and abrasion in the surf zone, which is extremely hostile to cables. This will increase the wind park cost, but will significantly reduce the risk of the cables failing and the loss of revenue.

The method of burial will depend on the condition of the sea bed. Sand can be fluidised to form a trough in the sea bed. Once the cable has been laid in the trough the sand can be allowed to back-fill naturally. If the sea bed is harder, such as clay, a plough may be required. Alternatively, trenches can be cut, typically 2 m into the seabed using a scavaging keel with high-pressure water jets. However, in this case, the sea bed at Arklow Bank is composed of sand material, and of muddy sands between the Bank and Arklow.

2.3.5. Route for Connection to Shore

Submarine cable installation techniques have been used extensively in the oil, gas, and telecommunications industries and should be capable of installing the cables at off shore wind parks.

The medium voltage sea cable from the turbines to the site substations is typically rated at 33 kV. The turbines are connected in series by the medium voltage sea cable which is connected to site substations to interface with the off shore high voltage power cables at 110 kV/220 kV.

Three cable routes have been considered by the developer. These routes are described and compared below. Figure 2 shows the three different routes, A, B and C. It is likely that that all these routes will be used for different phases of the development.

2.3.5.1 Route A

One of the site substations will be located in the northern section of Arklow Bank. The HV cable from this substation will take a route west, reaching the shore at a point approximately 4.5 km north of Arklow harbour, in the vicinity of Johnstown. The length of the line is approximately 14.2 km.

Onshore, the cable route takes a line along public roads. The point at which this line comes ashore is immediately south of the Wicklow SAC. The route follows the coast road south, along Johnstown Lane, to the underpass road under the N11, along the south perimeter of the road reervation for the N11, to the Arklow Town slip road, and across the road to the Arklow 220 kV substation. The length of the on shore section of this line is approximately 4.1 km.

2.3.5.2 Route B

Originating at a site substation midway down the Arklow Bank, the high voltage cable takes a north westerly route, and the cable reaches the coast at the same location as route A. The length of this line is approximately 15.0 km.

2.3.5.3 Route C

The high voltage cable from the substation located in the southern section of the Arklow Bank takes a route north of the Seven Fathom Bank, in water depths of up to 27 m BCD. Tidal currents of around 2.5 to 3.5 knots in a north east to south west direction are indicated for this area. The cable route then swings west to shore, reaching a point 0.5 km north of Arklow Harbour. In the inshore area, the chart indicates a tidal stream of 1 to 2 knots, in a north north east to south south west direction. The length of this route is approximately 15.4 km.

This cable route proposes to take the line of the old outfall/diffuser from the IFI/NET gypsum plant, running in a purpose built trench on the North Quay leding to the Avoca Bridge. This route avoids the Arklow Town Marsh NHA. Prior to construction the integrity and length of the outfall will be verified. The sea line outfall is an 8" fibreglass coated polythene pipe, constructed in the early 1970s.

The preferred route from the junction with the north quays is along the Dublin Road direct to Arklow ESB substation. The route will be carefully chosen to avoid existing utilities, and to limit the length of road opening so as to minimise potential disruption to traffic. It is likely that this segment of the route will be ducted in order to expedite construction.

A number of options have been considered to re-route the line around any local dislocations in the existing right of way. One option is to take a route along the road verge to Mill Road and back into the original trench along the north quay. Another option is a road opening along the new road around the marina.

The length of this line is approximately 3.6 km in existing trenches and road openings to the Arklow substation. Alternatively, a more direct route to the Arklow substation may be taken.

2.4. Construction Phase On Shore

During the construction and installation phases, certain sections of the work will be carried out on shore.

Construction of the site substations and gravity foundation caissons (in the event of them being used) is likely to be carried out at Arklow Port. All other materials, e.g., the turbines and the rotors, etc. will probably be brought in by sea, either through the port, or directly to the site. Some of the components may be pre-assembled onshore in order to make best use of available weather windows off shore.

During the operational phase of the wind park, a service building located close to the quays will be required to store stocks for spare parts, etc.

2.4.1. Employment Onshore

Depending on the type of foundation used, the personnel employed will be skilled labourers, welders and/or steel fixers and concrete labourers, electricians, technicians, electronic engineers, etc.

A socio-economic appraisal of the wind park (see Appendix 8) concluded that:

- the first phase of 60 MW will create 360 full time equivalent (FTE) jobs during construction and 23 permanent FTEs in direct employment from 2002.
- the full economic effect of phase 1 will create a further 144 jobs during construction and 45 permanent jobs in sub-supply.

Furthermore, there are a number of sources of estimates for employment generated by wind energy development. The following figures are given in a 1998 Greenpeace report, "*Offshore Wind Energy – Building a New Industry for Britain.*"[27] These figures are based consultation with existing off shore wind developers and operators, from experience gained from working on onshore and semi-off shore wind park sites.

Table 2.7: Estimate of Direct Employment to Develop Off Shore Wind Parks[13]

Development Stage		FTE Jobs per MW	FTE Jobs per 520 MW
Project Design & Development	Marine/Ground Investigations	0.01	5.2
	Site development including permissions	0.10	52
	Design including structural, electrical and resource	0.02	10.4
	Finance	0.04	20.8
Component Supply	Generators	0.15	78
	Gearboxes	0.4 - 0.9	208 – 468
	Rotor Blades	0.50	260
	Brakes, Hydraulics	0.04	20.8
	Electrical & Control Systems	0.04	20.8
	Towers	0.90	468
Assembly Installation	Wind turbines	1.00	520
	Foundation Structure	0.30	156
	Electrical and connecting cables	0.05	26
	Wind Turbines	0.30	156
	Project Management & Commissioning	0.11	57.2
Operation & Maintenance	Management, routine and fault maintenance	0.06	31.2
TOTAL		**4.52**	**2090.4 – 2350.4**

According to these figures, it may be anticipated that for a development of 520 MW, over 2000 jobs will be generated in Ireland and elsewhere.

These figures may be considered high. However, a survey of employment in the UK[28] onshore wind industry reviewed a number of employment studies, and concluded that a reasonable figure for direct jobs for wind energy at that time (1995) was 7 to 8 personnel years per MW for all manufacturing related to grid connected wind energy systems, and around 0.2 to 0.5 direct operation & maintenance jobs per MW capacity installed. For employment within the UK, these figures were 6.7 jobs per MW installed, and 0.49 operation & maintenance jobs per MW. Finally, for total employment in the UK and overseas, estimates were 12.4 jobs per MW. It should be noted that improvements in production efficiencies since that time would have reduced these figures.

By contrast, the European Wind Energy Association, in a report prepared for the European Commission,[29] states that 15 to 19 jobs are created for every 1 MW wind energy installed. This includes both direct and indirect employment, and also referred to onshore wind energy development.

In the context of the latter two reports, the Greenpeace employment estimates appear reasonable.

According to the BWEA report, a multiplier of 2.2 is used to convert direct jobs into total jobs,[30] giving a figure of 4599 to 5171 personnel years.

Clearly, not all of this employment will be generated in Ireland. However, to date, the project design & development stage has generated employment primarily in Ireland. Assembly, installation, and operation & maintenance will also provide employment primarily in Ireland. There remains the possibility that some of the component supply could also be developed in Ireland, this being such a significant proposal. It should be noted that the employment created for operation and maintenance off shore is lower than estimates for on shore development by a factor of 10.

2.4.2. Traffic Onshore

The turbines and associated equipment will be transported by sea to Arklow, most likely from either Germany or Denmark. Electrical cabling is likely to be transported by sea, due to the size of the cables and the drums. Hardcore for sea bed preparation or scour protection, where these may be considered necessary, are likely to be shipped to Arklow by sea. Monopile or tripod foundations are likely to be manufactured in major steel works. Due to their physical size, it is foreseen that the pipes are shipped on barges to the Arklow area, where the assembly area is likely to be located. They will therefore have the least impact on onshore traffic.

Concrete caissons will require a cement works either at the on shore site area, or in the vicinity of Arklow. Whichever means by which the caissons are constructed, there is likely to be a high level of increased traffic in the vicinity of the assembly site at Arklow during the construction period. However, this is minimised by bringing over sized loads by sea where possible.

As described above, the monopile and tripod foundation concepts offer a flexible solution with respect to the location of manufacturing yards, so that not all the production necessarily will have to take place in Arklow. However, regarding traffic, a worst-case scenario for the impact at Arklow is that all construction works take place in Arklow.

Employees of the construction site are foreseen to arrive by road. This will increase traffic volumes on the road network around Arklow. This is discussed further in Chapter 4.

2.4.3. Onshore Material Requirements

For the construction of temporary site facilities, material requirements will consist of general building materials for a hardstanding/marshalling area (approximately 80 m x 120 m) and a covered warehouse storage area (approximately 20 m x 40 m). A temporary office, canteen and toilet facilities are likely to be Portacabin type units; however should suitable existing facilities be available then these would be used.

The construction of the cables for power connection on shore is envisaged as typically being direct burial in open, undeveloped areas and being ducted under roads. Indicative quantities for the three cable routes and their construction element are as given in Table 2.8 below.

Table 2.8: Material Quantities for Construction of Proposed On Shore Cable Routes

Material	Quantity
Excavation material removed off site	11,000 m^3
Lean mix concrete	5,900 m^3
Tarmac road surfacing	1,250 m^3
Suitable backfill	5,100 m^3
Length of 200mm PVC ducts	30,300 m
Length of 90mm PVC ducts	40,400 m

The three onshore cable routes will proceed at the different phases of construction of the full 520 MW wind park.

With respect to the foundations, reference is made to section 2.3.2 – "Foundation Material Data," and tables 2.1 to 2.5 in particular.

2.4.4. Temporary Onshore Structures and Facilities

Temporary site facilities required include the following:

- Offices, a canteen, toilets, and washing facilities;
- A small fuel (diesel) storage depot;
- Mobilisation, plant and equipment storage area;
- Warehouse, workshop and covered storage area; and
- Assembly and launch area with marine access.

In addition service utilities (principally water, wastewater, communications and electricity) will be required. The main contractor will select the temporary facilities. These temporary facilities will require a temporary hardcore surface. All temporary facilities will be removed from the site following the completion of the construction phase. The hardcore surface will be reinstated with topsoil and grass will be seeded as necessary.

The worst-case scenario at Arklow is construction of the entire first phase of 25 concrete gravity foundations, which, due to the size of the bottom slab, will require a dry dock of some 20,000 m^2. For 25 steel foundations (monopile, tripod, or caisson) a best estimate is 3,000 m^2 under cover, and a total area of 30,000 m^2. Due to the lesser weight of the steel construction, compared to the concrete caisson, manufacturing does not have to take place within a dry dock. If the turbine towers and hence the blades are to be mounted while the concrete foundations are still in the dry dock, the area required increases accordingly. Otherwise, the concrete foundations may temporarily be moved to another area where the blades are mounted. Alternatively, assembly takes place at sea.

At Middelgrunden Wind Park in Denmark,[31] an area of 7,500 m^2 was required for the manufacture of 20 concrete gravity foundations, including space for site huts, stores, concrete mixing plant, steel works, and parking. The area of the dry dock used at the Middelgrunden project was approximately 5,000 m^2, the diameter of the bottom slabs having been 16 - 18 m.

At the planned off shore wind park at Horns Rev in Denmark (80 monopile foundations) an area of 20,000 m^2 will be required throughout the construction phase. The maximum water depth at Horns Rev is 12 m.

It is estimated that the area required for the construction yard at Arklow to facilitate storage of steel elements brought in from outside steelworks; space for assembly of piles and tripods; cranes; space for assembly of turbines, in case this does not take place at sea; space for storage of the electrical equipment; workshops; facilities for the workers; offices, etc., will be around 10,000 m^2.

In addition to these numbers mooring space for jack-up platforms, barges, cable vessels etc. is required during downtime, i.e., while waiting for acceptable weather windows.

Specific locations being considered for onshore construction and ancillary facilities include:

- Arklow Harbour – area designated for use as marine and port related activity use; otherwise
- Roadstone Provinces Ltd. works site and jetty to south of Arklow Harbour;
- Dublin Port commercial harbour area;
- Belfast Port – shipyard facilities.

It is possible that combination of these areas or other suitable marine facilities will be used during the course of construction.

2.4.5. Onshore Wastes, Residues, and Emissions

The primary types of waste and their sources are given in the following table.

Table 2.9: On Shore Construction Waste Types and Sources

Waste type	Source
Paper and plastics	Material packaging
Timber	Material packaging and temporary supports
Waste from toilets	Chemical toilets
Concrete, steel, fuel oil and lubricating oils	Residues at end of project
Concrete blocks	Residues from the temporary site facilities (e.g., offices, canteen and toilets)
Garbage	Canteen wastes
Gravel, stone and rubble	Temporary surfaces to facilitate construction

With respect to the concrete gravity foundations there will probably be a waste of some 5 % of concrete and steel for reinforcement, and casting moulds, the latter depending on the actual planning of the casting process. After casting of the foundations the moulds will be discarded.

Manufacturing of steel foundations will probably cause a waste of steel of 3 - 5 %. During construction there will be emission of smoke from welding as well as a limited amount of lubricating oil and cutting oil.

Wastes removed from the site during and at the end of the construction period will be reused, recycled or disposed of by a licensed waste contractor in accordance with best practice.

The site contractor will be required to implement an environment management system and a develop a waste management plan. See Chapter 17 – Monitoring Programmes.

2.5. Construction Phase Off Shore

During construction work at sea, installation components can be shipped from Arklow Port to the bank for fitting. Working areas at sea will be established and marked in accordance with the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Maritime Voyage System (MVS) and in agreement with the Commissioner of Irish Lights. Local radio navigation warnings will be given in advance of and during the construction of the off shore wind park and the laying of the power cables to the shore.

The tower is likely to be erected on top of the pile, followed by the nacelle and the blades; however, the completed and pre-assembled turbine can be installed directly on top of the pile. As the installation of the pre-assembled turbine off shore will require a more extensive construction site on shore, this option is considered the worst case scenario with respect to impact on land. However, shortage of suitable weather windows at the off shore site may possibly make it a more attractive option. This decision rests with the contractor.

The following major activities will take place off shore:

- preparation of the seabed, i.e., for monopile and tripod foundations, removal of large boulders, if any; for gravity foundations, dredging of a hole and construction of a gravel/stone bed.
- jetting or ploughing of trenches for cables for all foundation types.
- placing of cables for all foundation types.
- installation of foundations, i.e., for monopiles and tripods, driving and/or vibration of the piles; for gravity foundations, placing of the foundations.
- installation of turbine towers with or without turbines, i.e., for tripod and gravity foundations the towers may already have been pre-assembled onshore.
- installation of nacelles and blades for all foundation types, if not already pre-assembled onshore.
- installation of site substations.
- installation of cable for all foundation types, and installation of the cable through the j-tube.
- construction of backfilling and scour protection for the gravity foundation, and possibly scour protection for the monopile or tripod solutions.
- upon completion of each stage of construction, commissioning of that set of turbines will be undertaken.

2.5.1. Employment Off Shore

Employment off shore during the installation phase will primarily be crew on the various vessels. For placing of the foundations a number of divers, as well as engineers and surveyors, will be required.

At Horns Rev 20 vessels with accommodation for 50 - 70 people will be required for the installation of 80 monopile foundations and wind turbines.[32] At Arklow Bank the number of vessels and persons is not likely to be lower overall, but it depends on the time schedule and the equipment available.

Please see section 2.4.1, employment onshore. As discussed, it is difficult at this early stage of the industry's development to give an exact breakdown of numbers employed, and what proportion are on or off shore; however, a socio-economic report commissioned to examine the proposed wind park development found that extra employment will be generated in the area (see Appendix 8).

The Greenpeace report referred to suggests employment generation of up to 520 personnel years for the assembly of the wind turbines, and up to 395 personnel years for the installation of foundations, laying of cables, installation of turbines, project management and commissioning.

2.5.2. Shipping Traffic

During installation of the foundations and wind turbines there will be floating equipment like minor vessels, and other vessels to perform the installation, to dredge the access channels and to service the development. This will all increase the volume of sea traffic at Arklow, and on the bank.

Frequency and types of boats that will be used during construction cannot be accurately determined as it will depend upon such items as the foundation type, turbine type, and difficulties encountered during the construction of the wind park. It is expected that a barge and jackup platforms will be used for the construction of the foundations. A ship or barge with a suitable lifting crane will be required for the erection of the turbines. In addition, smaller boats for transporting people and other services will also be required.

As discussed, the turbines will be transported by sea to Arklow, increasing shipping traffic. Electric cabling will also be transported by sea to the site.

Hardcore or scour protection, and monopile or tripod foundations are also likely to be shipped to Arklow by sea, where necessary.

Please refer to Chapter 4, regarding safety at sea.

2.5.3. Material Requirements Off Shore

With respect to the foundations, reference is made to section 2.3.2 – "Foundation Material Data," and tables 2.1 to 2.5 in particular.

Turbine towers will be of steel, and are likely to weigh around 220 to 240 t, although figures vary depending on the manufacturer. Typical figures for the rotor and nacelle are between 100 and 150 t. The nacelle will be steel, housing the generator, a gearbox if applicable, and other electrical components. The rotor comprises three blades, each up to 60 m in length, typically made of glass fibre reinforced polyester.

The three cable routes will proceed at different phases of construction of the full 520 MW wind park.

Table 2.10: Material Quantities for Construction of Proposed Off Shore Cable Routes

Material	Quantity
armoured submarine cable (110/220 kV)	45,500 m
seabed material jetted out to depth of 2 m	3,822,000 m^3
submarine cable (33 kV) between turbines	50,000 m
seabed material jetted out to depth of 1 m	2,100,000 m^3

2.5.4. Temporary Off Shore Structures/Marine Plant

The off shore construction phase will not require any temporary site structures on the bank, as all the construction operations will be performed from either floating vessels and/or jack-up barges.

Installation of the foundations will require a crane barge, or a jack-up barge equipped with a crane. For monopile or tripod foundations, cranes will handle the pile driver or vibrator, as well as the piles. A small stockpile of piles will be held on the crane vessel driving the piles. The remaining piles will be transported from land to the crane vessel on flat top barges. The crane vessel will be self sustaining with respect to power, fuel tanks, tugs, etc.

Before placing gravity foundations, a hole with a diameter of 22 – 30 m and 6 - 8 m deep shall be dredged and a gravel/stone bed shall be prepared, based on the preliminary design carried out. Placing of the gravel/stones will require a backhoe dredge or a tremie pipe, depending on the water depth. If required, the gravel/stone bed may be compacted by using a large underwater compactor.

For the transport and installation of tripod or caisson foundations, flat top barges and crane vessels will be required.

For laying the cable, a plough or under water jet for provision of the trench is likely. The use of a cable laying vessel, handling the cable drums, is also likely.

Other than the major construction equipment, a number of tugs and service vessels will be required.

It is intended that the erection of the wind park will be carried out by the main wind turbine supplier or specialist marine construction contractor. This will ensure that proper procedures and standards are adhered to and also to preserve the guarantee integrity of the construction.

2.5.5. Off Shore Wastes, Residues, and Emissions

During the off shore construction phase, wastes and residues will come from operation of work vessels and other equipment, as well as from the accommodation on board the vessels. Hence, the wastes and residues will mainly consist of lubricating oil, diesel oil, and garbage and sewage.

All vessels working on site shall as a minimum sort and handle the wastes and residues according to International Maritime Organisation (IMO) regulations or similar. Further, all vessels employed at the site will be required to document their capability of fulfilling the IMO regulations. All wastes and residues will be taken onshore and the impact on the Arklow Bank will be negligible. Wastes removed from the site during the construction period will be reused, recycled or disposed of by a licenced waste contractor in accordance with best practice. The contractor will be required to implement an environmental management system and a waste management plan.

The tripod foundation may, among other methods, be connected to the piles by grouting. For each tripod foundation the amount of grout may be around 7.0 m^3 of which 0.05 m^3 may be spilled to the sea. The impact of the grout on the environment will depend on the type of grout used. The choice of installation method will be that of the contractor.

Dredging of holes for the gravity foundations will cause some sediment spreading in the area however, this is believed to be within reasonable limits. The existing currents in the area will quickly disperse any increased suspended solids.

With reference to ship collisions (with the construction equipment, the turbines, the substations, etc.), or to noise emissions during pile driving or vibration, please see Chapter 4. With regard to sediment spillage (in connection with the dredging of access channels), etc., please see chapter 5.

As a relatively new industry, it is not possible at this point in the development of the project to assess with accuracy the quantities of wastes and residues coming from the site. The item will be addressed before the installation of the wind turbines begins.

2.6. Operational Phase

During the operational phase of the wind park, the primary activities will be the operation of the turbines, inspection and maintenance of the turbines, plus the occasional exchange of major parts within the turbines. Should scour protection be utilised, its inspection and maintenance will also be required.

The wind park operation will generally be unmanned, being controlled remotely from the offices of the operation and maintenance contractor. The wind park will also be monitored from Sure Partners' headquarters. The developers will operate the Arklow Bank wind park in accordance with international best practice.

Suitably qualified contractors and personnel will undertake the marine works and maintenance management, and provide resources to ensure the safe and efficient maintenance of the electrical and control system elements of the plant. The maintenance of the wind turbine generators would typically be carried out by the original equipment manufacturer or by a suitably experienced maintenance contractor.

While the operation and maintenance of a large off shore wind park is new, the elements involved are well established. The promoters of this project and their contractors have significant knowledge and experience of on shore wind parks, marine works, electrical power systems, environmental protection, and health & safety issues. This knowledge and experience, together with ongoing consultation with regulatory bodies, including the Department of the Marine and Natural Resources, Commission for Electricity Regulation, Commissioners of Irish lights, Aviation Authority, etc., will be applied to develop operating practices and contingency plans to meet the conditions envisaged.

Weather conditions will have an influence on the construction and maintenance operations of the wind park. Scheduled outages for maintenance of key plant can be undertaken annually during convenient periods within low tariff summer months when winds are low and sea states minimal. The goal is to extend off shore turbine service intervals to 1 year from the current period of six months for on shore wind park developments.

Experience to date from Danish off shore wind parks shows that wind speeds must be less than 7 to 8 ms^{-1} when the wind is coming from certain directions to gain safe access on to the wind turbines, although safe access can be had at up to 12 ms^{-1} when the wind is coming from other directions.[33] This illustrates the difficulties that can arise in terms of maintenance access.

The site substations will require minimal maintenance. This maintenance will be carried out as part of the overall servicing of the wind park. Access to the site substations will normally be by service boat. A boat landing facility, which may consist of fender piles or some other method, will allow personnel transfer and temporary docking of the service boat. The site substations may have a helicopter deck to allow personnel access. Equipment and material transfer will be by crane. Any waste oil from the diesel generator/tank installation or the MV/HV transformer will be collected in a separate waste oil tank. Handling of the oil waste from this and other waste, wastewater etc., will be in strict accordance with the applicable maritime regulations.

To improve the safety of navigation and to protect the wind generators themselves, it is proposed to equip the wind park with warning lights in accordance with the guidelines set down in the IALA and in agreement with the Commissioner of Irish Lights. The Irish Aviation Authority may have its own requirements, which will be met.

2.6.1. Employment

The employment during the operational phase is hard to quantify, as no wind park of this size has been established to date. The proposed level of staffing for the facility will include a mix of operational, stand-by, marine, technical support and maintenance (OEM and bespoke) staff.

At Horns Rev Wind Park, where 80 wind turbines are planned, servicing is expected to require attendance for 150 days a year. For the Arklow Bank wind park, a corresponding level maintenance would require 30 to 40 staff. This corresponds with the information given in section 2.4.1, which suggests 30 staff members for a 520 MW wind park.

2.6.2. Traffic

For service of the wind turbines, likely to take place one or two times a year, vessels for crew transport will be used, leaving from Arklow Harbour. For replacement of major parts, a crane barge would be required.

If scour protection is utilised, maintenance will require video inspection by remote operated vessel (ROV) or echo sounder (e.g., SeaBat) survey carried out from smaller vessels. If required, replacement scour material will be shipped in on barges and placed by a grab operated from a barge or a jack-up.

See Chapter 4 for information relating to ship traffic and corresponding safety at sea.

There will be an increase in vehicular traffic in the Arklow area due to transport of crew members, etc.; however, this impact is expected to be negligible.

2.6.3. Material Requirements

Material required will include replacement parts and other materials for servicing. The exact quantities of these materials is not known at this present time. The gear oil is approximately 300 litres per turbine, as is the hydraulic oil. This will be replaced annually, in general.

During the operational phase there will be a need for storage capacity onshore, close to the Arklow Harbour. In case major repairs are carried out, a larger area for temporary storage of spare parts will be needed.

2.6.4. Wastes, Residues, and Emissions

During the operation phase wastes and residues will come from vessels bringing personnel and equipment out for service and maintenance. All wastes, residues, and replaced parts will be brought onshore and dealt with according to appropriate regulations. The impact on the Arklow Bank will be negligible.

Due to technological advancement with solid dielectric insulated cable, use of a fluid-filled flat type cable seems unlikely. However, if chosen for the grid connection by the contractor, it may lead to leaking of a small quantity of oil if damaged, say, by a ship's anchor. The actual size of the leakage depends on the cable in question, on temperature, water depth and load on the cable. At Horns Rev, the theoretical maximum release of oil is 0.5 litre per meter for a 3 conductor cable. The toxic influence of the oil on the environment will depend on the type of oil used. The possibility of such an occurrence would be mitigated by burial of the cable.

Everywhere oil is used in turbines or site substations, a system or a tank for accumulation of oil spill will be installed. The oil will be taken onshore and disposed of accordance with the Waste Management Act of 1996. If diesel oil is used at the substations the tanks will be constructed with double walls and bunded.

The corrosion protection of the foundation and tower is likely to consist of coating and/or cathode protection. A coating is likely to be based on epoxy or polyurethane, which will not cause any emission to the environment when hardened. The cathode protection is based on anodes (probably aluminium) being consumed during the lifetime of the foundation and tower. Thus, there will be a level of emission to the environment. As an aluminium anode consists of approx. 99.7 % aluminium the emission will be around 997 g aluminium per kg anode. The total amount depends on the composition and number of anodes and the design lifetime of the foundation and tower. However, because of exchange of water around the structures, the concentration of aluminium due to emission will be small compared to the natural content of aluminium in the seawater.

In case of the monopile foundation, the corrosion protection will probably be achieved partly by corrosion allowance of the steel, leading to emission of steel to the environment. The amount depends on the thickness of the sacrificial layer and the design lifetime of the foundation.

Garbage generated by operation and maintenance crews, and waste water from toilet and washing facilities will be removed from the wind park and will be disposed of by a licenced waste contractor in accordance with best practice, and the environmental management system and waste management plan for the wind park.

A preliminary operational risk assessment is given in Chapter 4.

2.6.5. Life Span

The turbines have a design life span of twenty years, although such this estimation is based on design and experience of on shore machines, which are subject to higher levels of turbulence. Off shore turbines may last longer; however, like on shore machines, their economic life span may be shorter, at, say 15 years, due to obsolescence and new design availability. To illustrate this point, existing 15 year old onshore turbines have an electrical capacity smaller by a factor of around 10, than those currently being installed. The foundations have a design life span of up to 50 years, but may well last longer.

2.7. Decommissioning

It is expected that the wind park will last until the end of the century. During this period turbines will be replaced and upgraded on an ongoing basis. The decision to replace or upgrade turbines will be based on an economic/commercial evaluation and advances in turbine technology.

The wind turbines and site substations can be taken down and removed for recycling after use.

The decommissioning of the wind turbines can be performed in several different ways, all depending on availability of cranes, jack-up barges and other vessels, and other equipment. It is noted that the most feasible method of decommissioning currently may not be the most appropriate method at the time of decommissioning. The decision on the method chosen will be made by the contractor.

Generally, the decommissioning is the reverse process of the installation. For the time being the cheapest way of decommissioning the wind turbines is as follows:

The power cables are disconnected and pulled out of the j-tube. The cables can be cut below the seabed or be reeled in after being water jetted free of sand. The reels are then transported to the harbour for further handling. It is expected that all metal from the cables will be reused. Insulation from the cables, etc., will be reused, recycled or disposed of according to best practice by a licenced waste contractor. Removal of the cables will cause a very limited release of sediment. It is not believed that this will have any significant impact on the environment.

At the site a large crane vessel can be used to remove the wind turbine, including rotor, nacelle and tower. The turbine may be removed to shore as one section, or disassembled off shore. The crane vessel will transport the turbines or sections of turbines to the harbour. Where the turbines has been removed in one piece, the wind turbine is placed on dummy supports for disassembly. Reuse, recycling, or disposal of the tower and turbine will take place according to the appropriate regulations. The blades of the turbine may be the only parts that may not be reusable.

Where monopile foundations have been used, the remaining pile foundation can be cut below the seabed, lifted by a crane, and placed horizontally on a flat top barge. According to an agreement in Sintra in 1998, within the EU it is acceptable to leave the remaining part of the pile in the seabed. In the *Sintra Statement*[34] the environmental ministers of EU countries and Norway and the member of the European Commission meeting within the framework of the OSPAR Commission, agreed that all dumping of steel installations offshore is generally prohibited. If for some reason it is a requirement to retrieve the pile completely, this may be done by the use of a large vibrator and a large crane.

Tripod foundations are handled in a similar way. When the piles have been cut below the pile sleeves, the tripod structure is lifted and placed on a barge for transportation to the harbour for reuse or recycling.

Before lifting the gravity foundations the scour protection must be removed by a dredger. The stone material may be left on the seabed or loaded on to barges for reuse in other projects. The foundation will be taken to the harbour where the structure is demolished, and the concrete may be reused for road construction, breakwaters or concrete production, after rinsing for salt. Gravel beds will be left in place, as the current will tend to refill the holes after a short time period.

The site substation is handled in a similar manner to the piled structures. First, the substation is decommissioned and removed, lifted and placed on barges to be brought onshore. The foundation is disposed of as described above. Some components may be reused or recycled. The remainder of the material is disposed of according to best practice.

Currently, decommissioning of post lifetime onshore wind turbines in Denmark and Germany primarily includes recycling of the steel or concrete towers. Almost 100 % of the tower can be recycled, as well as the copper from the cables. Some turbines are reused at new locations if the physical lifetime of the structure has not been exceeded.

With regard to the recycling of material from the wind turbines, several work groups have been appointed in Denmark to investigate the various possibilities. Quite large amounts of composite materials, steel, copper and aluminium may originate from offshore wind parks in the future. Within the next couple of years, guidelines regarding recycling these materials are expected to be available.

Overall, the greater part of the construction materials may be reused or recycled after decommissioning. However, whether this is economically feasible will depend on the technologies to be applied at the time of decommissioning.

3.1. Alternative Locations[35]

There are a number of attractive potential off shore wind park sites off the coast of Ireland, as evidenced by the considerable interest shown in applying for exploration licences. See Figure 3.1. for an illustration of the available resource in Ireland.

With respect to other suitable sites, the primary constraints are also those for the development of Arklow Bank, i.e., wind resource, water depth, size of site, and proximity to shore and a grid connection. It was found through the investigation process that locations with a sufficiently shallow water depth and reasonable proximity to a grid connection were typically within bays or on sand banks. Issues other than water depth and grid access were examined in less detail for these sites initially.

While many of the locations examined are considered likely to prove very suitable for wind park development, it was further considered that Arklow Bank is a superior site in many respects, as detailed in section 2.1.

3.1.1. West Coast Sites

Many of the potential sites off the west coast have similar characteristics. Typically, suitable sites are close to shore, which increases visual impact. Farther out from the shore, the area available for development decreases substantially, as water depths tend to increase rapidly. Economies of scale are important for the development of off shore wind parks at this present time, as the cost of construction and installation is otherwise likely to be too high for an economic proposal. A smaller area available for development will not allow the required economies of scale to be achieved. Finally, the grid connection poses challenges for any potential wind park in this area. These sites may well be suitable for the development of smaller wind parks, but currently they lack the obvious advantages presented by the site at Arklow Bank.

Figure 3.1: **Irish Off Shore Energy Resource at 50 m Water Depth within 12 Nautical Mile Limit**

3.1.1.1 *Donegal Bay*

Donegal Bay is open to the west, and exposed to Atlantic storms. The water depth increases relatively quickly, and the wave regime is strong. The sea bed is likely to consist of soft muds, sands, and gravels, with rock underlying at shallow depths, in general. According to a report published by the Department of Public Enterprise,[36] the predicted wind regime at this site is not as good as that at Arklow Bank. Because of the rate of increasing water depth with distance to shore, the area suitable for development is small, unless development close to shore is permitted. For these reasons, Arklow Bank is preferred for development.

3.1.1.2 *Galway Bay*

Predicted wind speeds for this location are excellent. The wave regime is considerably mitigated by the presence of the Aran Islands. There is commercial fishing activity in the area that would need to be examined. The sea bed is likely to consist of soft muds, sands, and gravels, with rock underlying at shallow depths generally. Water depths become deep quite quickly with increasing distance from shore, with depths of over 50 m at a distance of around 4 km from the shore. While an area in the inner bay has more suitable water depths, it is within clear view of the coast around Galway Bay. It is felt that there are other sites that do not immediately present such potential difficulties.

3.1.1.3 *Off Ballybunion/Shannon Estuary*

Predicted wind speeds are favourable in this area. This area is also open to Atlantic storms. With respect to the Shannon Estuary, environmental conditions are believed to be challenging. The possible impact of proximity to Shannon Airport would have to be discussed with the Irish Aviation Authority. The water depth increases relatively quickly with distance from shore, although there are suitably shallow areas up to around 5 - 7 km from shore. However, these are limited in area. Finally, the electricity grid is limited in what it can accept at Ballybunnion, and to connect at Tarbert or Moneypoint could add considerably to grid connection costs due to the extra distance. While this site may well prove suitable for development, there are more attractive sites.

3.1.2. Off East Cork/West Waterford Coast

The predicted wind regime is good in the general Ardmore Bay area, which is also characterised by deep water close to shore. However, there are some suitable areas within 5 km of the shore. The sea bed generally consists of rock. There are air and naval firing ranges located in the sea area off Co. Cork, and accidental losses of explosives or practice munition can be recovered here. This site may well prove suitable for a wind park, but Arklow Bank is preferred as it provides a substantially greater area for development at a lesser water depth.

3.1.3. East Coast Sites

3.1.3.1 Blackwater Bank

The east coast of Ireland is not subject to as severe a wave climate as the west coast, although storm wave conditions at potential wind park sites still provide significant design loads. The Blackwater Bank lies off the south east coast of Co. Wexford. The predicted wind regime is good, water depths are favourable, and the site is situated within reasonable distance of the shore. The wave regime from a southerly direction is reasonable, and the northern wave regime is considerably less. The bank exerts an influence on breaking waves due to shallow waters. Shipping traffic in the site is restricted due to the presence of the bank. High speed craft operate in the vicinity of the site, and there are also shipping lanes in the vicinity. The sand bank is suitable for a variety of foundation types. The grid connection capacity would have to be examined in detail. While this site presents very good possibilities in terms of a potential wind park development, the wind regime at Arklow Bank is predicted to be better.

3.1.3.2 Codling Bank

The Codling Bank is situated between 8 and 20 km from the shore, with Kish Bank to the north and Arklow Bank to the south. Predicted wind speeds are good at this site, and the water depth varies from 4 to 15 m BCD. Wave heights seem reasonable, although shallow water on the bank influences breaking waves. Shipping traffic in the site is restricted due to the presence of the bank. The sand bank is suitable for a variety of foundation types. Sand and gravel deposits are known to be present on the Codling Bank, and a temporary licence was granted to Bray UDC for aggregate extraction. Moreover, the Geological Survey of Ireland has identified the Codling Bank as offering the greatest potential in the country for offshore gravel extraction. Many of the other banks off the Irish coast are composed of sand, and there are limited gravel deposits on shore. The Codling Bank is close to the Dublin market, which is the main user of this aggregate. The bank is an important fish nursery, such that shallow waters may need to be avoided. This site may well be a very good one; however, the Arklow Bank is preferred, as it is closer to the shore and to a grid connection.

3.1.3.3 Kish Bank

Kish Bank extends from the mouth of Dublin Bay for 17 km as far as Codling Bank. The predicted wind regime is moderate. A substantial area of relatively shallow water depth is available. The wave regime is favourable. The environment in general is predicted to be less testing than at Arklow Bank. This site also has a number of possibilities for a grid connection, although according to an ESB report, there may be restrictions in the capacity of the grid in the Dublin area to accept additional power at present. Shipping traffic in the site is restricted due to the presence of the bank. The sand bank is suitable for a variety of foundation types. There are shipping, cable, and pipeline routes in the vicinity. High speed craft also operate in the vicinity of the site. The Kish Bank is an important area for birds. This site may well prove suitable for a wind park; however, according to the "*Assessment of Offshore Wind Energy Resources in the Republic of Ireland and Northern Ireland*," published by the Department of Public Enterprise,[37] the Arklow Bank has a better wind regime.

3.2. Alternative Sites Onshore

While it is true in general to say that wind speeds are better off shore, the exception to this is the very high wind speeds found in mountainous, coastal areas, where the speed-up effects of increasing elevation dominate. This is typical of the pattern seen in Ireland and Scotland. However, on shore wind energy development presents its own difficulties. Such sites, typically in the west of Ireland, are often poorly served by electrical infrastructure. Thus, there is the difficulty of acquiring sites with a good wind regime that also have good access to the electrical grid. Secondly, many sites are limited in available area. Thirdly, many of these upland sites are designated scenic areas. Moreover, surprisingly large areas in these regions are still commonage, sometimes with owners that are deceased or who cannot be contacted. The practical difficulty arises of locating all owners to a commonage, and then achieving agreement on a contract. Notwithstanding the difficulties, such sites can be found, albeit with a great deal of exploratory work. Sure Partners Ltd are involved in developing these sites.

However, Arklow Bank presents the possibility of developing a large scale wind energy project for which few opportunities exist on land. A site suitable for 200 machines would be rare on land, as the wind regime, the size of the available site, the planning or environmental designation, or the grid connection are all precluding factors. There are few upland sites capable of containing such a large number of machines. Many of those that exist have problems with grid connections and with scenic and environmental designations. The largest onshore project in Ireland to date is for 93 machines, and the question of planning permission has not been finalised. Proposals for 5 to 25 machines have been most common to date. The site at Arklow Bank offers a tremendous opportunity, and it would be very difficult to find a similar opportunity on shore.

3.3. Alternative Connection Points to the National Grid

There is a 110 kV substation at Carlow, and a 220 kV substation nearby at Kellis. These substations might be able to carry the capacity of the wind park, but the distance involved is likely to make costs prohibitive. Similarly, there is a 110 kV substation at Crane, near Ferns, Co. Wicklow, and another near Wexford town. Not only would the distances involved be likely to preclude development, but these substations could not accommodate a load of 520 MW. Another option would be to take the line as far as Dublin. This was not considered due to the prohibitive costs involved.

It may be seen that there is no other realistic option for connecting a power station of this size to the electricity grid in this location. Arklow is ideally suited for this purpose, having the capacity to accept the development, and being within a reasonable distance from the wind park. Moreover, the length of new cable to be constructed on shore are very short, which is an advantage. Because of this, and the fact that it is proposed to run these lines underground, the impact of these sections of line are minimised to a great extent.

3.4. Alternative Routes for Connection to Shore

Three routes for the connection to shore have been examined, and discussed in section 2.3.5. All options are likely to be pursued in order to facilitate grid capacity acceptance of 520 MW. Local fishermen and Bord Iascaigh Mhara were consulted before decisions were made on the final routes. Route C was moved at the behest of the fishermen from a route to the south of the Seven Fathom Bank to an alternative route to the north of the bank.

3.5. Alternative Turbine Layouts

A number of turbine layouts were examined in the course of preparatory work for this development. They are presented in Appendix 6. The same number of machines (200) are in each layout.

Turbine Layout 1 was the option chosen, primarily for economic and visual reasons. Layout one is uniform and ordered in appearance. This is desirable with a large number of turbines in order to avoid visual confusion. Further, a certain distance between machines is required for optimal turbine performance. Due to the smoothness of the water surface, wake effects from turbulent air coming off a turbine's blades deteriorate at a slower rate than they do on land.

Turbine Layout 2, which appears very random, was rejected for visual reasons. Turbine Layouts 3, 4 and 5 are quite similar to one another. The general layout pattern for these options appears to be a reasonable choice from a plan view, showing turbines roughly following contours, as is often recommended for on shore wind energy developments. However, when viewed from land, these layouts would appear as random and scattered a choice as Turbine Layout 2. Thus, all of these alternatives were rejected.

3.6. Alternative Turbine Types

While turbines that are typically available are generally of the three bladed, tubular tower model with horizontal axis, there are a number of possible features that may well prove interesting for use at Arklow Bank. Some of the features described are nearing a stage where they may be considered for use at the site. Others are somewhat farther from commercial exploitation, but are considered for possible use in the later phases of the development, which will extend as far as 2007, when they are likely to either have become more technically mature, or have been discounted by industry.

The next stage in off shore wind technology (beyond the present stage of marinisation of machines designed for land based sites) is to develop purpose designed machines achieving cost reduction arising from relief of noise restrictions and reduced wind turbulence.

3.6.1. Alternative Turbine Manufacturers

A final decision has not yet been made on a turbine manufacturer. However, the most popular and successful machines are very similar to each other in appearance, and quite similar in operation. The choice of one turbine manufacturer over another is not likely to have any significant impact on the various environmental aspects of the proposed development.

3.6.2. Direct Drive Machines

Turbine blades typically rotate at anything between 10 and 30 rpm, depending on the size of the blades among other factors. These turbines use high ratio, in most cases three stage gearing and generator speeds of 1500 to 1800 rpm. Gearing is inevitably subject to wear on the numerous fast running components. The risk of breakdown can only partly be reduced by generous dimensioning. In instances of gear damage that have occurred in recent times, it has transpired that it is the high speed gear stages that are responsible for the failures. Damage to planetary gear stages is extremely rare.

In contrast, direct drive systems, on which all components in the drive train rotate at the speed of the rotor, the risk of failure due to mechanical wear is minimised. On the other hand, direct drive generators in the multi megawatt power class can only be produced at considerable expense, due to the large diameter required. Also, direct ventilation of the generator winding using the salt laden air of off shore regions is not permissible, so new solutions are required.

3.6.3. Multibrid Technology[38]

Multibrid technology is a new drive-train design for very large turbines for off shore applications. This technology establishes a relationship between the conventional geared solution and direct drive generators. This design is an attempt to introduce increased service reliability and lower maintenance requirements, which is a prerequisite for successful development of off shore turbines. For the torque conversion of the rotating rotor, a single stage planetary gear is used, with a transmission ratio of 1:6 to 1:7. The second and third gear stages are omitted, since they are more prone to failure than the first by an order of magnitude. Generators of the required power output class with a rotational speed of the order of 100 rpm have been produced for many years, for example as shaft driven generators for ships.

3.6.4. Turbines Designed for Off Shore Locations[39]

The emphasis to date in existing off shore projects has been in marinisation, or the minimal adaptation of standard wind turbine types to cope with a persistent salt spray environment. However, the wind turbine designs that have evolved in the context of constraints that apply on land based sites are clearly not optimal in an off shore environment, for which different constraints apply. The next stage is therefore to develop specialised off shore technology for an improved overall cost benefit.

Where such improvements may be feasibly and economically applied to later phases of the Arklow Bank wind park, without changing the intrinsic design principles chosen, they will be implemented where found to be advantageous.

3.6.4.1 Tip Speed

In the European market, noise restrictions have limited the tip speed of competitive wind turbines to a maximum of about 65 ms^{-1} for fixed speed designs, or 70 ms^{-1} for variable speed designs. Wind turbines designed for a high tip speed have reduced rated torque and this has a proportional effect in reducing mass and cost of top tower components. This has been demonstrated, especially in small wind turbines of US origin, although there have been some high tip speed designs of European origin.

If the constraint on noise emissions is relaxed on large off shore wind parks that may be many kilometres from shore, a relatively low risk opportunity exists to reduce costs by the adoption of much higher design tip speeds. It should be noted while that the consequent noise levels generated will not approach levels covered by health and safety standards, the potential nuisance factor may have to be examined with regards to disturbance of marine mammals, fish, etc. Notwithstanding this, background noise levels are expected to be of a level that the turbine noise will not significantly increase it.

3.6.4.2 Number of Blades

While the optimal number of blades for wind turbine design has been one of the long standing debates of wind technology, three bladed machines have been favoured for European land based developments due to environmental and visual considerations rather then because of technical superiority. Aesthetically, three bladed machines are considered to appear more balanced in operation than one or two bladed machines. Further, machines with fewer blades have higher tip speeds, leading to higher noise emissions.

While off shore development could allow the re-examination of one and two bladed machines, there are probably no benefits to the design in having a rigid two bladed rotor, except for the possibility of a cheaper rotor. Alternatively, with a teetered rotor, benefits of fatigue load alleviation in normal operation have to be traded against the cost and reliability of the teeter system, and the possibility that, particularly after adequate design for the special teeter impact cases, the net benefit may be lost.

With a high design top speed (120 ms^{-1}), because of tip loss effects, a two bladed rotor will deliver about 2 % less energy than a three bladed one, but will often be easier to engineer, and simpler to erect. However, a Garrad Hassan cost model predicts that cost savings would have to be in the region of 20 % in order to fund a 2 % loss of energy output. As rotor costs and their erection are about 9 % of the total installed cost, it seems unlikely that there can currently be a cost benefit in having two blades.

While visual impact may be less important for future wind energy developments, farther off shore than the current proposal, it remains an important issue for the Arklow Bank wind park. Three bladed machines will be used throughout the development.

3.6.4.3 Blade Design

Current requirements for aerofoil solidity is high, and any reduction in solidity to reduce transportation width and extreme loads leads to a cost in energy output.

However, the use of high lift aerofoils allows rotors of less solidity. Lift is proportional to the product of the aerofoil lift coefficient and section chord width. Thus, an aerofoil with a higher lift coefficient allows the use of a smaller section chord width, and hence lower solidity blades, but without energy losses. This has the required advantages in terms of transport widths and extreme loads reduction.

The smaller blade sections will be subject to higher stresses, so new materials are required. High strength material such as carbon fibre reinforced plastic (CFRP) may be suitable. CFRP is currently three times the cost of glass epoxy, but savings due to the mass reduction balance the increased material cost. Further, mass production of such blades should develop a market for CFRP such that prices would drop.

Such design improvements in blades may possibly be available for later phases of the proposed development, but will not be available for the first phase. In terms of environmental impact, they will be very similar to blades that are used currently.

3.6.4.4 Operational Strategy

Variable speed is generally regarded as more complex than fixed speed operation, and it may seem surprising that variable speed operation may be advantageous in the context of off shore development because of the requirement for simplicity of maintenance. While there is a small energy gain compared to fixed speed operation, critically, only in variable speed mode can a very high design tip speed be achieved without significant aerodynamic penalties. At high tip speed, fixed speed machines become aerodynamically inefficient, and have a high cut-in wind speed. This is avoided in variable speed machines, as the turbine only operates at maximum speed in winds around and above the rated wind speed. Further, a high design tip speed leads to a rated torque reduction and consequent cost saving, as discussed.

The added electrical complexity of variable speed machines may be offset by having simple low maintenance generators, e.g., direct drive permanent magnet generators. There is not necessarily any cost benefit or disadvantage in direct drive technology. However, as discussed, the absence of gears could be a distinct advantage in terms of maintenance.

Such machines may be considered for later phases of the development, but will be very similar in terms of environmental impact.

3.7. Alternative Foundations

A number of foundation options have been examined in section 2.2.2. No final decision has been made on which of the options, or which combination of options to pursue.

3.7.1. Floating Structures[40]

Existing off shore wind parks all have foundations that are fixed to the sea bed. The concept of placing wind turbines on floating structures, rather than being fixed to the sea bed, has been considered for some time.

This concept extends the use of standard semi-submersible technology, featured in off shore drilling vessels, to support structures on which arrays of wind turbines are located.

The main structure of the vessel is located below the ocean surface, giving a number of advantages over traditional structures with hull forms close to the water surface. These include reduced wave loads (since the wave kinematics decay exponentially with depth) and longer periods of motions (hence reduced response motion).

The deep submergence of the pontoons combined with a structure made up of pontoons, columns, and bracing, yields the above characterisation of low motion in response to waves. This feature has made the semi-submersible design a work-horse for drilling, production, and well servicing in the off shore oil industry.

Such vessels have typical dimensions of 80 to 120 m, and displacements of 12,000 to 40,000 t. However, a floating wind park would require structures substantially greater in size, with deeper drafts and larger displacements, in order to provide the required distance between machines. At the same time, the structural configuration has to be easy to build and of intrinsically low cost.

Such scale up work has been already carried out on a variety of large structures for use as floating airports, industrial sites, and other applications around the world.

Two types of off shore arrays have been examined for off shore wind park use: arrays that naturally rotate with the wind, and those that are fixed in orientation. Optimum configurations researched were an "I" format (i.e., a line of turbines, with a stabilising area at either end) for the rotating arrays, and an octagonal shape for the fixed orientation array.

The feasibility of floating wind parks depends on their cost, which is greatly influenced by the kinds of construction and sizes that will be technically acceptable. In a wider context, the use of floating wind energy developments will depend on whether costs can be brought down, and whether land use pressure in shallower waters will encourage the utilisation of deeper water regions.

The greater distances from the electric grid is one contributor to increased costs. Moorings are another very significant proportion of the cost, typically at 20 % of the total cost. There are other off shore energy sources, for example gas at the Corrib gas field, that could be developed in conjunction with a floating off shore wind energy project, which could improve the economic prospects of the development. Wave energy projects could also be combined with floating off shore wind energy.

A floating structure has not been considered for the proposed project, principally due to cost considerations, with cost predictions of up to stg10p/kWh.

Interim findings suggest that the cost of floating off shore wind parks would be significantly more expensive than conventional sea bed mounted machines at the chosen location at Arklow Bank. However, for a wind park at large water depths (say, 50 – 60 m), this form of technology could well be competitive.

Foundations of this kind are not currently an economically feasible proposition. They are likely to prove a very interesting concept should this change, since water depth is currently one of the key limiting factors for off shore wind park development.

3.8.1. Brown Power

There are a number of other sources of power that could be utilised to generate electricity.

Conventional power sources include gas, oil, coal and peat. Nuclear power is not considered to be an option in Ireland. Gas and wind energy are currently the most cost competitive methods of generating electricity in Ireland. However, Sure Partners are green electricity developers and have no plans to develop "brown" power stations. ***eirtricity*** is the green electricity supplier on whose behalf Sure Partners are developing the proposed wind park. Their mission statement is '***eirtricity*** harnesses Ireland's greatest natural resources to create a customer choice of alternative energy while reducing pollution, reducing imports and creating jobs." Clearly, ***eirtricity*** is not in the brown energy business, and the development of fossil fuel stations is not an option they choose to pursue.

3.8.2. Other Green Electricity Sources

There are renewable energy sources of electricity other than wind energy. These include:

- hydroelectricity
- wave energy
- photovoltaic panels
- solar thermal
- fuel cells
- tidal barrage
- tidal stream
- ocean currents
- ocean salinity gradients
- ocean thermal gradients
- anaerobic digestion
- biomass combustion
- combustion of liquid biofuels, and
- arguably, waste incineration, etc.

Currently, only wind energy and hydro-electricity are commercially viable in Ireland. Most of the hydro sites in the country have already been developed. Only approximately 65 MW remain for development, including the renovation of old mill sites. Possibly up to half of this amount is not commercially viable. There is no possibility of developing any project or even a number of projects that would provide the kind of facility proposed for Arklow Bank.

3.9. Do Nothing Alternative

If the wind park is not developed, then fossil fuel power stations will be used to provide the required electricity instead. This will:

- contribute to greenhouse gas and pollution emissions, as described in Chapter 6;
- fail to make a contribution to Ireland's Kyoto commitments;
- retain fuel import dependency at an unsustainably high level;
- fail to utilise indigenous resources, favouring instead the dirtier fuels exported by other countries; and
- not provide the improvement in balance of payments that would accrue from the development of Irish resources.

4. HUMAN BEINGS

4.1. Human Beings in the Existing Environment

The complete development will consist of 200 wind turbines located on the Arklow Bank. The Arklow Bank is approximately 27 km long and 2.5 km wide, and is situated approximately 13 km offshore (east of Arklow Harbour).

The location of the bank is illustrated on Figure 1. The area of the bank is shallower than 20 m below chart datum (BCD) is 29.7 km^2, of which 14.9 km^2 is shallower than 10m BCD. The shallowest part of the bank is 0m BCD and it slopes down to the east to a depth exceeding 40 m BCD and to the west to 30 m BCD.

The main areas to be examined with respect to potential effects on human beings are, visual impact, noise and health and safety issues. Other issues that must be addressed with regard to human beings are, shipping, navigation and undersea cables, commercial fishing, recreational activities and aviation. There may also be short-term impacts on local traffic in Arklow while transporting the turbines. Visual impacts are discussed in Chapter 13.

4.1.1. Noise

Baseline noise monitoring was carried out at 3 potential sites for the onshore construction of the wind park. These locations were as follows:-

- The Roadstone Provinces Ltd. quarry;
- The Arklow Harbour; and
- The North Quay Site.

The noise monitoring locations on the Arklow Harbour and North Quay site are shown in Figure 4.1. The Roadstone Provinces Ltd. plant is located approximately 3 km from Arklow town.

Figure 4.1: Noise Monitoring Locations

The noise measurements were carried out using a Bruel Kjaer 2260 noise meter and calibrated before and after use. No significant instrumentation drift was recorded during the measuring periods. Monitoring was carried out on the 29th May 2001 and weather conditions during daytime were an ambient air temperature of 20.8^{0}C and windspeed of 0.24 m/s. During the night-time monitoring a temperature of 14.9^{0}C and a windspeed of 0.32 m/s was recorded.

The noise monitoring locations are described below:

N1 – Roadstone Provinces Ltd. Quarry Site

Two daytime noise monitoring events were carried out beside the cement silo opposite the site offices in the Roadstone Provinces Ltd. quarry. During the first sampling event the silo was not operational and a blast occurred during the monitoring. On the second sampling occasion the silo was in operation and the noise emanating from this was the dominant noise source. Night-time noise measurements was also carried out and the results of this are giving in Table 4.1.

SL1 – Noise Sensitive Location Close to Quarry Site

Noise measurements taken here were dominated by a building site located adjacent to the sampling location. Operational noise from the quarry was barely audible at this location.

N2 – Harbour Warehouse

The harbour site consists of a warehouse located at the southern end of the harbour. The immediate surroundings of the warehouse are commercial units. The dominant noise source recorded during this monitoring event was the traffic on the harbour access roads and a building site to the west of the site. Noise from the road traffic dominated during the measurements.

The night-time noise measurements also recorded noise consisting of traffic on the harbour access roads and dogs barking in local houses.

SL2 - Noise Sensitive location to the South of the Harbour Site

The dominant noise source at this point was also traffic on the harbour access road. A local industrial unit was also a significant contributor to the ambient noise levels. The results of the ambient noise monitoring is presented in Table 4.1.

N3 – The North Quay Site

The North Quays are located near the harbour mouth beyond the marina in a derelict industrial area. The nearest noise sensitive location is housing on the south quays. Several caravans were parked on the site but it was not ascertained if they were occupied.

The daytime noise levels recorded included noise from distant traffic, dogs barking and birds song. Night-time noise sources were also similar. The results of the ambient noise monitoring is presented in Table 4.1.

SL3 – Nearest Noise Sensitive Locations to the North Quay

The daytime and the night-time sources were dominated by traffic on the Harbour Road.

4.1.1.1 Results

In order to understand the terms used, some definitions are outlined as follows:-

L_{AF10} Refers to those levels in the Top 10 percentile of the sampling interval; it is the level which is exceeded for 10% of the measurement period. It is used to determine the intermittent high noise level features of locally generated noise, and is a good indication of traffic noise.

L_{AF90}/L_{AF95} Refers to those levels in the lower 90/95 percentile of the sampling interval; it is the level which is exceeded for 90%/95% of the measurement period. It is used to estimate a background level.

L_{Aeq} The average level recorded over the sampling period. The closer the L_{Aeq} value is to either the L_{AF10} value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of noise on the background.

L_{Amax} The L_{Amax} is the maximum reading measured at the sound level meter. It gives an indication of the highest noise produced by a varying noise source.

L_{Amin} The L_{Amin} is the minimum reading measured at the sound level meter. It gives an indication of the lowest noise produced by a varying noise source.

The results of the noise monitoring are presented in Table 4.1

Table 4.1: Ambient Noise Monitoring Results*

Sample Point	Measuring Period (min)		$L_{(A)eq}$	$L_{(A)max}$	$L_{(A)max}$	$L_{(A)F10}$	$L_{(A)F90}$	$L_{(A)F95}$
N1	30	Day	64.2	84.6	41.5	67.0	45.0	44.2
	30	Day	75.0	85.9	53.5	78.0	68.0	64.4
	15	Night	51.3	82.3	–	45.6	32.6	32.0
SL1	30	Day	49.4	66.8	40.6	51.2	44.4	43.8
	15	Night	45.3	80.6	31.3	36.4	32.8	32.4
N2	30	Day	65.4	85.9	53.9	68.4	58.2	56.2
	15	Night	54.1	79.5	–	56.4	37.8	37.4
SL2	30	Day	60.3	89.3	42.5	62.0	47.2	46.0
	15	Night	49.1	68.5	37.4	52.4	43.0	42.6
N3	30	Day	53.8	83.8	43.1	53.2	45.8	45.2
	15	Night	49.0	77.7	39.4	47.4	40.8	40.6
SL3	30	Day	57.9	81.1	41.1	60.8	45.0	44.2
	15	Night	48.5	73.0	33.0	42.6	35.0	34.6

* All results are expressed as dB(A)

The results shown in Table 4.1 indicate that at the Roadstone Provinces Ltd. Quarry (N1), traffic noise (L_{A10}) was the dominant noise source during the daytime. Noise levels at the nearest noise sensitive location (SL1) to the quarry were also dominated by traffic, (Note L_{A10}, 51.2 dBA).

The noise monitoring location at the southern part of the harbour (N2) was dominated by traffic noise both during the daytime and the night-time (L_{A10} 68.4 dBA and 68.4 dBA respectively). Noise levels at the nearest noise sensitive location (SL2) was also dominated by traffic noise during the daytime and the night-time (L_{A10}, 62 dBA and 52 dBA respectively).

Noise levels recorded at the north quay again were dominated by traffic noise both daytime and night-time.

In general the ambient noise levels recorded around the Arklow Harbour area and the Roadstone Provinces Ltd. Quarry were dominated by traffic noise, and are typical of an urban/ industrial area.

4.1.2. Traffic

Traffic counts were carried simultaneously out during the noise monitoring at the various locations. A breakdown of the Light Goods Vehicles (LGV) and Heavy Goods Vehicles (HGV) are shown in Table 4.2.

Table 4.2: Traffic Counts

	Daytime		Night-time	
Location	**LGV's/hr**	**HGV's/hr**	**LGV's/hr**	**HGV's/hr**
N2	62	44	56	---
SL2	18	10	---	---
N3	---	---	---	---
SL3	66	34	20	---

4.1.3. Shipping, Navigation, Undersea Cables and Pipelines

4.1.3.1 Ship traffic

The Arklow Bank wind park is planned in an area where ship traffic will occur, for example fishing vessels, commercial ships, etc. In this section of the EIS a description of the commercial traffic in the area is given.

The risk of ship collisions is described in Section 4.3.

The description is divided into a description of the existing traffic in the area and a description of the shipping traffic during construction and operation and maintenance. For further details reference is made to Appendix 7.

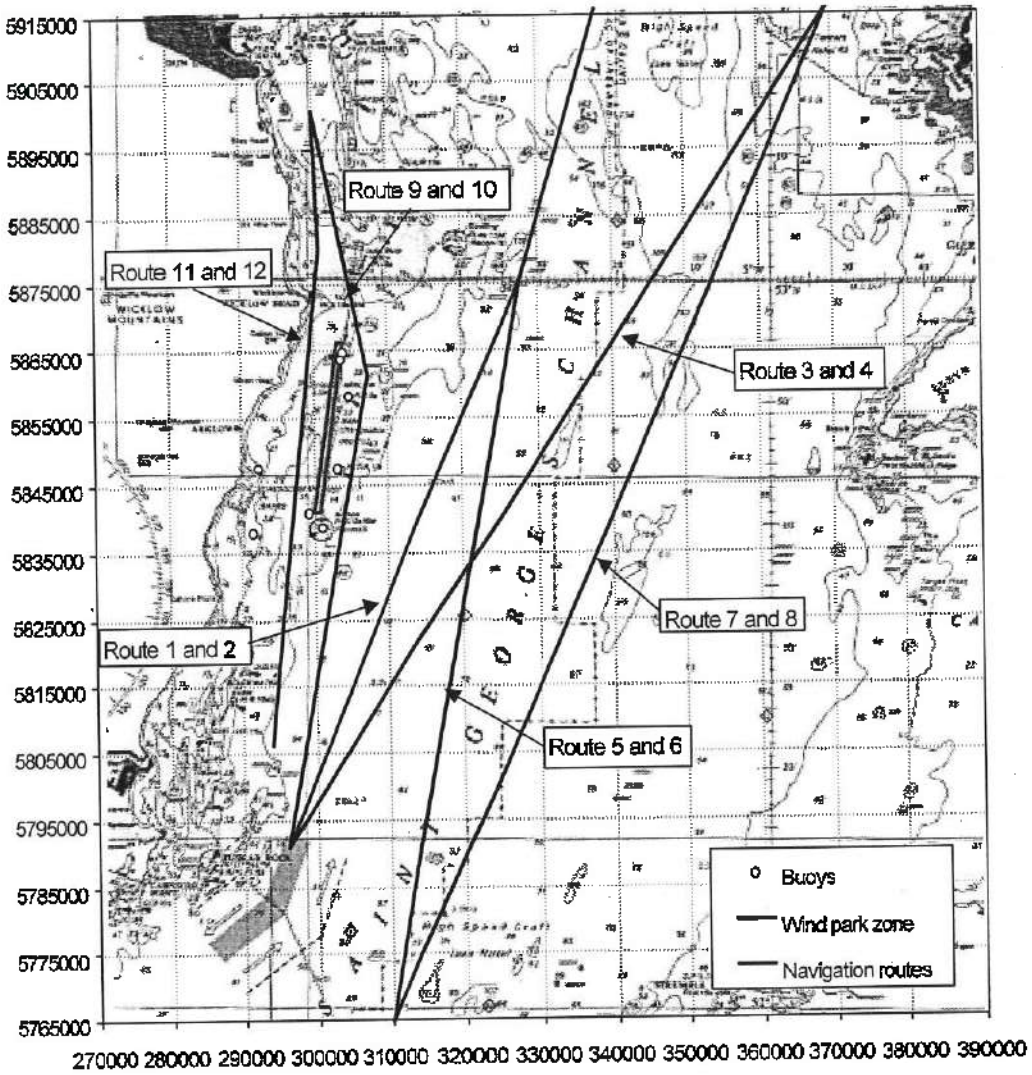
Available information on the existing ship traffic in the area relevant for Arklow Bank wind park has been collected. Information regarding navigation routes, number and type of ships, etc. has been obtained from the following ports:-

- Larne
- Belfast
- Dublin (detailed information)
- Dun Laoghaire
- Wicklow (detailed information)
- Arklow (detailed information)
- Holyhead
- Rosslare
- Liverpool (detailed information)
- Fishguard
- Heysham
- Milford Haven (detailed information)
- Swansea
- Port Talbot
- Fleetwood
- Newport
- Bristol
- Plymouth.

The ship traffic is assumed to follow the routes defined below and are shown in Figure 4.2.

- Tuskar Rock - North Channel (Route 1 and 2)
- Tuskar Rock - Holyhead (Route 3 and 4)
- The Smalls - North Channel (Route 5 and 6)
- The Smalls - Holyhead (Route 7 and 8)
- Dublin - Tuskar Rock (Route 9 and 10)
- Near shore route west of Arklow Bank (Route 11 and 12).

Figure 4.2: Definition of Navigational Routes in the vicinity of Arklow Bank.



The key parameter in describing the size distribution of the ships in the various routes is the GRT (Gross Register Tonnage) value. The ship size distribution for each route is given in Table 4.3.

Table 4.3: Annual Number of Movements on each of the Routes

Ship Class	*GRT [ton]*	*Route 1 and 2*	*Route 3 and 4*	*Route 5 and 6*	*Route 7 and 8*	*Route 9 and 10*	*Route 11 and 12*
1	0-249	42	50	21	55	911	2725
2	250-499.	42	50	21	55	11	25
3	500-999	78	93	39	104	13	99
4	1000-1999	185	219	92	244	94	215
5	2000-2999	251	298	125	331	185	328
6	3000-4999	209	248	104	275	303	373
7	5000-9999	218	259	109	288	256	329
8	10000-24999	123	331	61	368	79	120
9	25000-	147	288	74	320	94	143
Total	-	1295	1836	646	2040	1946	4357

It is seen that the routes with largest traffic volumes are the routes 11 and 12, i.e. the routes west of Arklow Bank in northern and southern direction, respectively. The main contribution on these routes is from the fishing vessels.

4.1.3.2 Marine Traffic during Construction

The traffic in connection with the installation will depend on the applied concept of installation and foundation of the turbines as well as the location of the manufacturing.

All aspects are not yet decided, and for the present assessment it is assumed that the installation of each turbine may result in up to 40 visits to the site of different vessels during the construction period.

4.1.3.3 Undersea Cables and Pipelines

FTC consulted with Arklow Harbour Master, Eircom, the ESB and Bord Gais regarding the existence of any undersea cables or pipelines in the Arklow area.

Arklow Harbour Master advised FTC that there was an outfall pipe from the Gypsum Works at the harbour when the works were operational but that the outfall has since been removed. The harbour master is unaware of any undersea pipelines or cables in the area.

Eircom advised FTC that there are no cross-channel communication cables in the vicinity of the Arklow Bank. The only cross-channel communication cable between Ireland and the UK comes ashore in Ireland near Kilmore Quay, Co. Wexford. All other communication cables in the Arklow area are land-based cables, both above ground and underground cables.

The ESB advised FTC that there are no dedicated high voltage or low voltage distribution cables in Arklow. Basically, the ESB cable network in Arklow comprises only of the transmission cables in and around the town that are required for electricity requirements of Arklow.

Apart from within the town where there are underground cables, the ESB has no underground cables on the beach or foreshore in the Arklow area. The nearest Transmission substation to Arklow is located just north of the town on the "old" Dublin Road.

Bord Gais informed FTC that there are no gas pipelines on the foreshore in the Arklow area. All gas mains distributing natural gas in the area are land-based underground pipelines. The cross-channel undersea gas pipeline otherwise known as the "1st Interconnector" is not in the vicinity of the Arklow Bank.

The first interconnector cross-channel gas pipeline comes ashore in Ireland at Loughshinny near Rush in North Dublin.

4.1.4. Recreational Activities

After consulting with Arklow Harbour Master with regard to recreational usage of the area FTC were informed that there are up to 25 yachts associated with the Arklow Yacht Club. During the summer, these yachts would make cross-channel trips. Most yachts in the vicinity of the Arklow Bank would either sail north and from the northern end of the bank towards Holyhead, while other yachts would sail south towards the southern end of the bank and then on to the Bristol Channel.

Other than cross-channel legs, yachts also sail close to shore inside the Arklow Bank. These yachts would be relatively small and are not capable of undertaking a cross-channel voyage.

Shore angling is enjoyed by residents of Arklow but neither shore angling or sea angling are practised extensively in the area as fish catches in the area are generally poor.

There are a similar number of small yachts (approximately 25) based in Wicklow and approximately 15-20 based in Courtown. These yachts would make similar voyages during the summer but there is little yachting activities in the area in general except for the Bi-Annual Round Ireland Yacht Race.

4.1.5. Aviation

There are two licensed Aerodromes on the eastern coast near Arklow town. Brittas Bay aerodrome is located 5 nautical miles north east of Arklow town and Newcastle aerodrome is located 1 nautical mile east of Newcastle, Co. Wicklow.

The principal consideration for ensuring air navigation safety for the Arklow Bank will relate to Search and Rescue (SAR) activities. Search and Rescue operations are provided by both civil and military authorities. The Civil SAR unit was consulted through the Coastguard Services. The Military SAR unit was consulted through Aircorps at Casement Aerodrome, Baldonnel.

4.1.6. Commercial

The existing commercial fishing usage of the Arklow Bank and surrounding area is discussed in detail in Chapter 8 of this EIS.

4.2. Characteristics of the Development Which Could Impact on Human Beings

4.2.1. Noise

Construction

Depending on the type of foundation and the method of installation, noise could cause an inconvenience to the residents in Arklow. Work carried out during the construction of the wind farm in Rodsand found that the noise level at source due to the driving of a monopile was 150dB(A). Over a distance of 8km this noise had reduced to 42-53dB(A). Ambient noise monitoring results in the area of Arklow Harbour (see Table 4.1) show that the existing ambient noise levels is greater than the predicted levels.

Operation

Historically the impact of noise from on-shore wind farms has been the impact on houses in the vicinity of the wind farm. Due to the distance of the Arklow Bank from shore (approximately 10-13km) it is anticipated that there will not be any significant noise nuisance associated with the operation of the wind park on land.

Decommissioning

The possible sources of noise that may be generated during the decommissioning of the turbines include:

- Removal of the tower, rotors and transportation to shore.
- Removal of the foundation and transportation to shore.

To date no offshore wind farm decommissioning has taken place, therefore it is difficult to accurately predict the increase in the ambient noise levels at noise sensitive locations. Given a worse case scenario, i.e. decommissioning of the turbine and removal of the foundation giving a noise level of 150dB(A) at source then the resultant noise levels on shore would not be greater than the existing ambient noise levels.

The so-called Sintra Statement*, prepared after a meeting of the EU and Norwegian environmental ministers agreed that all dumping of steel installations offshore is generally prohibited. In the case of a monopile foundation, the pile will be cut 2 metres below the seabed. Under the Sintra Statement, it will be acceptable to leave the remaining part of the pile in the seabed. However, if there is a requirement to retrieve the pile completely, than a large vibrator and large crane can be used for the operation.

4.2.2. Traffic

Details regarding the type of foundation and location for construction of the foundations has not yet been finalised. However, the volume of traffic both onshore and offshore will increase when construction of the wind park commences. The use of monopile and tripod foundations will cause the least impact on the local traffic in Arklow as both the monopile and the tripod foundations are constructed from steel pipes which are likely to be manufactured in major steel works. Because of the size and physical dimensions of the steel pipes it is envisaged that the pipes will be shipped for example, on a barge to Arklow for the construction of the wind park. This will cause an increase in local shipping traffic within the area.

* Sintra Statement. Summary Record OSPAR 98/14/1-E, Annex 45 Refs. B-10-2. OSPAR. Convention for the protection of the marine environment of the North East Atlantic Ministerial Meeting of the OSPAR Commission, Sintra 22-23 July 1998.

As there are currently no major Irish manufacturers of turbines, the nacelles, the towers and the rotors may have to be shipped to Ireland. The turbines can be shipped from the country of origin to Arklow on ships or barges. This will increase shipping traffic to Arklow.

If used, the manufacturers of the gravity foundations will require a dry dock in the vicinity of Arklow Harbour. The developers are investigating suitable sites that could be used around the Arklow area and have reviewed sites along the Arklow pier and at the Roadstone Quarry south of Arklow Town. Traffic monitoring during the noise monitoring has shown that approximately 44 HGV's per hour access the south harbour site during the daytime and 34 HGV's per hour use the north quay site. Noise monitoring has shown that traffic noise is the main source of ambient noise in the area. The construction of the offshore wind farm will increase traffic movements within the area and consequently will increase ambient noise levels in the area. Until the exact location of the construction sites, and the location of the location for the dry dock in the event of concrete caissons being used is known, it is not possible to accurately predicted what the increase in traffic movements and ambient noise levels will be in the area.

Skilled craftsmen such as concrete labourers, steel fixers, welders, electricians, etc. will be required to construct the foundations. These personnel will increase traffic movements in Arklow Town.

4.2.3. Health & Safety

The wind park will be designed, constructed, operated and decommissioned in accordance with the Safety, Health and Welfare Act at Work (Construction) Regulations 1995 and the Irish Wind Energy Association (IWEA), Best Practice Guidelines.

However, aspects of the development will present health and safety issues. These will be primarily during the construction phase. The aspects of the development where health & safety issues are of particular importance are as follows:-

Construction

- Traffic safety during the transportation of oversized loads;
- Lifting of heavy loads overhead using cranes;
- Working with electricity during commissioning;
- Working at heights; and
- General construction safety and particularly safety while working at sea.

It is not the intention of this list to minimise the safety issues of any activity associated with the project, as all are important.

Operation

Under normal conditions the public will not access the wind park due to the off-shore location of the turbines. However, for visitors to the wind park or maintenance staff the turbines will be very safe for suitably trained people and seacraft at the turbine landings.

Access to the turbines will be through a hatch door at the base of the structure. This will be locked at all times.

It is not anticipated that the workings of the turbines will present any danger to any shipping, sailing or fishing activities in the area. The components of a wind turbine are designed to last for 20 years and are equipped with a number of safety devices to ensure safe operation during their lifetime. These include:-

- A vibration sensor will detect if a turbine starts shaking and turns the turbine off;
- Other sensors in the nacelle to check the operation of the turbine;
- Static testing of rotor blades;
- Dynamic testing of the blade's ability to withstand fatigue from repeated bending;
- Independent fail-safe brake mechanisms to stop the turbine. The aerodynamic braking system is the main braking system with mechanical braking services as a backup system. The turbines will shut down at wind speeds exceeding up to 30m/sec; and
- The turbines are also fitted with lightening protection mechanisms to counteract any lightening strikes.

The rigorous safety checks imposed on the turbines during design, construction and commissioning will ensure the risks posed to humans are negligible.

Marine Vessels

The Maritime Safety Division of the Department of the Marine and Natural Resources will be contacted regarding the production of a marine notice. This notice will describe the works and give commencement and completion dates for same. The notice will be forwarded to the Maritime Safety Division at least four months prior to works.

The developer will ensure that all vessels employed in relation to the development will comply with all statutory regulations. The vessels that will be employed will be of sufficient size to cope with the works and the adverse weather conditions that may prevail. Vessels used to carry persons employed by the contractors to and from the site will have a passenger boat licence if carrying 12 or less persons and a passenger vessel certificate if carrying more than 12 persons. All the appropriate certificates will be forwarded to the Maritime Safety Division for review.

The turbine is a generator, which generates electricity at low voltage, emitting a negligible amount of electromagnetic radiation. It emits no more electromagnetic radiation than, for example, a diesel generator. There is no known risk to human beings from the electromagnetic emissions from wind turbines.

The turbines will be fitted with navigational aids to ensure air navigation safety. Lighting will be in accordance with the IALA specification as provided and interpreted for the Arklow Bank situation by the Commissioner of Irish Lights. It is estimated that there will be six red lights and six green lights built onto the towers. There will also be low intensity yellow lights to help navigation.

4.2.4. Socio-Economic Impacts

The design, construction and operation of the wind energy project will provide employment to the local community. The design and planning stage will provide employment for a number of technical consultants.

The construction phase will provide employment for local tradesmen, labourers and specialised contractors, perhaps from other areas of the country. This will have a direct short-term positive impact on the local economy.

The operational phase will present an opportunity for local mechanical-electrical contractors to become involved with the maintenance programmes for this wind energy project. A socio-economic study has been conducted for the development and the report is presented in Appendix 8.

4.2.5. Shipping, Navigation and Undersea Cables and Pipelines

The presence of the wind park at Arklow Bank inevitably will impose a greater risk of ship collisions with the turbines and impact on the cables – both with possible impact on the environment. The environmental impact will mainly be due to potential oil spillage, which is considered in the following.

The risk of oil spillage is a product of frequency and consequence. In the following the frequency is firstly described followed by a description of potential consequences. For further details reference is made to Appendix 7.

4.2.5.1 Frequencies

Ship Collision with the wind park

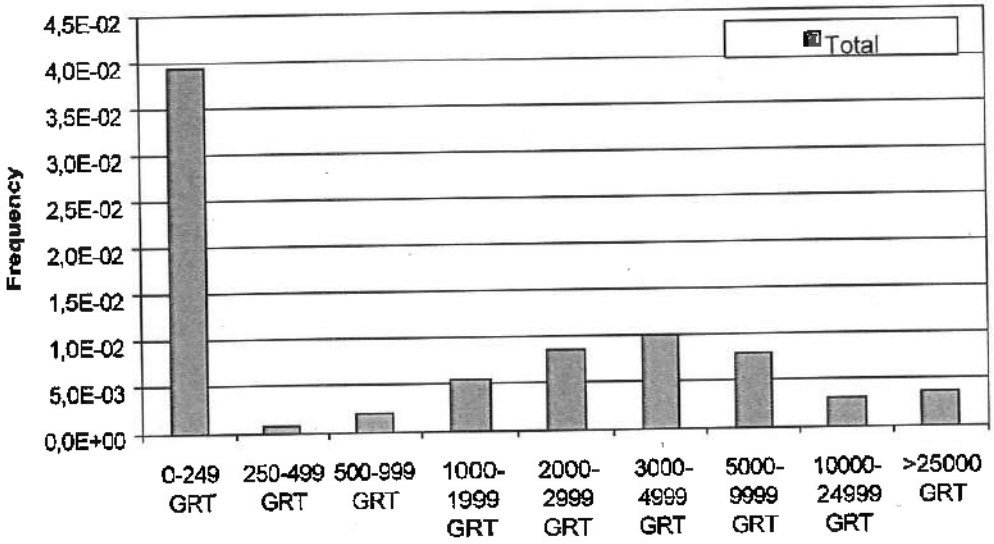
The ship collision frequencies are presented as total frequency for all ships for the three different collision scenarios i.e. human failure, steering failure and drifting ships. For further details on the definition of the scenarios refer to Appendix 7. The results of the yearly ship collision frequencies are given in Table 4.4.

Table 4.4: Yearly Ship Collision Frequencies for the Wind Park

	Annual Frequency	Return Period [years]
Human failure	3.4×10^{-7}	3×10^{6}
Steering failure	8.0×10^{-11}	1.2×10^{10}
Drifting ship	8.1×10^{-2}	12
Total	8.1×10^{-2}	12

The total yearly ship collision frequency for the wind park corresponds to a return period of approximately 12 years and the main contribution is from drifting ships. The collision frequencies for each of the ship GRT-classes are shown in Figure 4.3.

Figure 4.3: Yearly Collision Frequencies divided into Ship Classes for the Wind Park considering all Ship Collisions



From Figure 4.3 it is seen that the main part of the collisions is from minor ships i.e. ships less than 250 GRT.

The calculated frequencies are based on the box model for the fully developed wind park area in the sense that if a ship enters the area of the wind park, it is assumed to collide with one of the turbines. This is obviously conservative. If each turbine is modelled separately it is estimated that the frequencies will decrease with a factor between 3 and 10. The total yearly ship collision frequency for the wind park may thus decrease from the value in Table 4.3 to a return period of approximately 60 years.

Ship – Ship Collision During Construction

During construction vessels will travel between the coast and the construction site at Arklow Bank. The vessels will vary from smaller ships with workers to larger vessels as flattop barges, floating cranes and dredgers. This traffic is perpendicular to the commercial ship traffic in the area and there is therefore an increased risk for a ship – ship collision during the construction period.

The yearly frequency for a ship – ship collision due to construction of the wind park is estimated to 1.9×10^{-3}, which corresponds to a return period of approximately 500 years. The yearly frequency is based on a construction time of approximately 2.5 years (900 days) and that each turbine will result in 40 visits of different vessels. There is uncertainty on this value as the actual number of the visiting vessels will depend on the applied concept of installation and foundation of the wind turbines.

4.2.5.2 *Cable Damage from Fishing Gear/Trawl – Internal and External Cables*

Approximately 25-30 small fishing vessels from Arklow are fishing on the west side of Arklow Bank. These are small boats used for whelk fishing. Pots are placed in coils with a buoy in each end. The electricity supply cables are designed to resist such impacts and hence will not be affected.

On the east side of the bank at most 10 beam trawlers are operating depending on the time of year. The frequency of cable crossings from beam trawlers has been estimated to 0.3 cable crossings per year per km cable. However, the cables will be on the west side of the bank and will not be in the area where the fishermen operate. This suggests that any likely damage to the cables would be minimal.

4.2.5.3 *Cable Damage from Anchors - External Cables*

Two different scenarios is considered for dropped anchors:

- Emergency anchoring;
- Uncontrolled drop of anchor

The anchor crossing frequencies for the cable connection to the shore are given in Table 4.5.

Table 4.5: Total Anchor Frequencies for the Cable Connection from Arklow Bank and to the Shore

Total Frequency	Uncontrolled Drop	Controlled Drop
6.1×10^{-4}	5.3×10^{-4}	7.7×10^{-5}

It follows from Table 4.5 that the return period for an anchor crossing of the external cable is 1650 years.

4.3. Consequences

4.3.1. Oil spillage due to Collision

The main source of collision has been identified to be from the navigation routes close to Arklow Bank, where the ship traffic mainly constitutes either smaller coasters with bulk and dry cargo or fishing vessels. Tankers are very rare on the routes close to Arklow Bank. Hence, the possibility of oil spillage from collision with tankers is therefore not considered.

Representative scenarios in connection with the EIS are therefore ship – ship collision or ship – turbine collision where the consequences in both case can be leak of bunker oil tanks.

The expected oil spill volume in the case of a ship collision in the area around Arklow Bank will be between 5 to 8 m^3 bunker oil for collision with ships in class 1 or 2. Collision with ships in class 3 to 9 will result in spillage of 100 m^3 to 300 m^3 bunker oil. Both consequences have a return period of 120 years.

4.3.2. Oil spillage due to cable damage from anchors - external cables

Disruption of the external cables may lead to spillage of oil. The potential amount of oil spillage will depend of the type of cable. However, as mentioned above the frequency of a cable disruption is low.

4.3.3. Recreational Activities

It is not anticipated that the wind park will have any impact on recreational activities in the area during the construction, operation or decommissioning phases. This is due to the fact that no recreational activities are enjoyed on the Arklow Bank. Similar to shipping movements, yachts either sail inside or outside the bank also and do not cross the bank.

However, it is estimated that the wind park will encourage casual sailing activities.

4.3.4. Aviation

It is unknown if the proposed wind park is on any flight path from the two small aerodromes on the east coast near Arklow, namely Brittas Bay and Newcastle Aerodromes.

The most likely impact of the wind park is the requirement to ensure air traffic navigation safety for the turbines. Search and Rescue aircraft may fly in this zone at any time. Consultation with the Irish Navigation Authority suggested that the exact location of each turbine and lighting would be required by them.

4.3.5. Commercial Fishing

The existing commercial fishing usage of the Arklow Bank and surrounding area and potential impacts of the wind park on same are discussed in detail in Chapter 8 of this EIS. In summary, it is predicted that the operation of the wind park will not impact on these activities. Indeed, the presence of structures on the bank will encourage the creation of marine ecosystems in the area.

4.4. Mitigation Measures

4.4.1. Noise

The impact of noise during the construction of the wind park is undetermined and will depend upon the engineering design and foundation type decided at the tender stage. The final design will be available post final EIS. The noise issues will be accurately determined at his stage. Based on the experiences gained at the Rodsand wind farm, the hammering of a 3.5m diameter pile resulted in a noise level of between 42 and 53dB(A) at 8km from the site. Although no sound power level was available for vibrating the piles, it is estimated that it will be less than 150dB(A), i.e. the noise level recorded at source during the hammering of a pile. Notwithstanding that, if ambient noise levels are significantly increased during construction, the developer proposes to mitigate the noise by placing a cushion around the hammerhead during driving.

During the operation of the wind park ambient noise levels on the shore will not increase.

4.4.2. Traffic

The impact of the wind park on traffic is undetermined at this stage also. Depending upon the final engineering details and construction of the turbine foundations it is not possible to predict the impact of increased traffic movements in the area. Monopile or tripod foundations if used, will have a lesser impact on traffic movements. Traffic counts carried out in the vicinity of Arklow Harbour indicate that HGV's are a main source of traffic in the area.

However, some likely mitigation measures required to mitigate traffic during construction are as follows:-

- Provision of traffic control while transporting oversized loads to Arklow for sea transport to the Arklow Bank. Movement of oversized loads will be co-ordinated with the local authorities and the Gardai; and

- Movement of loads during off-peak hours.

It is expected that similar increases in traffic levels will be experienced during decommissioning. Similar mitigation measures will be put in place during decommissioning. Traffic movements within Arklow have significantly reduced due to the opening of the Arklow bypass.

4.4.3. Health & Safety

A site-specific health & safety statement for the construction phase of the project will be prepared in accordance with the Safety, Health & Welfare at Work (Construction) Regulations 1995. This will address all issues of the construction project including general site safety, protective clothing and footwear required, crane operation, heavy equipment operation, lockout-tag-out procedures for safe electrical work, scaffold and working from heights. The site manager will be responsible for the implementation of procedures outlined in the safety statement.

As stated in Section 4.2.3 electromagnetic radiation levels from wind turbines are negligible and have no known health effects. No mitigation measures are therefore suggested.

4.4.4. Socio-Economics

The development will provide employment to the local community during the construction phase. The operation of the wind park will also provide employment to the local community in the long term. A socio-economic appraisal of the wind park concluded that:

- the first phase of 60MW will create 360 full-time employment jobs (FTEs) during construction and 23 permanent FTEs in direct employment from 2002;
- the full economic effect of Phase 1 will create a further 144 jobs during construction and 45 permanent jobs in sub-supply;
- the social benefits of avoided pollution is in the region of £20 million; and
- the total net benefits of the 60MW phase are estimated at £46.5 million in 2001 prices.

No mitigation measures are deemed necessary.

4.4.5. Shipping, Navigation and Undersea Cables and Pipeline

In Section 4.2.5 the environmental risks due to ship collision and anchor impact on cables is evaluated. With reference to the results in Section 4.2.5 the environmental risk does not call for significant additional mitigation measures. The ordinary sea marking will be sufficient relative to the environmental risk.

4.4.6. Recreational Activities

The wind park will not have any impact on recreational activities in the area during construction, operation or decommissioning. No mitigation measures are deemed necessary.

4.4.7. Aviation

The wind park will have an impact on air navigation safety. Mitigation measures have not been finalised at this stage but at a minimum will include the following:-

- Air traffic navigational lighting; and
- Possibly radar navigational provision.

These measures will ensure conspicuity of the wind turbines in low levels of visibility.

Furthermore, the Irish Aviation Authority will be advised of the positional data for each turbine which will be published. The specific lighting requirements for the turbines will be agreed with the Authority.

The Irish Aviation Authority will be contacted during decommissioning to determine if there are any particular guidelines to be provided by the developer.

4.4.8. Commercial Fishing

The impact of the wind park and the mitigation measures proposed during construction, operation and decommissioning to minimise the impact on commercial fishing usage of the Arklow Bank and surrounding area is discussed in detail in Chapter 8 of this EIS.

5. PHYSICAL ENVIRONMENT

In the following the existing physical environment is described. The bathymetry and seabed features are briefly described based on the Fugro Ltd. Report[2] (Appendix 9). The existing physical environment with respect to tidal currents, wave climate, bank sedimentology, general sediment transport system, and historical bank stability are described in the Murphy Dollard[4] Report (Appendix 10). The relevant hydrodynamic literature and hydrodynamic modelling and current/sediment transport studies on the Arklow bank area are provided in the Coastal Resources Centre Report. For further information reference is made to the Coastal Resources Centre, the Fugro Ltd. Interpretative Report, the Fugro Ltd. Geotechnical Report and the Murphy and Dollard Report.

5.1. Existing Environment

Arklow Bank is located in the Irish Sea, between 7 and 12 km offshore from the Wicklow and Wexford coastline, Republic of Ireland. It is situated in an area known as the Irish Platform, which occupies a corridor some 20 to 30 km wide off the east coast of Ireland. The bank is approximately 25 km long and oriented roughly north south.

On the bank the water depth varies between 2 and 25 meters. West of Arklow Bank the water depth varies between 22 to 35 meters being deepest in the southern part. East of Arklow Bank is the Irish Sea and Saint George's Channel, where the water depth varies between 60 and 100 meters.

The sea floor in the area is dominated by sand and gravel deposited by the abating ice front during the last glaciation (pre 12.000 BP). The Arklow Bank exists south-east of the inferred limit of the Delgany Moraine, based on known seabed exposures although this does not discount the possibility of an inferred morainic core at Arklow Bank. The surface sediment is mobile, formed due to reworking following relative sea-level rise post 10.000 BP. Areas around the bank are also characterised by mobile sand overlaying glacial clays. To the west of the bank, gravels are exposed on the seafloor.

The Arklow Bank is subject to very strong currents with evidence of sand transport northwards on the landward side of the bank and southwards on the seaside of the Bank. Due to the shallow water overlying the bank, even during a low swell condition; breaking waves are often present making the bank a difficult area to work. Due to the low tidal amplitude in the area, even during spring tides and calm seas most vessels cannot cross the bank. It is no coincidence that Arklow Bank has one of the highest concentrations of shipwreck incidents in the Irish Sea, (Bourke 1994[11] and Bourke 1999[12]). However, the energetic physical environment does not favour the preservation of this maritime heritage resource.

Anecdotal information from local fishermen suggests that a degree of liquefaction is prevalent in the sediments along the bank. This assertion is supported to a degree by the fact that a number of wrecks were not at their charted location. Currently the shipwrecks are being located by an investigation, including side scan sonar and magnetometer.

It should be noted that a discrepancy exists between the bathymetry data obtained during the recent survey (Spring 2000) and the existing admiralty charts covering the area. The discrepancy may be due to either differences in the original survey grid datum as used by the admiralty or discrepancies caused by the use of different equipment and logging equipment. Comparing the two charts the bank has apparently moved slightly eastward. The apparent movement of the bank is not as pronounced at the northern end. The admiralty chart, surveyed between 1873 and 1914, shows a drying area. Anecdotal evidence suggest that the bank did dry in recent times as a game of cricket was played on the exposed sand – year unknown. The least depth found in the Spring 2000 investigation was less than one meter, though there are extensive areas of less than two meters depth. Overall however, it appears that the bank is more consistent in form than is shown in the admiralty chart.

The morphology of the Arklow Bank is generally asymmetrical over the southern half and more symmetrical over the northern half. Over the asymmetrical part of the bank the steepest slope is on the eastern or seaward side. The seabed sediments comprise loose to medium dense fine to coarse sand, which becomes coarser to the north of the bank.

Below the bank core, quaternary soils predominantly consist of very dense sand, gravel and gravelly sand. However, a thin clay layer was encountered in one of the initial borings.

The site is extremely exposed and prone to strong sea currents. The asymmetrical morphology of the bank induces extreme sea states on either side of the bank crest. Water current velocities are up to 5 knots in both north-easterly and south-westerly directions and sea states are found to be roughest when prevailing winds are from the north-east, east or southeast. Tidal ranges in the area are generally in the order of 2m and surface currents are known to exceed 1.25 m/s.

5.1.1. Bathymetry

A hydrographical and geophysical survey across Arklow Bank using an echo sounder, side scan sonar and surface tow boomer was performed in spring 2000[2]. In summary fifty seven east-west and one north-south sub-bottom and side scan sonar lines, and 252 east-west oriented bathymetric survey lines were performed across the bank. A bathymetry chart showing the variations in the elevation below bed levels across and along the Arklow Bank is presented in the Fugro Ltd. Report (Appendix 9). The survey showed water depths along (North-South) the bank crest varying between 0.6m and 4.0m relatively to lowest astronomical tide (LAT) (=CD Arklow). Away from the bank crest the depths increase rapidly (maximum slope encountered of approximately 6°) eastward to between 20m and 30m and, with a more gentle slope, (1-4°) westward from the crest also to 20m and 30m.

The high current regime gives rise to a variety of bed forms in the general area of the Arklow bank. Sand waves are present with crests oriented approximately at right angles to the crest of the bank. They measure up to 30 m in length with amplitudes generally of a few metres. Additionally, numerous small asymmetrical sand waves were found locally along parts of the bank crest. The net sediment transport is interpreted to be to the north on both sides of the bank due to the dominant northerly current direction.

Across most of the Arklow Bank crest a smooth seabed is present with localised areas of sand ribbons, the crests of which are aligned roughly orthogonal to the direction of sediment transport.

A few isolated areas are present to the east and north of the Arklow Bank where the underlying till is interpreted to crop out at the seabed or beneath a thin cover of seabed sediments.

5.1.2. Hydrography

According to the HMSO[5] and admiralty charts the spring tidal amplitude (STA) in the region of Arklow Bank should be approximately 0.5 m. However reliable on-site measurements indicate on STA in the order of 1m[4].

Storm surges (SS) lead to an increase in surface elevations up to 0.75-1.0 m for the 50 year event. For the 100 year event the storm surges may be 0.8-1.05 m. The highest mean water level for Arklow Bank with a return period of 50 years can be calculated as:-

LAT + 1.29 STA + 1.11(STA + SS). =3.51 m above LAT,

when adopting SS = 1 m and STA = 1 m.

For the 100 year event the level will be 0.06 m higher.

The flood and ebb tide in the area is between 1.5 and 4 knots corresponding to 0.75 m/s to 2 m/s respectively.

5.1.3. Sedimentology

The seabed sediments comprise predominantly sand and gravel[4]. The seabed sediments on the ridge are composed of sand, which becomes coarser to the north, whilst the material around the edges of the bank is composed predominantly of more granular material (gravel), especially to the east of the bank. The Arklow Bank area is interpreted to be underlain by a moraine ridge (Wheeler et al., 1999), the core material is believed to be Quaternary in age. The core material, if present, is interpreted to have been deposited during the last glacial period.

The sedimentation processes operating off the coast are poorly understood and a number of postulations have been made with little hard evidence available for validation. Given the nature of the strong tidal currents in the area it is likely that this current is the driving force behind the movement of sediment and the formation of the banks.

By comparing recent bathymetric surveys with old admiralty charts an apparent movement of the bank towards the east and north has been identified. However, some caution must be exercised concerning the accuracy of the original bathymetric survey[4]. This movement is consistent with the main directions of waves and current loading and the general northerly movement of sediments in the overall area as well as the cross sectional shape of the bank. However the major parts of the movement are believed to be due to different horizontal datum used in the two surveys.

5.1.4. Waves

The Arklow Bank, along with all the other east coast banks, plays an intricate role in the evolution of the nearby coastline. Because they refract, diffract and cause waves to break they are critical to the nature of the inshore wave climate and consequently to the shape of the coastline.

Three different sources of wave data are available for the south Irish Sea. In order of accuracy these are:

- Wave height and direction as measured by wave buoys or wave riders;
- Computer generated wave hindcast data using wind fields; and
- Observed wave data from ships of passage.

Wave height and directions were recorded between 31st October 1997 to 12th October 1998 using a wave rider off Rosslare, resulting in wave energy rose along with maximum significant wave height[4]. However due to gaps in the recording, the coverage was approximately 67%. Consequently this data set does not give a complete picture of the wave climate.

Other wave heights at Arklow Lightship located just south of Arklow Bank were recorded during a one year period (1973-1974), giving a 92% coverage, however the wave directions were not recorded, and the wind direction measured at Rosslare was used to generate the wave rose.

In summary all the wave roses for the area show a dominance of southerly waves, this is expected as the large Atlantic swells enter the Irish Sea and the dominant wind direction is from the west[4]. The observed wave rose indicating the south-west to be the dominant direction, however the large area covered by observations, including areas such as Cardigan and Liverpool Bays, causes this.

The nearshore wave climate, shown in the recorded Wave Energy Rose off Rosslare shows the effect of the swallowing water depths on waves entering the Irish Sea[4]. This location is closer to the shore and the waves are refracted towards the coast resulting in the dominant waves arriving from the south-east.

The majority of the waves are coming mainly from south south west (south-west to south south east), but it is noted that large waves (exceeding 2 m) have been recorded for nearly all directions between 0 and 300 degrees.

The wave climate is one of the most severe in terms of coastal erosion, as sediment transport along the coast tends to be unidirectional. Sediment removed in these conditions is generally moved up the coast and is very unlikely to return to its original location.

In the Murphy Dollard report[4] the significant wave heights (H_s) for a range of probability levels are calculated based on the hindcasting model from BMO:

- $H_{s1} = 5.6$m,
- $H_{s10} = 7.2$m,
- $H_{s50} = 8.3$m,
- $H_{s100} = 8.7$m.

This is significantly lower than the values referred in the SEACORE Ltd. Report[10], where H_{s50} = 9.9 m, based on the design guidelines in the HMSO[5] and OTH89300[9] Reports. Applying the relationships $H_{max100}=1.95\ H_{s50}$, and a $H_{100} = 19.3$ m is obtained[5].

By comparing the above wave heights to the bathymetry for the Arklow Bank it is evident that a large portion of the waves break when reaching the bank, as they are higher than the breaker index 0.78 d, where d is the water depth.

The Murphy Dollard report does not discuss the corresponding wave periods. However, these formulations can be used[5].

$$3.2\ H_{s50}^{1/2} < T_z < 3.6\ H_{s50}^{1/2}$$

where T_z is mean wave period for a specific storm event.

5.1.5. Currents

The Arklow Bank is subject to very strong currents with evidence of local sand transport northwards on the landward side of the bank and southwards on the seaside of the bank.

It appears that currents up to 1- 1.2m/s during spring tide must be considered for the site[5]. During storm surge, currents not higher than 0.5m/s must be considered [4,3].

However, across the bank total currents of up to 2.0 m/s (tidal and storm surge) have been measured. The directions of the currents are typically E to W or WSW to ENE.

5.2. Characteristics of the Development which could Impact on the Environment

In the Murphy Dollard report[4] the possible impacts of the construction and operation of the planned wind park on the physical environment are discussed.

The study shows that the wind park will not have a negative impact on the sediment transport processes of the bank. Apart from the immediate vicinity of the wind turbine structures, there is expected to be none or only minor alteration in the sediment transport pattern. Hence, the wind park will not destabilise the bank nor have a negative impact on the coastline.

These conclusions agree with the general observations and existing knowledge for similar sites. Furthermore it is believed that these conclusions can be drawn on the basis of existing data, i.e. additional investigations are not required.

However, it is also evident, although not discussed previously, that dredging operations during construction of the planned wind turbine park will impose a risk of fine sediment being spilled and subsequently spread by the current. If this process is to be quantified additional investigations and studies are to be conducted. The need for dredging operation depends on the type of foundation for the turbines. Some dredging will be required for the cabling.

Apart from the above, the wind turbine field will have no impact on the physical environment.

5.3. Mitigation Measures to Reduce the Impact on the Physical Environment

Scour is the common used name for the erosion process where bed material in the vicinity of a structure is eroded and removed due to the hydraulic impact from waves and/or current.

As concluded in the previous sections, no significant impact on the seabed is envisaged. However, local scour is expected and can from a structural point of view be prevented by either incorporating it in the design or by applying scour protection measures to the wind turbine foundation. A number of methods are currently available for protection against scour, wave-current loading or other impacts in the marine environment, or for increasing bottom stability. Of these methods only construction of protective stone reefs is considered feasible for the current project.

However, from an environmental impact viewpoint piled foundation can incorporate provision for scour, so that extra scour protection is not required. Scour protection could diminish the water flow, and not using it can prove advantageous, and less disturbing for the environment, especially at shallow water depths (5 to 10 metres).

The permissible sediment spillage from the dredging operations will be limited in order to reduce the impact on the nearby mussel beds and fish beds. To reduce sediment spillage from the dredging operation, the developer will consider the use of mechanical dredges, e.g. backhoe or dipper types.

The knowledge of the physical environment for the Arklow Bank is sufficient for an understanding of the physical environment requested in the EIS. However additional information will be required for a detailed design (optimised structures) of the proposed development. If the foundation layout in the construction phase requires an extensive amount of dredging, additional measurements may be required to perform a simulation of the spreading of sediments.

1. "Literature and Data Review for the Arklow Bank within the Context of Offshore Wind-Energy Generation" by Coastal Resources Centre, University College Cork dated November 1999.
2. "Phase One Interpretative Report. Proposed Offshore Wind Farm Development. Arklow Bank, Irish Sea. Report 04504-1 by Fugro Ltd. dated 30 June 2000.
3. "Offshore Wind Farm Development Arklow Bank, Irish Sea. Geotechnical Site Investigation. Laboratory and In-Situ Report". Report No. 04520-2 by Fugro Ltd. dated 24 November 2000.
4. "Effect of Wind Farm Structures on the Arklow Bank Seabed" by Dr. J. Murphy, University College Cork and Brendan Dollard Enterprise Ireland, dated February 2001.
5. Offshore Installations: Guidance to design, construction and certification. HMSO, 1993.
6. "VVM redegørelse for Vindmøllepark på Middelgrunden – Redegørelse for de miljømæssige konsekvenser." Københavns Belysningsvæsen og Middelgrundens Vindmøllelaug I/S. Juni 1999.
7. "Havmøllepark ved Rødsand. Vurdering af virkninger på Miljøet – VVM-redegørelse." SEAS Distribution A.m.b.A. for Energi E2 A/S. Juli 2000. In Danish.

8. "Havmøller Horns Rev. Vurdering af virkning på miljøet. VVM-redegørelse." Elsamprojekt for I/S Elsam og Eltra amba. Maj 2000. In Danish.

9. OTH 89300: Metocean Parameters. Wave parameters.

10. SEACORE Ltd. Report. Meteorological Mast Monopile Foundation, proposed Offshore Wind Farm. Arklow Bank, Irish Sea.

11. Bourke E.J (1994) *Shipwrecks of the Irish Coast 1105-1993* E.J. Bourke, Dublin.

12. Bourke E.J. (1999) *Shipwrecks of the Irish Coast, Volume 2, 932-1997.* E.J. Bourke, Dublin

6.1. Climate in the Existing Environment

Arklow is the nearest climatological station to the proposed site. Casement Aerodrome and Dublin Airport are the nearest synoptic stations, followed by Rosslare. The monthly and annual rainfall averages (1951 – 1980) for Arklow, Casement Aerodrome, Dublin Airport, and Rosslare are given in Table 6.1

Table 6.1: Monthly and Annual Rainfall Averages, mm (1951 – 1980)[41]

	Arklow (Shelton Abbey) 15 m	Arklow (WW) 34 m	Casement Airport 94 m	Dublin Airport 71 m	Rosslare Pier G.S 15 m	Rosslare S.W.S. 26 m
January	115	109	66	68	94	95
February	82	80	51	51	68	69
March	84	81	49	50	62	63
April	57	56	47	47	54	54
May	68	67	58	58	58	59
June	55	54	49	53	49	49
July	62	59	54	59	58	59
August	80	78	70	75	73	73
September	93	91	69	73	78	79
October	98	98	68	68	89	90
November	109	107	70	69	99	99
December	118	113	77	79	99	98
Year	1021	992	728	750	880	887

The long term average potential evapotranspiration (1958 – 1972) for Dublin Airport and Rosslare is given in Table 6.2.

Table 6.2: Long Term Average Potential Evapotranspitation, mm (1958–1972)[42]

	Dublin Airport	Rosslare
January	6.8	9.1
February	18.4	21.9
March	36.8	38.9
April	62.6	64.4
May	83.8	87.2
June	97.0	100.9
July	87.2	90.7
August	70.8	75.0
September	48.3	52.4
October	23.5	26.5
November	8.7	12.4
December	5.0	7.6
Year	**549.1**	**586.8**

More detailed climatic data is given in Tables 6.3 and 6.4 for the two nearest synoptic stations, Dublin Airport and Casement Aerodrome.

Table 6.3: Dublin Airport Monthly and Annual Mean and Extreme Values (71 m a.s.l 1961 – 1990)[43]

TEMPERATURE (° C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean daily max.	7.6	7.5	9.5	11.4	14.2	17.2	18.9	18.6	16.6	13.7	9.8	8.4	12.8
Mean daily min.	2.5	2.5	3.1	4.4	6.8	9.6	11.4	11.1	9.6	7.6	4.2	3.4	6.4
Mean	5.0	5.0	6.3	7.9	10.5	13.4	15.1	14.9	13.1	10.6	7.0	5.9	9.6
Absolute max.	16.6	15.3	21.3	20.5	23.4	25.1	27.6	28.7	23.9	21.2	18.0	16.2	28.7
Absolute min.	-9.4	-6.2	-6.7	-3.7	-1.0	1.5	4.8	4.1	1.7	-0.6	-3.4	-10.1	-10.1
Mean no. of days with air frost	6.4	4.9	3.3	1.4	0.2	0.0	0.0	0.0	0.0	0.1	3.3	4.8	24.3
Mean no. of days with ground frost	14.0	12.7	12.4	9.2	2.9	0.2	0.0	0.0	0.6	2.3	9.7	12.5	76.4
RELATIVE HUMIDITY (%)													
mean at 0900UTC	86	84	82	79	76	76	78	81	82	85	86	86	82
mean at 1500 UTC	79	75	70	68	67	68	68	70	70	75	78	81	72
SUNSHINE (hours)													
Mean daily duration	1.8	2.5	3.6	5.2	6.1	6.0	5.4	5.1	4.3	3.1	2.4	1.7	3.9
Greatest daily duration	8.0	8.0	9.2	11.9	13.8	15.4	15.9	14.5	12.4	10.4	8.5	6.9	15.9
Mean no. of days with no sun	11	8	5	3	2	2	1	2	3	6	8	11	61
RAINFALL (mm)													
Mean monthly total	69.4	5034	53.8	50.7	55.1	56.0	49.9	70.5	66.7	69.7	64.7	75.6	732.7
Greatest daily total	30.3	31.3	35.7	26.2	30.0	46.6	34.8	60.2	40.9	47.5	55.1	41.7	60.2
Mean no. of days with 0.2 mm	18	14	16	14	16	14	13	15	15	16	16	18	185
Mean no. of days with 1.0 mm	13	10	11	10	11	10	9	11	10	11	11	12	128
Mean no. of days with 5.0 mm	5	3	3	3	4	4	3	4	4	4	4	5	48
WIND (knots)													
Mean monthly speeds	12.2	11.7	11.6	9.7	8.7	8.0	8.1	8.0	8.9	9.9	10.8	11.8	9.9
Max. gust	75	73	61	60	58	55	54	56	64	73	64	71	75
Max. mean 10 minute speed	48	49	42	41	39	36	34	41	35	45	43	47	49
Mean no. of days with gales	2.1	1.1	1.2	0.3	0.3	0.1	0.0	0.3	0.2	0.5	0.7	1.4	8.2
WEATHER (mean no. of days with...)													
Snow or sleet	6.0	5.5	4.3	1.7	0.3	0.0	0.0	0.0	0.0	0.1	0.9	2.9	21.6
Snow lying at 0900 UTC	2.1	1.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6	4.5
Hail	0.7	0.9	2.2	2.4	1.4	0.3	0.1	0.1	0.0	0.2	0.5	0.8	9.5
Thunder	0.1	0.1	0.2	0.3	0.6	0.7	0.7	0.6	0.3	0.3	0.1	0.1	4.1
fog	4.8	4.3	3.9	4.5	3.6	3.1	3.6	5.3	4.9	4.7	4.0	3.9	50.5

Table 6.4: Casement Aerodrome Monthly and Annual Mean and Extreme Values (71 m a.s.l 1961 – 1990)[44]

TEMPERATURE (° C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean daily max.	7.8	7.6	9.6	11.8	14.6	17.7	19.7	19.3	16.8	13.6	9.9	8.3	13.1
Mean daily min.	2.0	1.7	2.5	3.2	5.7	8.6	10.7	10.3	8.5	6.7	3.6	2.8	5.5
Mean	4.9	4.6	6.0	7.5	10.1	13.1	15.2	14.8	12.6	10.1	6.7	5.6	9.3
Absolute max.	15.4	14.7	18.8	21.3	24.7	27.5	29.8	30.5	24.7	21.3	17.7	15.4	30.5
Absolute min.	-12.4	-10.3	-7.8	-4.5	-3.0	0.3	2.5	2.5	-0.3	-4.1	-6.2	-9.7	-12.4
Mean no. of days with air frost	7.5	7.7	6.3	4.9	1.0	0.0	0.0	0.0	0.0	1.4	5.9	6.6	41.3
Mean no. of days with ground frost	15.3	15.0	13.1	12.8	6.3	1.1	0.1	0.1	1.6	4.5	11.0	13.5	94.3
RELATIVE HUMIDITY (%)													
mean at 0900UTC	87	86	84	80	77	77	79	81	84	86	87	87	83
mean at 1500 UTC	82	77	72	68	68	68	68	68	71	76	81	83	74
SUNSHINE (hours)													
Mean daily duration	1.63	2.38	3.04	4.83	5.65	5.63	5.01	4.83	4.04	3.07	2.16	1.42	3.64
Greatest daily duration	8.1	9.2	10.9	13.6	15.4	16.0	15.4	14.4	12.3	9.8	8.5	6.9	16.0
Mean no. of days with no sun	10	7	5	2	2	2	1	2	3	5	7	11	55
RAINFALL (mm)													
Mean monthly total	68.7	50.7	53.8	49.9	56.6	53.0	48.9	63.7	58.7	67.2	67.2	73.1	711.4
Greatest daily total	31.4	42.8	30.0	35.3	34.3	108.6	41.4	73.0	32.1	48.5	58.4	42.9	106.6
Mean no. of days with 0.2 mm	18	14	17	14	15	14	14	14	15	16	16	17	185
Mean no. of days with 1.0 mm	13	10	12	10	11	10	9	10	10	11	11	12	131
Mean no. of days with 5.0 mm	5	3	3	3	4	3	3	4	4	4	4	5	45
WIND (knots)													
Mean monthly speeds	14.1	12.5	12.8	10.1	9.1	8.7	8.9	8.7	10.1	11.2	12.3	13.3	11.0
Max. gust	80	78	71	59	63	53	58	58	69	65	68	81	81
Max. mean 10 minute speed	57	54	47	43	43	36	39	39	46	44	49	57	57
Mean no. of days with gales	5.2	2.7	2.7	0.6	0.5	0.1	0.1	0.2	0.6	1.4	2.4	3.7	20.3
WEATHER (mean no. of days with...)													
Snow or sleet	4.6	4.8	3.5	1.4	0.1	0.0	0.0	0.0	0.0	0.0	0.4	2.1	16.9
Snow lying at 0900 UTC	2.4	1.8	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.5	5.3
Hail	0.8	1.2	2.8	2.2	1.3	0.5	0.1	0.1	0.3	0.1	0.7	0.6	10.7
Thunder	0.0	0.1	0.2	0.3	0.9	0.9	0.8	0.6	0.3	0.2	0.2	0.1	4.8
fog	2.5	2.3	1.8	2.4	1.6	1.4	1.2	2.6	2.9	2.7	1.6	2.3	25.9

6.2. Potential Impacts of the Development on Climate

The development of the wind park is expected to have a neutral impact on the climate of the area. The wind energy project will generate electricity that would otherwise be generated by fossil fuel burning power stations. While the wind park itself will have a neutral effect on climate, the fact that greenhouse gas and pollutant emissions are being avoided is a positive result.

The avoidance in emissions of greenhouse gases and other pollutants to the atmosphere will correspond to the amount of electricity generated by the wind turbines and therefore displaced at other power plants. The exact amount of avoided emissions depends on which power plants are displaced by wind energy. In most of Europe this is coal, a situation likely to continue for some years yet. The reason for this is that nuclear plant and combined cycle gas turbines almost all operate at high load factors, to cover the "base load".[45] This is the minimum load on the system, usually between 20 and 40 % of the peak load. At higher levels other plant, mostly coal, are brought on line to cover peak demand. The addition of wind has the effect of displacing coal plant and hence the emission savings are typically those associated with coal plant. Assuming a 37.5% capacity factor for the wind park, 10% losses (electrical and wake effects), and 90% availability of plant, avoided emissions are generally as given in Table 6.5.

Table 6.5: Annual Emissions for the Generation of Electricity by Various Plant* (t)[46]

Technology	Coal	Coal + FGD†, low NO_X burner	Oil	Gas	Wind
Stack Emissions					
Carbon dioxide	1149209 - 1356898	1204593 - 1356898	927675 - 1038442	526144 - 581528	0
Carbon monoxide	42 – 194	42 - 208	194	42	0
Sulphur dioxide	15230 - 22153	277 - 2215	1800 - 18000	0	0
Nitrogen oxides	692 - 6231	277 - 1385	1108 - 5123	485 - 969	0
Methane	14	14	14 - 42	152 - 194	0
Particulates	277 - 692	277 - 692	554	low	0
Waste Products					
Ash	80306 - 246457	48461 - 318456	138	0	0
Gypsum	0	31846 - 41538	34615	0	0

Climate change has been identified as one of the most serious environmental problems facing the country at the present time.[47] The scientific consensus is that the release of greenhouse gases such as CO_2 from the burning of fossil fuels is one of the primary

* Based on the generation of the same average number of units of electricity per annum as is predicted for the Arklow Bank wind park

† Flue gas desulphurisation

causes of global warming. Avoided emissions of nitrogen oxides, sulphur dioxide and especially carbon dioxide using wind energy as a clean alternative energy use will have a neutral impact on climate and air quality.

The economic savings due to the avoidance of these emissions do not presently figure in economic assessments of wind energy. The external costs of fossil fuel sources, associated with the damage these emissions cause, may be difficult to quantify, but they are real. A review of several studies carried out by the British Wind Energy Association indicated that external costs for coal fired generation could be assigned at around €10/MWh (0.013IRp/kWh).[48] Other sources give figures as shown in Table 6.6.

Table 6.6: External Costs of Power Generation[49] *

External Costs of Generation	Coal	Gas	Nuclear	Wind
IRp/kWh†	0.55	0.07	0.23	0

6.3. Mitigation Measures

The impact of the proposed wind park on the climate will be wholly beneficial. No mitigation measures are required.

* these figures relate to generation of electricity and do not include plant construction or disposal of waste
† based on a conversion rate of IR£1 = stg 76.43p on 19th June 2001

7. CULTURAL HERITAGE/ARCHAEOLOGY

7.1. Introduction

A pre-development archaeological assessment of development in a marine environment is required under the EU Environment Impact Directives 85/337/EC and 97/11/EC. The protection of archaeological heritage is legislated for in the European Convention for the protection of the archaeological heritage (revised) 1992. FTC, in association with Management for Archaeology Underground Ltd. carried out two desk based archaeological assessments. These assessments involved a report on the archaeology in the area of the proposed wind park and an assessment report on submarine wrecks on the Arklow Bank, and the findings are described below.

Geophysical work is ongoing and the results to date are described in Section 7.4.

7.2. Archaeological Desk Based Study

The desktop study showed that there are no archaeological or historical data relating to the Arklow Bank other than that relating to the wrecking of vessels. During the desktop study, the following archaeological registers were consulted:-

- Inspection of National sites and monument records;
- Inspection of the relevant files of the National Museum of Ireland;
- Inspection of the National Maritime Register;
- Inspection of relevant site inspection reports; and
- Inspection of relevant geophysical survey reports.

The desktop study found that from as early as 6400BC there was evidence of habitation in Arklow. The first evidence of settlement on the site of present day Arklow was found in the 2nd Century. In the 9th Century the Vikings settled on the north side of Arklow and it is they who are responsible for giving the town its name. In 1169AD, the Normans arrived and built a castle the remains of which can still be seen in the town. In 1315, the O'Byrne's and the O'Tooles burned the towns of Arklow, Bray and Newcastle but were later defeated by Edward le Boitleir. The castle was eventually seized and demolished by Oliver Cromwell in 1649.

Arklow was very much involved in the United Irishman's Rebellion in 1798 and several major battles took place in and around the town.

In 1846 Arklow had a booming fishing industry and was one of the main fishing ports in the country. Back then its fishing fleet consisting of 59 deck vessels, 153 half decks, 57 open sailing boats and 14 rowing boats employing a total of more than 1300 men. Arklow is also famous for its boat building. Sir Francis Chichester's yacht "Gypsy Moth III" with which he won the transatlantic single handed yacht race was built in Tyrrell's Yard in Arklow. In 1981 the same yard designed and built the Irish Navy training sailing vessel The Asgard II. The first motor power fishing vessel was launched from Arklow in 1908.

Arklow is also famous for the Kynocks Munitions factory, which commenced production of explosives in the late 1800's and continued until the early 1900's when a disastrous explosion, during World War 1, resulting in the loss of many lives and caused huge damage to the production facility forcing it to close down. It supplied a large amount of the munitions needed by the Allies during World War 1.

The National Maritime Wreck Register lists approximately 300 vessels as having been wrecked in or close to the proposed development site. The records list vessels known to have been lost between 1670 and 1945. A large number of vessels were wrecked in 1917 and may indicate a large trade between the Kynocks Munitions factory and the Continent. The investigation found that the majority of the wreckings occurred during the winter months, but all periods of the year have had their share of wreckings. The cargoes listed for the stricken vessels range from ballast to valuable cargo. Data relating to the location of 3 chartered wrecks within the study area was provided by the Wrecks Department of the UK Hydrographic Office. These wrecks are listed below:-

- Wreck No. 9982 – A Schooner sunk in 1931;
- Wreck No. 9979 – A barque sunk in 1865; and
- Wreck No. 9973 – A vessel of 946 tonnes stranded in 1950.

A geophysical survey along the Arklow Bank failed to locate any of these wrecks at their chartered positions.

The deskbased archaeological assessment completed by Management for Archaeological Underwater Ltd. is giving in Volume 4, Appendix 11.

7.3. Assessment Report Submarine Wreck

Initial reports of submarine activity in Arklow Bay centered around the destruction of Kynock's, a large munitions factory in 1917. The factory, located on the foreshore north of Arklow Harbour, was a major supplier of munitions to the Allies during World War 1. The reports of a submarine wreck centre around salvage work relating to a British vessel - The Anna Toop which sunk on the Arklow Bank in 1958. This ship was a small 421 tonne coaster carrying sheet steel from Port Talbot to Derry and it ran aground on the Arklow Bank. The crew of 10 was rescued by lifeboat and the vessel sank the next day. Some weeks after sinking, the Naomh Eamon was hired to try and locate the vessel. Tests were carried out using a wire stretched between two small boats and then dragged along the seabed. Soon after dragging started, the wire became entangled in something and the divers went down to check. The divers reported that it was not the Anna Toop but instead an old submarine stuck in the Arklow Bank. The submarine was noted as being closed up.

The wreck of the Anna Toop was located some hours later and the vessel was not raised or its cargo salvaged.

The State owned fertiliser company Nitrogen Eireann constructed a plasterboard manufacturing plant on the foreshore adjacent to Arklow Harbour in the 1970's. This plant was designed to produce plasterboard and plaster products from gypsum slurry, a waste product from the manufacturer of phosphoric acid. On occasions when the plasterboard plant was not in operation, the slurry was diverted to discharge into the Arklow Bay via a submarine pipeline. Due to the nature of the material and the length of pipe the system was prone to blocking and on occasions divers were sent to clear the pipes. On one occasion divers were taken to a site where a submarine was reported to have been lost. There they located an intact submarine in shallow water (estimated as 50 feet). The submarine was said to be covered in marine growth.

The full archaeological report is given in Appendix 12, Volume 4 of the EIS.

7.4. Geophysical Surveys

Management for Archaeology Underwater Ltd. have conducted a geophysical survey covering an area of 8 x 1.5km of the northern section of the Arklow Bank. The site-scan sonar survey of the Arklow Bank was conducted using dual frequency Geo Acoustics Model 159A side-scan sonar towfish. Track line spacing was fixed at 50m ensuring in excess of 200% sea floor coverage was achieved throughout the survey. Sonar data was required and processed on an Apple Macintosh platform and logged to 2 gigabyte jaz disks. A total of 17 bank-parallel and 19 bank – normal lines were acquired amounting to 124.5km of track line data.

A magnetometer survey of the Arklow Bank was conducted using a Aquascan AX2000 proton magnetometer. The track line facings follow the same 50m pattern as the side-scan sonar survey. The method adopted was recommended by Duchas – The Heritage Service. The full report is presented in Appendix 13, Volume 4.

7.5. Results of Geophysical Survey

Interpreters of geophysical data tend to concentrate on anomalies, i.e. an appreciable differences between a constant or smoothly varying background and a very strong or "anomalous" geophysical signature. Archaeo-geophysical anomalies take many forms for example a wooden vessel on a planar sand substrate may present a noticeable high backscatter anomaly on a side scan data.

To date approximately 25% of the sonar data acquired during May 2001 has been analysed for geophysical anomalies of archaeological potential. From this data 7 anomalies are interpreted. The location of the anomalies with regard to the northern portion of the bank is shown in Figure 7.1 and are detailed in Table 7.1.

Figure 7.1: Location of Anomolies

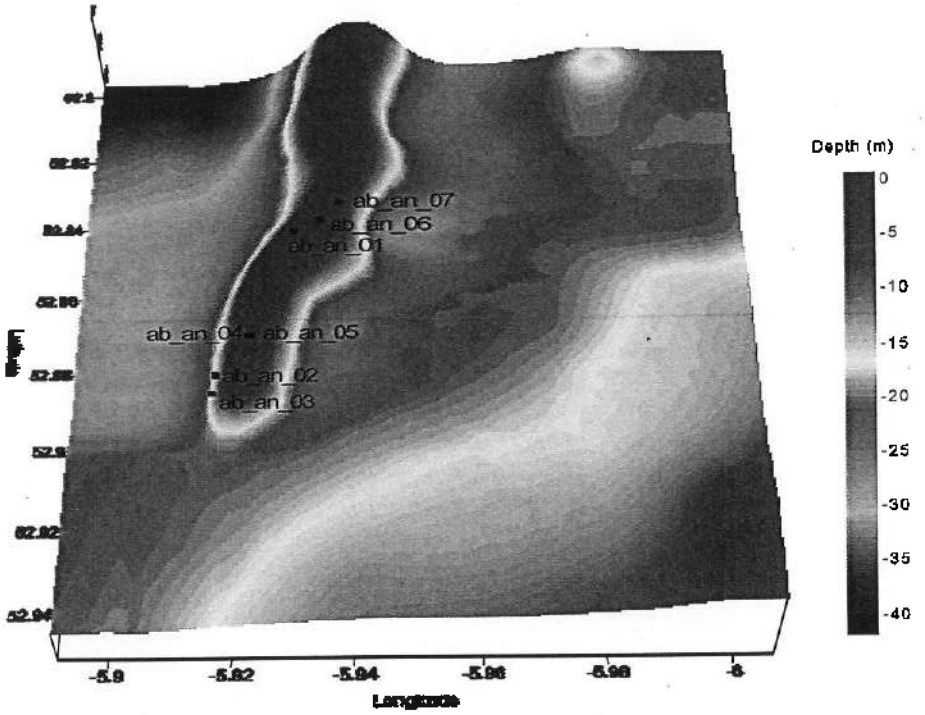


Table 7.1: Parameters of the Anomalous Geophysical Signature Identified in the Preliminary Interpretation

Code	Latitude (N)	Longitude (W)	Dimensions
Ab_an_01	52.8574	-5.9294	7.73 x 7.5m
Ab_an_02	52.8902	-5.9164	21 x 12 x 15m
Ab_an_03	52.8950	-5.9159	4.5 x 4.5m
Ab_an_04	52.8851	-5.9224	3m
Ab_an_05	52.8851	-5.9223	2.6m
Ab_an_06	52.8548	-5.9341	20.74 x 0.5m
Ab_an_07	52.8494	-5.9372	22.98 x 8.50

Anomaly AB_an_01 is imaged as a high-backscatter discrete reflector and it may be natural and is possibly directly related to the adjacent sand ripple. Anomaly AB_an_02 is also a natural anomaly. AB_an_03, AB_an_06 and anomaly AB_an_07 are almost certainly wreck sites. Anomalies AB_an_04 and AB_an_05 coincide with the position of the anemometer mast located on the Arklow Bank.

7.6. Impact of the Proposed Development on Archaeology

The results of the sonar scans and the geophysical survey will identify areas where potential ship wrecks are located. These areas will be avoided when placing the foundations for the turbines on the Arklow Bank.

7.7. Mitigation Measures

An overview of the project design and development to date will be provided to Duchas Maritime Unit. A communication procedure has been put in place whereby the Duchas Marine Unit will be regularly informed of the project development. The archaeological management strategy for this development will be to preserve archaeology insitu by avoidance.

8. COMMERCIAL FISHERIES WITHIN THE STUDY AREA

8.1. Introduction

This report compiles a review of available data and information on commercial fisheries off Arklow and data from the Irish Sea/Celtic Sea Ground Fish Survey and the Juvenile Plaice Survey conducted annually by the Fisheries Research Centre and the Marine Institute in the Arklow Bank area. Data was also gathered from the Central Statistics Office, Bord Iascaigh Mhara (BIM) and Arklow fishermen. Impacts and mitigation measures are also presented

The complete report on commercial fisheries within the study area is given in Appendix 14, Volume 4.

8.2. Review of Existing Information

8.2.1. Arklow Fisheries

Fisheries data from the Arklow Bank area was collected and examined. Figures for all fish (demersal, pelagic and shellfish) landings and values into Arklow Port from 1996 to 1999 were supplied by the Department of the Marine and Natural and the Central Statistics Office (2000) (Tables 8.1 and 8.2).

The main fishery in the Arklow Bank area is for whelks and to a lesser extent blue mussel seed, however the latter are not as lucrative. There is also a mixed whitefish trawl fishery, the dominant species being ray/skate, plaice and cod to the west and east of the bank. This fishery involved up to 10 trawlers from Arklow, Howth and Clogherhead in the past (Dominic Rihan, BIM, Table 8.5). Now, however Arklow boats have all been adapted to pot for whelks (James Heaney, pers. comm. 2001).

Since values are for the total landings into Arklow Port, it is not possible to ascertain the percentage of these that were only caught on or around the Arklow Bank. For example the prawn, *Nephrops* is landed into Arklow but fished off the Smalls, St Georges Channel and off Howth and scallops are caught by Kilmore boats but landed into Arklow (James Heaney, pers. comm. 2001). Similarly, it is not possible to determine the percentage of fish caught around the Arklow Bank and landed to other ports such as Clogherhead, Howth and Wexford. For example mussel seed is fished from around the Arklow Bank, but landed into Wexford and squid is fished from the Arklow Bank area but is landed into Kilmore Quay. Details of total catches into these ports are given in Tables 8.3 and 8.4. Caution must also be taken when examining these figures, as they may not reflect the actual landings into Arklow as vessels under 10 metres are not required to report landings. As such these figures may be an underestimate of actual catch.

8.2.2. Finfish

In terms of demersal fish landings into Arklow Port, the following fish species have been the most important over the years; ray/skate, plaice, cod, spotted dogfish, spur dogfish, whiting, codling, haddock and monkfish (Table 8.1).

Similarly, in terms of value, ray/skate, plaice, cod, turbot, brill, monk/angler fish, spotted and spur dogfish, codling and haddock have been the important species over the years (Table 8.2), which highlights the variation between fish species prices. Fishing methods and the times of year that these fish are caught around the Arklow Bank are given in Table 8.5 and notes on their ecology is given below. The finfish landed in Arklow are predominantly by visiting vessels and most of these are caught to the east of the bank. In the past many of the Arklow boats would have caught finfish, however, these have now been adapted to fish for whelks. (Arklow fishermen pers. comm. 2001). Local fishermen stated that an area 1km north of the south buoy had previously been fished for cod, plaice, ray and sole. This is now unfished and is kept clear for restocking (James Heaney pers. comm. May 2001).

Table 8.1: **Figures for Fish (demersal, pelagic and shellfish) Live Weight Landings into Arklow Port from 1996 to 1999**
(The Department of the Marine and Natural Resources, 2001).

	Live Weight (tonnes)			
Fish	**1996**	**1997**	**1998**	**1999**
Ray / Skate	50.3	99.8	34.5	98.4
Plaice	18.5	32.8	14.0	27.1
Cod	16.4	24.8	10.0	13.0
Spotted Dog	8.9	14.0	13.5	13.0
Spur Dog	2.0	5.6	2.2	3.5
Whiting	11.4	33.3	5.8	2.5
Codling	6.3	6.8	5.4	2.1
Haddock	5.5	9.8	5.9	2.0
Monk /Angler	2.0	5.8	3.1	1.9
Turbot	1.0	0.8	1.4	1.7
Saithe	1.9	3.0	1.2	1.5
Brill	1.0	1.2	1.5	1.4
Mixed Boxes	1.9	5.9	4.9	1.2
Ling	2.2	6.0	1.9	1.1
Lemon Sole	1.1	2.7	0.8	0.8
Dabs	1.2	1.7	1.4	0.7
White Pollock	1.9	2.0	0.9	0.6
Gurnard	0.8	2.0	0.9	0.5
John Dory	0.5	1.0	0.3	0.3
Witch	1.1	2.2	2.9	0.3
Common Sole	0.3	0.8	0.4	0.2
Hake	0.4	0.5	0.7	0.2
Megrim	2.0	2.8	1.0	0.2
Sand Sole	0.0	0.0	0.0	0.1
Slip Sole	0.1	0.1	0.0	0.1
Conger Eel	0.7	2.6	2.0	0.0
Total demersal	**124.9**	**267.9**	**116.6**	**174.6**
Mackerel	0.2	0.4	0.0	0.0
Herring	0.0	0.0	0.0	0.4
Total pelagic	**0.2**	**0.4**	**0.0**	**0.4**
Total wet fish	**139.6**	**268.3**	**116.6**	**175.0**
Blue mussel	1450.0	0.0	0.0	400.0
Escallop	0.0	0.0	0.0	12.0
Crab claws	1.3	0.5	0.5	0.0
Lobster	0.0	0.0	0.0	0.1
Nephrops	3.0	14.1	3.1	6.5
Spider crab	0.0	0.0	0.0	0.0
Prawn tails	0.6	11.3	0.0	0.0
Queen escallop	0.0	0.0	0.2	0.0

Table 8.1 Cont'd.

Squid	7.1	4.1	3.6	1.1
Whelk	*2453.0	*1784.1	891.8	371.0
Total shellfish	**3915.0**	**1814.0**	**899.2**	**790.7**
Total all fish	**4054.6**	**2082.3**	**1015.7**	**965.7**

**Combined values for Arklow and Wicklow port. Arklow landings are approximately 30% of this figure (Maria O'Neill, Sea Fisheries Control & Management Division, DoMNR, pers. comm.)*

Table 8.2: Figures for Fish (demersal, pelagic and shellfish) Values (IR£) into Arklow Port from 1996 to 1999

	Value (IR£)			
Fish	**1996**	**1997**	**1998**	**1999**
Ray / Skate	34,960.0	69,440.0	30,200.0	109,000.0
Plaice	26,475.0	38,925.0	23,730.0	56,325.0
Cod	22,951.5	32,665.0	12,635.0	19,090.0
Turbot	6,650.0	5,215.0	12,040.0	11,275.0
Brill	3,325.0	3,745.0	5,825.0	6,142.5
Monk /Angler	3,840.0	10,920.0	5,880.0	3,680.0
Spotted Dog	1,557.5	2,450.0	4,050.0	3,600.0
Spur Dog	1,560.0	3,360.0	1,320.0	2,100.0
Haddock	4,845.0	5,055.0	5,530.0	2,060.0
Codling	6,675.0	5,912.5	4,960.0	1,900.0
Whiting	5,075.0	19,220.0	3,672.5	1,575.0
Common Sole	2,340.0	5,967.0	3,350.0	1,275.0
Lemon Sole	1,575.0	3,825.0	1,392.5	1,125.0
Mixed Boxes	1,480.0	4,520.0	3,760.0	1,012.0
Saithe	800.0	1,275.0	700.0	913.0
Ling	1,300.0	3,477.5	1,105.0	780.0
John Dory	1,040.0	2,405.0	754.0	652.0
White Pollock	1,360.0	1,400.0	800.0	520.0
Hake	1,050.0	765.0	1,785.0	420.0
Slip Sole	462.0	165.0	0.0	420.0
Witch	1,260.0	2,520.0	4,220.0	416.0
Megrim	2,840.0	2,550.0	1,890.0	400.0
Dabs	368.0	512.0	870.0	352.5
Gurnard	480.0	1,170.0	522.0	330.0
Sand Sole	0.0	0.0	0.0	200.0
Conger Eel	300.0	1,150.0	900.0	0.0
Total demersal	**134,569.0**	**228,609.0**	**131,891.0**	**225,563.5**
Mackerel	40.0	80.0	0.0	0.0
Herring	0.0	0.0	0.0	64.0
Total pelagic	**40.0**	**80.0**	**0.0**	**64.0**
Total wet fish	**134,609.0**	**228,689.0**	**131,891.0**	**225,627.5**
Blue mussel	99,000.0	0.0	0.0	80,000.0
Escallop	0.0	0.0	0.0	24,000.0

Table 8.2 Cont'd.

Crab claws	375.0	150.0	200.0	0.0
Lobster	0.0	225.0	255.0	425.0
Nephrops	7,200.0	45,150.0	9,300.0	14,625.0
Spider crab	0.0	0.0	0.0	20.0
Prawn tails	600.0	14,880.0	0.0	0.0
Queen escallop	0.0	0.0	240.0	0.0
Squid	14,200.0	8,200.0	7,100.0	2,200.0
Whelk	*1,171,510.0	*675,633.6	365,264.0	159,980.0
Total shellfish	**1,292,885.0**	**744,238.6**	**382,359.0**	**281,250.0**
Total all fish	**1,427,494.0**	**972,927.6**	**514,250.0**	**506,877.5**

**Combined values for Arklow and Wicklow port. Arklow landings are approximately 30% of this figure (Maria O'Neill, Sea Fisheries Control & Management Division, DoMNR, pers. comm.)*

Table 8.3: Live Weight (tonnes) of all Fish Landings into Arklow, Clogherhead and Howth Ports

Port	1997	1998	1999
Arklow	2,082	1,016	966
Clogherhead	1,040	764	1,304
Howth	5,962	5,376	5,548

Table 8.4: Values (IR£) of allFfish Landings into Arklow, Clogherhead and Howth Ports

Port	1997	1998	1999
Arklow	973,000	514,000	507,000
Clogherhead	1,488,000	1,090,000	1,833,000
Howth	7,946,000	7,559,000	8,429,000

Table 8.5: **Times of Year, Catch Methods and Locations of Commercial Fisheries on the Arklow Bank**
Information provided by Dominic Rihan, Bord Iascaigh Mhara and conversations with Arklow fishermen.

Common name	Time of year caught	Catch Methods	Location
Cod	Sept. to Dec. and from May to June	whitefish/Nephrops trawls	south, west and east of bank
Thornback Ray	All year round, mainly April to Dec.	whitefish/Nephrops trawls	east and west of bank
Cuckoo Ray	All year round	whitefish/Nephrops trawls	south and east of bank
Plaice	May-October peak	whitefish/Nephrops trawls	east of bank
Dogfish	All year round but Sept-Dec peak period	whitefish/Nephrops trawls	east of bank
Haddock	All year round	whitefish/Nephrops trawls	Not caught around Arklow
Codling	All year round but Feb-April peak period	Whitefish/Nephrops trawls	east of bank
Whiting	All year round	Whitefish/Nephrops trawls	Not caught around Arklow
Turbot	Occasional	Whitefish/Nephrops trawls	east of and on bank
Brill	Occasional	Whitefish/Nephrops trawls	east of and on bank
Monkfish	Occasional	whitefish/Nephrops trawls	west, east and south of bank
Whelk	All year round	Pots	west & north west of bank
Scallop	Mainly summer months	Dredges	east of bank
Nephrops	All year round	Nephrops Trawls	Landed in to Arklow but fished off the Smalls and Howth
Squid	Sept-Dec	Whitefish Trawls	east of bank
Blue mussel		Dredges	north and west of bank
Brown crab	Occasional	Pot fisheries	west bank
Razorfish	Limited	Dredge	east of bank

Raja clavata (Thornback Ray)

- The thornback is common on muddy, sandy and gravely bottoms and sometimes areas of mixed sand and rock around Ireland and Britain. It is usually found between 10-60m depth, but has been found as deep as 300m.
- The female thornback lays her eggs between March and August in inshore waters, enclosed in an oblong dark capsule (mermaids purse). They feed on the bottom, mainly on crustaceans, but also on fish, worms, molluscs and echinoderms.
- The thornback is caught in bottom trawls and is sold as 'skate' along with the true skate, *Raja batis*. It is caught all year round to the east of the Arklow Bank in white fish/nephrops trawls.

Raja naevus (Cookoo Ray)

- The cookoo ray is distributed all round Ireland and it lives on sediment from 20m down to 150m depth.
- Females lay their egg capsules throughout the year producing up to 90 capsules within a 12 month period. The capsules are small, transparent and brown and have two pairs of horns on them. The incubation period in the wild is not known, but in aquaria the young hatch at about 8 month old and 12 cm in length. Cookoo rays feed mainly on fish, worms and crustaceans.
- This ray is of some commercial importance. It is caught all year round to the east of the Arklow Bank in white fish/nephrops trawls.

Pleuronectes platessa (Plaice)

- Plaice are common around Ireland and Britain and live on sandy and sometimes gravely, muddy seabeds and are usually found at depths of between 10 and 50m.
- Plaice spawn between January and March. The eggs are laid in fairly shallow water (20-40m) in spawning grounds. The eggs hatch after 2-3 weeks depending on the temperature and after 4-6 weeks change to flatfish shape and settle on the bottom.

  The young fish spend their first year in very shallow inshore waters and move to deeper water in their second year. Plaice are slow growing and can live up to 30 years.
- Plaice are an important commercial fish and are caught in trawls, seine nets and by anglers, but very large fish are rarely caught now. Plaice are caught all year round in whitefish/nephrops trawls to the east of the Arklow bank with the peak period between May and October.

Gadus morhua (Cod)

- Cod is widely distributed in Irish and British waters. Cod is common along the Irish coast especially the east coast north of Arklow (sea-fishing.com website). They live in a variety of habitats down to about 60m depth.
- The females spawn between February and April at a depth of 200m in well defined spawning grounds and lay from 3 to 6 million eggs. The eggs and the larvae drift near the surface of the water. Any uneaten survivors drift to shallower water and settle on the bottom. Juvenile fish feed mainly on copepods, but the older fish eat a variety of seabed fauna including crabs, lobsters, prawns, brittle stars, worms, shellfish and variety of fish.
- Cod has been a very important commercial fishery in the past but catches have declined in recent years due to over fishing. Cod are caught all year round, to the east of the Arklow Bank, in the whitefish/nephrops trawls.

Scophthalmus maximus (Turbot)

- Turbot are distributed all round Ireland and Britain but are more common in the south. They tend to inhabit sand/gravel/shell areas may also be found in muddy or mixed sand/rock areas. The adults are found at depths of 20 – 80m, but smaller fish can be found up to the shoreline. The turbot spawns in spring and summer at depths of 10-40 m. Each female lays about 10-15 million eggs which hatch and drift near the surface for up to 6 months. They then settle to the seabed where they feed on other fish such as sand-eels, sprat, herring, whiting and cod. They also feed on crustaceans, molluscs and gobies.
- It is an important commercial fish, particularly in the North Sea. It is caught in trawls, seine nets and on lines. It is caught occasionally in the whitefish/nephrops trawls to the east of the Arklow bank.

Scophthalmus rhombus (Brill)

- Brill are found in all Irish and British waters, but are more common in the south. They are usually found on sandy substrates, but sometimes on gravel and mud at depths of 10-70 cm. The young fish live in shallow water.
- Brill spawn in spring and summer, mainly in shallow water between 10-20m. The larvae float near the surface until the fish are 20-35mm long. After this they settle on the bottom and feed on sand eels, whiting, gobies and crabs etc.
- Brill are fished commercially but are not as important as the turbot. It is caught occasionally in the whitefish/nephrops trawls to the east of the Arklow bank.

Lophius piscatorius (Angler Fish/Monkfish).

- The anglerfish is common around the coast of Ireland and Britain. It usually inhabits shelly, sandy, gravely substrata at about 18m depth, although sometimes occurs on muddy substrates.
- Their eggs are laid in a single layer in large ribbon-like gelatinous sheets which float in the water column. Spawning occurs offshore over deep waters in spring and early summer. The juvenile fish swim freely in the water column until about 8cm, before settling down to the seabed. The angler fish feed on small flatfish, gobies, haddock and many fish and bottom dwelling fauna.
- There is no commercial fishery for angler fish but when they are caught their tails are often marketed as 'monkfish'. They are caught occasionally around the Arklow Bank in white fish/nephrops trawls

Scyliorhinus canicula (Common Dogfish).

- The common dogfish is widely distributed around Ireland and Britain and mainly inhabit sandy, gravely or muddy seabeds and sometimes mixed sand/rock, from 1m down to 50m.
- Dogfish usually mate in the Autumn and the eggs are laid by the female from November to July, in leathery, pale brown cases attached to seaweed by long tendrils. The young hatch from 5-11 months later. Dogfish feed on most types of small fauna which live on the seabed.
- Dogfish are caught all year round, but mainly in September to December peak period, to the east of the Arklow bank in whitefish/nephrops trawls

Melanogrammus aeglefinus (Haddock)

- Haddock are found in Irish and British waters usually at depths of 40 – 300 m. They spend most of their time feeding close to the seabed.
- Spawning occurs between February to June, in deep water with up to a million eggs laid, which drift near the surface until the autumn of their first year. The young fish that survive feed on copepods near the surface during their first year but later move to the seabed to feed on worms brittle stars and molluscs.
- Haddock is a very important commercial fish but numbers are in decline due to overfishing. It is caught all year round in the whitefish/nephrops trawls to the east of the Arklow bank.

Marlangius merlangus (Whiting)

- Whiting are very common in Irish and British waters and are usually found between 25 and 100m.
- Spawning occurs between January and July in open waters, depending on the water temperature. After hatching the young drift near the surface for up to a year. After this the juvenile whiting move down towards the seabed, where they feed on small crustaceans. Adult whiting will also feed on small fish including sprat and sand eels. Whiting usually live on average for 5 to 7 years.
- Whiting is an important commercial fish, which is caught all year round in the whitefish/nephrops trawls to the east of the Arklow bank.

8.2.3. Shellfish

The common whelk, *Buccinum undatum*, is a marine gastropod which occurs on hard and soft substrata from low water spring tides to 1200 m. They are distributed from Iceland and northern Norway to the Bay of Biscay and are common and often abundant around the British Isles, with the exception of the Isles of Scilly (Hayward and Ryland, 1995). The larval stages of the whelk take place inside the egg capsule, so dispersal does not occur. Tagging experiments have revealed adults to be fairly sedentary (Hancock, 1963; Himmelman and Hamel, 1993) so that local stocklets develop distinctive characteristics (Valentinsson *et al.*, 1999). Due to the low dispersion rate and exchange between stocklets, the south west Irish Sea whelk fishery is defined as four sectors rather than one homogenous unit by the Marine Institute. Details of the times of year whelks are caught and fishing methods are given in Table 8.5 and their ecology is discussed below (From Fish and Fish (1996) and Hayward and Ryland (1995).

Buccinum undatum (Whelk)

- *B. undatum* is a large stout mollusc (up to 110 mm in height) with a spire and spiral and longitudinal ridges and is grey-brownish white in colour.
- It is widely distributed in north-west Europe on soft sediments from low water mark down to the deep sublittoral
- The breeding period extends from October to May, depending on the locality. The sexes are separate with internal fertilisation and the eggs are laid in capsules attached to rocks and stones. The young hatch from the capsules after several months and may live up to 10 years, with sexual maturity at a shell height of about 60mm. They feed on polychaetes and bivalves.
- *Buccinum* is fished commercially using baited pots, all year round, to the west and north-east of the Arklow Bank.

Mytilus edulis (Common Mussel)

- *Mytilus edulis* is a triangular shaped bivalve which has a dark blue outer shell surface and can grow up to 10cm in length.
- It is widespread and common from the middle shore to the shallow sublittoral around north west Europe and is also occurs in soft sediments in estuaries.
- It attaches itself to stones, rocks and piers by byssus threads and in soft sediments in estuaries. Mussels are suspension feeders and are preyed on by the shore crab, common starfish, dog-whelk and the oyster catcher. They have separate sexes which both spawn in spring and summer.
- Mussels are fished commercially as well as farmed and cultivated.
- Mussels and mussel seed have traditionally been fished from Arklow over the years.

Nephrops norvegicus (Norway lobster, Dublin Bay prawn)

- *Nephrops norvegicus* is in the same family as the prawn and lobster. They reach up to 250mm in length and are orange in colour.
- They are widely distributed in Europe and live in soft sediments at 20-800m depth.
- The sexes are separate and after mating in the summer the eggs are carried by the female for about 9 months time before hatching into larvae.
- *Nephrops* are fished commercially with trawls all year round on the east side of the Arklow Bank.

Pecten maximus (great scallop)

- *P. maximus* is a rounded bivalve with radiating ribs on the shell and large equal 'ears' on either side of the beaks.
- It is widely distributed in north-west Europe, sublittorally on sand and gravel to depths of about 110m.
- Scallops are suspension feeders and can swim by opening and closing their shell valves. They are hermaphrodite and produce gametes of both sexes which are fertilised externally. The larvae are planktonic for the first month and then settle temporarily on algae, bryozoans and hydroids via a byssus. The byssus disappears when they reach 4-13mm in length. They breed first at 2 years old and live for up to 20 years.
- Scallops are important as a commercial fishery. They are caught in dredges, mainly during the summer months to the east of the Arklow Bank.

Ensis sp (Razorfish, Razor-shell)

- Razor-shells have a narrow fragile shell, they have a large foot and are deep burrowers.
- They are widely distributed in north-west Europe in sand or muddy sand from extreme low water to the shallow sublittoral.
- Breeding probably occurs in the spring producing free-swimming veliger larvae.
- There is a limited dredge fishery for razor-shells to the east of the Arklow Bank

Crangon crangon (Common Shrimp)

- The common shrimp is brownish in colour and usually 30-50mm in length
- It is very common in Europe and can be found buried in sand from the middle shore down to depths of 150m and may also be found in estuaries.
- The sexes are separate and females may spawn three times a year producing up to 30,000 eggs in total. The average life-span for a common shrimp is three years. *Crangon* feed on a variety of invertebrates including worms, crustaceans and molluscs, but is preyed on by a wide variety of fishes.
- *Crangon* is fished commercially in some areas.

Cancer pagurus (Edible Crab)

- The edible crab has a carapace which is much broader than long and is reddish brown in colour.
- It is widely distributed in north-west Europe in pools on the lower shore to depths of about 90m.
- Breeding occurs in winter and the eggs are carried for seven to eight months before hatching in the summer. The eggs are laid in small depressions in the sand. The larvae are planktonic for 23-30 days, reach maturity at three to five years old and can live for up to 20 years.
- Brown crab are occasionally fished commercially using baited pots inside the Arklow Bank.

During the 1990's with trade opening up in the Far East, the existing small fishery, which supplied limited stocks to the United Kingdom, expanded rapidly in response to the large demand. Landings for the south west Irish Sea increased from 56 tonnes in 1990 to 5943 tonnes in 1996. In the following years landings declined and stabilised at between 3,600 and 4,600 tonnes per annum. The principle destination of the Irish caught whelks is to Japan and South Korea with only a small market in Europe, supplying Italy and Britain. This dependence on a single large customer can expose producers to an uneven market. The whelk fishery has encountered many difficulties, resulting in the fluctuation of prices and occasional closures of the fishery. For example a reduction in demand in 1999 was attributed to the worsening economic situation in the Far East.

Landings of whelks are made on all coasts of Ireland but are largely concentrated on the south-east, from north of Howth, Co. Dublin to Carne, Co. Wexford (52°10' to 53°30'). Within this area, whelks are distributed on mud, sand and gravel banks in strong tidal currents, most of which are within five nautical miles from the shore. The majority of whelks are fished close to the ports where they are landed, but some are caught further a field. The fishery is divided up into four sectors (Figure 8.1).

1. The Dublin sector, which fish from north of Howth to halfway between Dun Laoghaire and Wicklow (53°10'). This sector lands approximately 16% of whelks around the Irish coast.
2. The Arklow sector, which encompasses Wicklow and Arklow ports, fishes from 53°10' to 52°25'. The Codling Bank is a substantial part of this sector as it supports high, local concentrations of whelks. This sector lands approximately 40% of the total whelk catch.
3. The Courtown sector extends from 52°44' to 52°25'and shares its southern boundary with the Arklow sector. This sector lands approximately 16% of whelks.
4. The Wexford sector includes Carne, Rosslare and Wexford ports. This sector extends from 52°34' to 52°8', overlapping with the Arklow and Courtown sectors. This sector lands approximately 27% of whelks.

The southern Irish Sea whelk fishery is a valuable one, earning IR£2,026,217.56 in 1999 (Table 8.6). During the peak of the fishery, in 1996, it supported 80 boats, but only half that number are in operation now. However, the number of boats involved in the whelk fishery in Arklow has remained more or less the same since 1996 (Fahy *et al.*, 2000). Approximately 30 boats are used and 45 fishermen identified as landing into the Arklow sector. Daily landings of six of the best documented fishermen were traced and analysed and all of the daily landing of the vessels in question have risen over the period 1995-1999 (Fahy *et al.*, 2000). Annual landing of between 735.90 tonnes in 1996 to 371.00 tonnes in 1999 into Arklow port have been recorded, valued at IR£351,453.00 and IR£159,980.00 respectively (Table 8.7).

Figure 8.1: Map of the Southern Irish Sea with Whelk Fishing Sectors

Fahy *et al.* (2000) documents that the local fishermen have two schools of thought on the performance of the whelk fishery in Arklow. One source observed that the inshore grounds have become depleted and that boats have had to move seawards in search of new fishing areas. Arklow Bay is reported as being fished out while the south ground, outside the Blackwater Bank, has been fished down. This however contrasts with that provided by other fishermen who reported that certain areas can be fished annually, repeatedly providing worthwhile yields. A possible explanation for this may be the concentration of whelks in certain locations due to strong currents and close isobaths or the fishermen moving onto virgin ground. The Codling and Rusk Banks are estimated to support the highest densities of whelks in the southern Irish Sea and are fished by the Arklow sector (Fahy *et al.*, 2000).

As mentioned previously, the Arklow sector represents 40% of the total whelk fishery in Ireland. The proportions landed into Arklow port were between 8.13% (in 1999) and 11.20% (in 1996) while those landed into Wicklow port were between 26.12% (in 1999) and 52.36% (in 1996) (Table 8.6). However, the majority of boats working in the Arklow Bank area would be under the minimum size for mandatory recording of catches and therefore these figures are probably an underestimate.

Table 8.6: The Percentage of Whelks landed into Arklow and Wicklow 1996-1999

Port	1996	1997	1998	1999
Arklow	11.2%	13.9%	24.3%	8.13%
Wicklow	26.1%	32.4%	45.1%	52.4%

From conversations with local Arklow fishermen, during April and May 2001, the only fishery exploited in the Arklow area, by Arklow boats, is for whelks. The main areas used for fishing whelks are close to the shore north and south along the west side of the bank. The younger generation of fishermen in Arklow are working together to develop a system to sustain the whelk population in the area.

Over the years fishermen from Wexford have travelled to Arklow to collect mussel seed for re-seeding in Wexford Harbour. Huge amounts were taken in the past, however this has been vastly reduced in recent years.

The area between the Arklow Bank and the shore is of particular importance to the bottom mussel industry in Ireland as it is a prime area for the settlement of mussel larvae and seed beds. (Brian O'Loan, BIM in a letter to Fehily Timoney and Co. of the 2704/01). This industry is very dependant on the successful collection of natural seed mussels. The Arklow Bank area has provided suitable conditions and habitats for the formation of viable seed beds in the past and is likely to provide new seed beds in the future. Some of the mussel seed sites used in recent years are shown in Figure 8.2. These sites are concentrated to the north, north-east and east of the Bank.

Figure 8.2: Mussel Seed Beds in the Vicinity of Arklow Bank

Bord Iascaigh Mhara (BIM) carried out annual seed mussel surveys between 1996-2000 using RoxAnn and a small dredge to sample mussels in the Arklow Bank area (Lucy Watson, letter to EcoServe, 20/11/00). Only one small seed mussel patch, approximately 1 mile off the north of the Arklow Bank was found in 1996. Mussel beds were also located outside the Arklow Bank area to the north-east of Wicklow Head and south west of the India Bank and to the south along the Glassgorman Banks. As mussel settlement varies from year to year it is impossible to rule out any particular area as a likely settlement ground for mussel seed.

The mussel seed that is fished from the Arklow Bank area is re-seeded in Wexford, Waterford and Lough Swilly. Large numbers were taken in the past, however this has been reduced in recent years. Mussel seed figures provided by the Department of the Marine and Natural Resources are likely to be an underestimate, as catches by small boats are not logged. In the year 2000, James Heaney of Arklow logged 4,080 tonnes of mussel seed landed into Arklow (James Heaney, pers. comm). Similarly, this figure is an underestimate as catches by Wexford boats are not included.

Values in bold indicate the landed weight (in tonnes) of whelks and values underneath indicate the value (in IR£) of the whelk fishery (source, Department of Marine and Natural Resources, October 2000).

The whelk fishery was at its peak in 1996 when it landed 2,453 tonnes, with a value of IR£1,171,510. Landings steadily declined in the following years to just 371 tonnes in 1999 with a value of IR£159,980. However, even with this drastic decline, the shellfish fishery, in particular the whelk fishery remains the most profitable fishery landed into Arklow. Over the period 1996 to 1999 ray/skate were by far the most important demersal fish species in terms of volume and value landed, into Arklow Port, with 50.3 tonnes landed in 1996 and 99.8 tonnes in 1997 (with a value of IR£69,440). The fishery experienced a sharp decrease in 1998 with only 34.5 tonnes but dramatically increased again in 1999 to 98.4 tonnes and a value of IR£109,000. Plaice, cod and spotted dog are also a valuable fishery, with landings being kept relatively steady over the years. During 1996 to 1998 whiting and haddock were being landed regularly, however in 1999 numbers dropped off considerably. The mussel seed beds are an important fishery around the bank. As mussel settlement varies annually it is difficult to predict where it will occur. However, in the past the beds have occurred to the north and west of the bank.

Table 8.7: **Landings for Whelks from different Sectors and Ports on the South-East Coast of Ireland from 1996-1999**

PORT	1996	1997	1998	1999
DUBLIN SECTOR				
Skerries	**35.00** 22,750.00			
Howth	**555.00** 248,160.00	**256.00** 97,280.00	**117.94** 45,391.75	**319.90** 145,054.00
Dun Laoghaire	**520.00** 281,300.00	**339.00** 131,220.00	**295.00** 111,200.00	**576.00** 257,400.00
ARKLOW SECTOR				
Greystones	**0.60** 228.00	**28.00** 11,600.00	**15.00** 5,860.00	**103.67** 46,626.40
Wicklow	**1717.10** 820,057.00	**1248.83** 472,943.54	**1,655.00** 757,700.00	**2,388.00** 1,072,320.00
Arklow	**735.90** 351,453.00	**535.22** 202,690.08	**891.79** 365,264.00	**371.00** 159,980.00
COURTOWN SECTOR				
Cahore Point	**114.14** 55,522.44			
Courtown	**864.00** 403,920.00	**474.56** 183,580.00	**395.50** 147,670.00	**567.74** 251,097.20
WEXFORD SECTOR				
Wexford	**1,455.79** 876,227.00	**890.06** 556,265.00	**158.58** 87,433.00	**167.08** 66,830.80
Rosslare	**15.71** 8,826.00	**9.00** 5,880.00	**86.93** 34,770.20	64.15 25,660.00
Carne			**36.19** 14,477.20	
OTHERS				
Kilmore quay		**15.00** 10,150.00	**14.77** 5,908.000	**2.26** 904.92
Duncannon / St Helens				**0.56** 224.24
Castletownbere				**0.30** 120.00
Fethard and Slade	**16.75** 10,050.00	**11.00** 6,950.00		
Dunmore East	**525.22** 315,086.00	**45.00** 18,000.00		
Greencastle	**15.00** 6,921.00			
Bantry	**0.10** 60.00			
Dingle	**1.95** 802.00			
Moville	**2.53** 1,630.00			
TOTAL	**6,574.79** 3,402,992.44	**3,851.67** 1,696,558.62	**3,666.70** 1,575,674.15	**4,560.66** 2,026,217.56

Trends of the dominant catches landed into Arklow Port, and their value, from 1996 until 1999 can be seen in Figures 8.3 and 8.4. The main fishery in the Arklow Bank area is for whelks and to a lesser extent blue mussels, however the latter are not as lucrative. There is also a mixed whitefish trawl fishery, the dominant species being ray/skate, plaice and cod in the deeper water to the east of the Bank. This fishery involves up to 10 trawlers from Arklow, Howth and Clogherhead (Dominic Rihan, BIM, Table 8.5).

In conclusion, the shellfish fishery, in particular whelks, are the most important fishery landed into Arklow Port since 1996 and are fished by local fishermen. The most important demersal fishery are the ray/skates and to a lesser extent plaice. However, it is necessary to bear a few points in mind. These figures relate to the total catch landed into Arklow and are not specifically related to the Arklow Bank area. The figures may be an underestimate of the landings as small vessels are not required to complete logsheets and figures for boats fishing in the Arklow Bank area and that landing into other ports are not included.

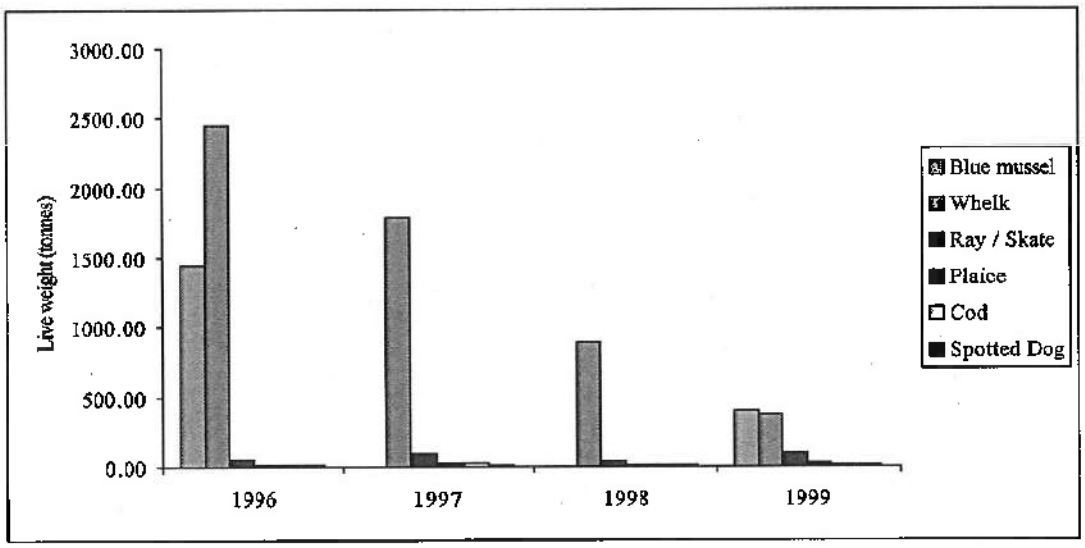


Figure 8.3: Live Weights of the Six Largest Fisheries from 1996 to 1999 Landed into Arklow Port

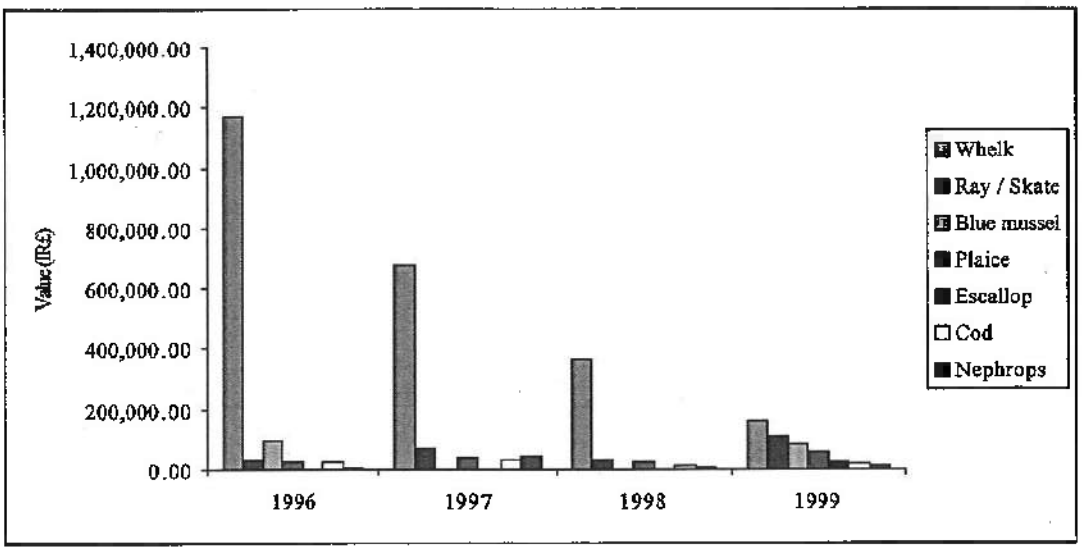


Figure 8.4: Values of the Seven Largest Fisheries from 1996 to 1999 Landed into Arklow Port

8.3. Ground Fish and Juvenile Plaice Survey

Data was collected from the Fisheries Research Centre, Abbotstown, where yearly surveys are conducted around the Irish coast for research purposes. Two surveys, the Irish Sea/Celtic Sea Ground Fish Survey and the Juvenile Plaice Survey sample annually in the Arklow Bank area (Figure 8.5).

The Irish Sea/Celtic Sea Ground Fish Survey has been in operation since 1998. Sites 22, 23 and 24 are located in the Arklow Bank area. A GOV trawl was deployed at each site for 30 minutes before being hauled and the contents identified (Table 8.8).

The Juvenile Plaice Survey (1996-2000) has a number of sites in the Arklow Bank area, sites 5a, 5b, 5c, 5d, 5e, 6a, 6b, 6c and 6d. This survey was designed to examine juvenile plaice recruitment. A 3m beam trawl was deployed for 15 minutes before it was hauled and the contents of the trawl identified (Table 8.9).

The Juvenile Plaice Survey sites were located inshore of the Bank whereas the Groundfish Surveys were situated outside the Bank.

A diverse range of fish species were recorded from both of these surveys. The numbers and species of flatfish and rays were well represented however, the numbers of cod recorded were generally low. Large numbers of plaice and dab were recorded from the Juvenile Plaice Survey, although many of these would be juveniles. In addition the lesser spotted dogfish and whiting were dominant. The Groundfish Survey had a large range of flatfish and ray, but in much lower numbers than in the Juvenile Plaice Survey. Whiting, poor cod and Norway pout were the dominant species in these surveys.

8.4. Fish eggs and Larval Survey

Information on fish eggs and larval surveys was requested from the Marine Fisheries Services Division, Marine Institute, but none was available.

Figure 8.5: Location of Irish Sea/Celtic Groundfish Survey Sites

Table 8.8: **Species and Numbers of Fish caught from the Irish Sea/Celtic Sea Groundfish Survey 1998-1999**

Year	1998			1999		
Station	**22**	**23**	**24**	**22**	**23**	**24**
Brill	3			1		
Turbot				1		
Plaice	7			9		
Dab	1	1	1	9	2	
Lemon Sole			2		2	3
Black Sole	1	1				
Spotted Ray	8	1	4	3	2	3
Cuckoo ray			2			
Blonde Ray	8		6	2		
Small eyed ray				1		
Ray			1			
Monkfish		1				
Lesser spotted Dogfish		1		28	12	38
Greater spotted Dogfish			1		1	4
Smooth hound					3	4
Tope					1	
Tub Gurnard	1					1
Gurnard: Red					1	1
Gurnard: grey	1	1		9		2
Pogge		1				1
Dragonet						3
Goby		1		3		
Weaver	1			7		
Sand eel				1		
Blenny						
Shore Clingfish					1	
Conger eel		1				
Eel				1		
John Dory	1		3			22
Cod		8			2	1
Haddock						2
Whiting	177	107	1	384	150	31
Poor cod	1	1		22	80	143
Norway pout	1	1	1	38	124	20
Pollack						2
Mackerel	1	2	1			
Scad	4	1	1	3	11	2
Herring				1	7	1
Sprat	3	3		18	21	
Anchovies		2			4	
Hake	1					5
No. of species	**17**	**17**	**12**	**19**	**17**	**20**

Table 8.9: Species and Number of Fish caught in the Juvenile Plaice Survey 1996, 1998, 1999 and 2000

Year	1996									1998									1999									2000								
Station	5a	5b	5c	5d	5e	6a	6b	6c	6d	5a	5b	5c	5d	5e	6a	6b	6c	6d	5a	5b	5c	5d	5e	6a	6b	6c	6d	5a	5b	5c	5d	5e	6a	6b	6c	6d
Plaice	1	-	40	4	38	1	-	6	8	-	3	44	-	76	39	-	1	40	-	7	3	2	8	37	2	1	23	-	6	19	2	127	9	1	13	45
Flounder	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	1	-	-	8	-	1	-	-	-	5	-	-	-	-	-	1	-	-	-
Dab	1	1	-	-	-	1	-	-	1	1	1	1	1	-	41	-	-	1	1	41	49	3	8	14	1	-	169	-	44	34	15	84	48	4	10	152
Lemon Sole	1	-	-	-	-	-	-	-	-	6	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Solenette	-	-	-	-	-	1	-	-	1	-	-	-	-	-	1	-	-	1	-	-	-	-	-	13	-	-	9	-	-	-	-	-	-	-	-	-
Black Sole	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	6	2	-	-	-	-	-	-	-	-	-	-	-
Thickback Sole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	8
Thornback Ray	-	-	-	-	-	4	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4	-	-	1	-	3	-	-	-	-	2	3
Spotted Ray	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	2	-	4	-	-	-	-	1	-	-	-	-	-	-	-
Ray	-	1	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lesser spotted Dogfish	1	1	-	-	1	-	-	-	-	1	1	1	1	1	1	1	-	1	5	5	9	3	3	6	2	53	4	-	10	-	1	-	1	-	-	-
Smooth hound	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	72	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Spurdog	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tope	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gurnard: Red	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	20	-	-	-	1	-	-	-	-	-	-
Gurnard: grey	-	-	-	1	-	-	-	1	1	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-	5	2	-	1	1	5	11	-	4	8	10
Pogge	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	1	5	1	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-
Dragonet	-	-	-	-	-	-	-	-	-	1	1	1	1	-	1	-	-	-	1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Goby	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	8	6	-	-	-	1	3	-	-	1	3
Weaver	1	-	-	1	-	-	2	1	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	3	-	-	-	-	-	2	-	-	6	1	-
Sand eel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	24	-	-	-	-	-	-	-	-	-	-
John Dory	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Cod	-	-	-	2	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Whiting	-	-	-	-	3	1	-	5	1	13	7	36	1	1	41	-	1	34	3	3	3	3	1	11	10	43	24	-	1	-	-	-	10	-	5	1
Poor cod	1	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	5	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mackerel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Sprat	-	-	-	-	-	1	-	-	-	-	1	-	-	-	1	-	1	2	1	2	3	32	10	-	5	4	11	-	-	-	5	-	3	-	2	2
No. of species	6	3	1	4	5	8	1	5	7	7	9	7	6	3	8	4	4	10	8	11	8	8	7	8	9	8	13	0	8	5	7	4	7	3	7	7

The turbines and cables will be situated to avoid areas of high species richness and abundance. The potential short term and long term impacts of the development during the construction, operation and decommissioning phases are described below.

8.5.1. Short term

- Loss of habitat and feeding ground.

  Due to high turbidity, the existing physical environment of the Arklow Bank means that the ecological diversity is limited to species that can withstand silt laden conditions. This means that the placement of the foundations and towers on the bank will have minimal impact on habitats and feeding grounds on the bank.

  Habitats and feeding grounds will be lost and disturbed during the construction of the trench and laying of the cables in the short term. As a result, species and spawning grounds may be lost. These impacts are however likely to minimal as they will be restricted to the width of the cable trenches and when these trenches have been back filled, habitats and feeding grounds may return to their original state.

  Decommissioning of the foundation will, in particular, result in a loss of habitat.

- Loss of species.

  While the impacts of construction of the towers on the bank is limited, shell/fish eggs and larvae may be directly lost and disturbed during the laying of the electrical cables. Fish species are mobile and through the removal readily move from one area to another if disturbed or if environmental conditions are not suitable. The most likely impact would occur if their habitat, food source or spawning grounds are disturbed and if no alternative is available to them. However the extent of the fish habitat available in the Arklow Bank area, is so great that the area that will be lost or altered by the laying of the cables will be insignificant.

- Increased turbidity.

  As described in Section 5 of the EIS, currents across and within the vicinity of the bank result in adverse conditions on the bank. This, coupled with the two metres of mobile sand, results in naturally turbid conditions.

  There will be an increase in the turbidity of the water during construction of the wind park. This could result in increased siltation and the smothering or negatively effected of shell/fish eggs and larvae. Other fauna that fish feed on or substrates or seaweeds that fish lay their eggs on may be lost or impacted on. The turbidity of the water may reduce light levels which would effect seaweed growth. However, this is likely to be short term due to the high tidal current velocities at the site.

- Noise pollution.

  Noise and vibrations during the construction phase may disturb fish around the site (Soker & Schreiber, 2000). Demersal species are more likely to be effected than pelagic ones. The impact is likely to be minimal and short term and is mainly restricted to the construction phase. Impacts due to noise from the turbines in the operational phase is likely to be negligible.

- Pollutants and waste.

  Contamination of the area due to accidental spillage of pollutants, e.g. oil and other chemicals, or waste, e.g. litter, may occur during the construction phase. However, if suitable precautions will be put in place and the impact will be minimal.

8.5.2. Long term

- Loss of habitat and feeding grounds.

  There will be a permanent loss of seabed habitat from the 'footprint' of the turbine foundations. The footprint of the development will occupy less than 1ha of the development area of 6,570ha. As a result non-mobile species, occurring in the 'footprint' will be lost and mobile species utilising these habitats for feeding and spawning will loose this resource. However, it has been previously noted that this habitat is not diverse and any impact is likely to be minimal as it will be restricted to the 'footprint' of the turbine foundations.

- Loss of species.

  Species will be directly lost through the removal of sediment when laying the electrical cables and from the 'footprint' of the turbine foundations. Indirectly, species may be lost as a result of loss of feeding and spawning grounds.

- Water movement.

  The turbine foundations may alter the pattern of water movement over the Bank, resulting in a change in sediment deposition and erosion pattern. This may create minor changes in the substratum and habitat at these locations, resulting in an alteration in species composition.

- Noise pollution.

  The effects of noise and vibrations from turbines during the operational phase are not well documented, however they may have an impact on fish and other species.

- Pollutants and waste.

  Contamination of the area due to accidental spillage of pollutants or waste from vessels maintaining the turbines, may occur during the operational phase of the wind park. However, if suitable precautions are taken this should be minimal.

- Electromagnetic radiation.

  The effects of electromagnetic radiation from submerged electric cables are not well documented. However they may have some impact on shell/fish and other species.

- Habitat change.

  The addition of substantial areas of hard substrata (the turbine foundations), will provide a new habitat within the area as shallow rock is very restricted. This will result in a change in the species composition along the Bank.

The short term impacts described will be similar to the impacts from the decommissioning of the turbines. A larger impact will be experienced during the removal of the foundations and the cables as the habitats that will develop on these structures will be removed.

8.6. Mitigation Measures Proposed by the Developer

- Loss of habitat and species

The turbines and cables will be situated to avoid areas of high species richness and abundance, and spawning grounds. Bord Iascaigh Mhara and the local fishermen were consulted before choosing the cable routes.

Direct disturbance to habitats and communities will be avoided where possible. Following construction of the cable trenches, efforts will be made to restore habitats to their current condition, if impacted upon. Cable trenches will be filled to their pre-construction level, minimising changes in water flow regime, and with material of a similar particle size to allow recolonisation of benthic species.

If a monopile design is used, the area of the 'footprint' will be small, minimising the area of impact on the seabed habitats. If a gravity caisson is used the area of impact will be larger, however, in the context of the total area of the Arklow Bank, not significantly so. Using a gravity caisson design would however provide additional hard substratum for colonisation by marine organisms. Careful design of the foundation, taking into account criteria used in the design of artificial reefs, may maximise colonisation by marine life, including species of commercial or nature conservation importance. If bottom fishing is restricted or prevented around the wind park, this will have added benefits to the fish in the area.

The establishment of an exclusion zone for the cable routes will provide a refuge for juvenile and spawning fish and prevent seabed habitats being impacted by fishing gear.

- Increased turbidity.

Whenever possible, construction of the cable trenches will be conducted at times of slack tide in order to reduce the amount of sediment being removed from the location by the water currents.

- Noise pollution.

Noise pollution will be kept to a minimum. The area of seabed impacted upon during dredging will be kept to a minimum. Movements of vessels will be minimised to reduce noise disturbance.

- Pollutants and waste.

  Waste generated during construction must be returned to the shore for authorised disposal to minimise litter of the seabed. Potential contaminants will be stored in bunded containers to prevent leakage. Utmost care and vigilance will be followed to prevent accidental contamination of the site and surrounding environment during the construction of the wind park. Construction and on site operating procedures will be followed to the highest standard to minimise unnecessary disturbance and prevent accidental spillage of contaminants.

8.7. References

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9. MARINE BENTHOS

9.1. Introduction

This section of the EIA describes the benthic flora and fauna, in the existing environment both on the Arklow Bank and surrounding areas and at the landfall locations. The existing environment, as well as the potential impacts of the proposed development during construction, operation and decommissioning and mitigation measures proposed by the developer will be addressed for each of these items individually.

9.2. Benthic Flora and Fauna in the Existing Environment

A literature review found that there was no available information on the existing marine benthic flora and fauna within the study area. FTC in association with EcoServe conducted benthic marine sampling over three seasons to characterise and identify benthic flora and fauna within the study area. An assessment of the baseline benthic flora and fauna, fish populations and phytoplankton communities was undertaken during this study. Summer and Autumn sampling was carried out during 2000 and Spring sampling was carried out during 2001. Due to extremely poor weather conditions during November to March it was not possible to conduct fieldwork for the Winter season.

The complete marine benthic study report is given in Appendix 15, Volume 4.

9.2.1. Summer Sampling

Summer sampling was carried out between the 7th and 15th of June 2000. A total of twenty-nine sites were sampled. The location of these sampling sites is shown on Figure 9.1.

Benthic fauna and flora were sampled using a biological dredge (approximately 50cm x 25cm) with a 1cm mesh bag. The dredge was typically deployed for between 1 and 9 minutes. Upon retrieval of the dredge the samples were passed through a 0.5mm mesh sieve and the material collected was sorted on board. On occasions when species could not be identified in-situ, they were placed in a laboratory container containing 70% industrial methylated spirits (IMS) for later identification in the laboratory.

Where possible fauna were identified to species level and their relevant abundance was noted. Species nomenclature follows Howsen and Picton (1997) and abundances were applied following the six-point abundance scale in Hiscock (1996). Specimens were identified to the lowest taxonomic level possible using:-

- For mysid-crustaceans, Makings (1997);
- For crabs, Crothers & Crothers (1998);
- For shrimps and prawns, Smaldon (1993);
- For marine molluscs, Graham (1998); and Picton & Morrow (1994);
- For echinoderms, Picton (1993); and
- For marine fish, Wheeler (1997).

Fish populations were sampled using an otter trawler (approximately 4m wide x 4m long with 1cm mesh cod end). Typically the trawl was deployed for a minimum of 20 minutes. All fish caught were identified to species level in the field and each of their numbers, size and sex (where possible) were recorded.

Zooplankton were sampled using a 500 micron mesh net (64cm diameter and 24m in length). The net was lowered to 20m and slowly hauled vertically to take a cross section of the water column. Samples were preserved in 99% IMS and returned to the laboratory for identification.

Phytoplankton samples were taken using a Fieldmaster perspex water sampler. Two 250mls sub-samples of the seawater sample were taken at each site and preserved on board using Lygols Iodine Solution. The samples were returned to the laboratory for identification.

Figure 9.1: Benthic Flora and Fauna Sampling Locations, Summer 2000

In addition to sampling for phytoplanton, temperature and salinity profiles were also taken at the sampling locations. Discreet measurements were taken at the surface, 5m, 10m, 15m and 20m below the surface using the Fieldmaster water sampler. Temperature and salinity readings for each one of the samples were recorded using a WTW-LF 330/SET meter.

9.2.2. Results of Summer Sampling (June 2000)

A total of twenty-one dredges were taken in the environment of the study area (see Figure 9.1). From these sites a total of 82 species or higher taxa were recorded. The fauna was dominated hydroids, bryozoans, molluscs and crustaceans. The species recorded in the study area are commonly found on the east coast of Ireland. No species of flora were recorded from the dredge samples.

The site locations and details of the subtidal dredge sites are shown in Table 9.1.

Table 9.1: Site Locations and Details of Subtidal Dredge Sites, Summer 2000

Site no.	Site name	Date	Position (Start)	Position (End)	Duration (min.)	Distance (km)
D1	North of North Buoy	07/06/00	340251 186344	340179 185729	5	0.12
D2	North of North Buoy	07/06/00	340301 186159	340164 186267	8	0.45
D3	North of Arklow Bank	07/06/00	339650 181909	339834 182156	7	0.31
D4	Middle of Arklow Bank	09/06/00	338444 170239	338840 170585	4	0.52
D5	Middle of Arklow Bank	09/06/00	338600 170689	338708 170878	7	0.22
D6	Middle of Arklow Bank	09/06/00	338576 170763	338630 170820	1	0.08
D7	Middle of Arklow Bank	09/06/00	338567 170669	338610 170764	6	0.1
D8	Southerly point of Arklow Bank	14/06/00	337009 164464	336998 164464	6	0.01
D9	South of Arklow Bank	14/06/00	336429 159030	336486 158604	5	0.26
D10	South of Arklow Bank	14/06/00	336372 158638	336345 158786	6	0.12
D11	South-east of Arklow Bank	14/06/00	339726 165581	339789 165750	6	0.18
D12	East of Arklow Bank	14/06/00	340788 170548	341133 171059	3	0.62
D13	North West of Arklow Bank	07/06/00	336837 182905	336939 183261	3	0.37
D14	East of Arklow Bank	09/06/00	335116 173356	335172 173747	7	0.39
D15	East of Arklow Harbour	09/06/00	335181 173840	335273 174177	9	0.35
D16	South West of Arklow Bank	06/06/00	335083 165654	335324 166273	6	0.66
D17	East of Arklow Harbour	09/06/00	335989 171116	336242 171717	3	0.65
D18	North East of Arklow Harbour	09/06/00	332850 174351	333210 174750	4	0.54
D19	North East of Arklow Harbour	09/06/00	333228 174936	333399 175238	3	0.35
D20	East of Arklow Harbour	06/06/00	330548 173824	330888 174130	3	0.46
D21	North of Arklow Harbour	09/06/00	327912 173977	328076 174167	5	0.25

Table 9.2 details the 82 species that were found within the study area.

Table 9.2: List of Species or Higher Taxa Recorded from each Site, Summer 2000

The list is arranged in taxonomic order. P = present, R = rare, O = occasional, F = frequent, C = common, A = abundant.

	Dredging stations - D																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Species																					
Porifera																					
Tethya aurantium	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-
Scypha ciliata	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-
Porifera crusts indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
Porifera indet.	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-
Anthozoa																					
Anthozoa indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P
Alcyonium digitatum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	P
Urticina sp.	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-	-	-	-	P	-
Urticina felina	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	P	-	F
Hydrozoa																					
Tubularia indivisa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	F	-	-
Tubularia larynx	-	-	-	-	-	-	-	-	-	-	P	P	P	-	-	-	-	-	P	-	-
Eudendrium sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P
Halecium halecinum	-	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-	-	-	P	P
Nemertesia antennina	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	P	P
Nemertesia ramosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-
Abietinaria abietina	P	P	-	-	-	-	P	-	-	-	P	P	P	-	-	P	P	-	P	-	-
Dynamena pumila	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
Hydrallmania falcata	P	-	-	-	-	-	P	-	P	P	P	P	P	-	-	P	P	-	P	F	P
Sertularia sp.	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sertularia argentea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	F
Clytia hemisphaerica	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-
Obelia sp.	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polychaeta																					
Polychaeta indet.	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	P	-	P
Terebellida indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P
Sabellaria sp.	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-
Lanice conchilega	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	P	P
Sabellidae indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-
Sabella pavonina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	P	-
Pomatoceros sp.	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-	P	-	-	-	-	-
Pomatoceros triqueter	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-
Aphrodita aculeata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-
Glyceridae indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-
Nephtys sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	P
Harmothoe sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P

(cont.)	Dredging stations - D																				
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
Crustacea																					
Balanus crenatus	-	-	-	-	-	-	-	-	-	-	P	-	P	-	-	-	-	-	P	F	P
Amphipoda indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	P
Pagurus bernhardus	-	-	-	-	-	-	-	-	-	-	P	F	F	-	-	P	-	-	P	F	-
Pisidia longicornis	-	-	-	-	-	-	-	-	-	-	-	P	F	-	-	P	-	-	-	-	P
Ebalia tuberosa	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-
Hyas coarctatus	-	-	-	-	-	-	-	-	-	-	P	P	P	-	-	-	-	-	-	P	-
Inachus leptochirus	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-
Inachus phalangium	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	P	-
Macropodia rostrata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	P	-
Macropodia tenuirostris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	F	-
Eurynome aspera	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-
Cancer pagurus	-	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-	-	-	-	-
Liocarcinus depurator	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-
Carcinus maenas	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	P
Xantho incisus	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	P	-	-	-	-	-
Mollusca																					
Mytilus edulis	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-
Aequipecten opercularis	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	P	-
Mactridae indet.	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-
Calliostoma zizyphinum	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	P	-
Spisula elliptica	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	P	-
Angulus tenuis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P
Donax vittatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P
Venerupis senegalensis	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-
Chamelea gallina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	F	-
Clausinella fasciata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-
Loligo vulgaris	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-
Nucella lapillus	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Buccinum undatum	-	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-	-	-	-	-
Neptunea antiqua	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	P	-	-	-	-	-
Acanthochitona fascicularis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-
Bryozoa																					
Bryozoa indet.	P	P	-	-	-	-	-	-	-	-	P	-	-	-	-	P	-	-	-	P	-
Alcyonidium sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P
Alcyonidium diaphanum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	F	-	-
Alcyonidium parasiticum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-
Vesicularia spinosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	P	P
Eucratea loricata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	F
Electra pilosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P
Flustra foliacea	P	P	-	-	-	-	-	-	-	-	P	P	P	-	-	-	-	-	P	F	-
Bugula flabellata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	P	P	-
Echinodermata																					
Henricia oculata	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-
Asterias rubens	-	-	-	-	-	-	-	-	-	-	P	P	P	-	-	-	-	-	-	F	F

(cont.)	Dredging stations - D																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Species																					
Ophiura albida	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-
Ophiura ophiura	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P
Psammechinus miliaris	-	-	-	-	-	-	-	-	-	-	C	F	P	-	-	F	-	-	-	F	-
Tunicata																					
Corella parallelogramma	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	P	-
Ascidia mentula	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	P	-
Polycarpa sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-
Botryllus schlosseri	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-
Molgula sp.	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-
No. of taxa	5	4	0	0	0	0	3	0	1	3	14	26	27	0	0	12	5	0	17	34	25
Dredge time - minutes	5	8	7	4	7	1	6	6	5	6	6	3	3	7	9	6	3	4	3	3	5
Biotope No.	-	1	-	-	-	-	2	-	1	1	2	8	5/6	-	-	1/2	1	-	7	8	3

The four fish trawls that were carried out are shown in Figure 9.1 and details of the trawls are shown in Table 9.3. Table 9.4 details the species of fish found in the fish trawls.

Table 9.3: Location and Duration of Fish Trawls, June 2000

Site	Date d/m/y	Location	Position (Start)	Position (End)	Duration (min.)
T1	14/06/00	South of Arklow Bank	335539 158968	336542 155785	40
T2	14/06/00	West of Arklow Bank	341448 173388	341621 174414	20
T3	09/06/00	East of Arklow Bank	331139 172356	329280 171193	35
T4	09/06/00	Along proposed cable route	334673 173492	334556 174899	43

Table 9.4: List of Species collected in the Fish Trawls, June 2000

Site	Species	Common name	Abundance	Notes
T1	*Lophius piscatorius*	Monkfish	1	60 cm in length *Carcinus maenas* and *Asterias rubens* also collected
T2	*Raja clavata*	Thornback Ray	1	60 cm in length
T3	*Raja clavata*	Thornback Ray	7	3 male, 4 female
	Scyliorhinus canicula	Dogfish	2	1 male, 1 female
	Platichthys flesus	Flounder	1	20 cm in length *Asterias rubens* also collected
T4	*Scyliorhinus canicula*	Dogfish	1	1 female
	Raja clavata	Thornback Ray	5	5 female
	Raja naevus	Cuckoo Ray	1	1 female
	Pleuronectes platessa	Plaice	1	20 cm in length

Phytoplankton and zooplankton samples were taken at four sites around the bank. The location of the sampling sites are shown in Figure 9.1 and the location are also given in Table 9.5.

Table 9.5: Locations, Positions and Times of Plankton, Temperature and Salinity Samples

Site	Date of survey	Location	Position	Time
P1	14/06/00	SE of Arklow Bank	339717 166286	17:24
P2	15/06/00	NE of Arklow Bank	341845 177890	13:05
P3	07/06/00	NW of Arklow Bank	337630 185396	11:49
P4	09/06/00	SW of Arklow Bank	335335 166700	16:40

Table 9.6 details the results of the four zooplankton samples taken on the north-west, north-east, south-west and south-east of the bank. A total of twenty-two species were recorded. Crustaceans were the dominant fauna, with all of the crabs being in the first Zoea Stage (the first stage of development). Phytoplankton results are shown in Table 9.7. A total of twelve species were recorded and the flora was dominated predominately by diatoms.

Table 9.6: Zooplankton Species from the Summer Sampling Survey P=present

Site	Z1	Z2	Z3	Z4
Species				
Protozoa	-	P	-	-
Noctiluca scintillans		-	-	-
Cnidaria (Jellyfish)	-	-	-	P
Scyphozoa indet	-	-	-	P
Ctenophora (Comb jelly)				-
Beroe cucumis			P	-
Polychaeta (Worms)				
Polycheta Larva	-	-	P	-
Polycheta Larva (segmented)	P	P	P	P
Polynoid Larva	P	P	P	P
Magellonid Larva	-	-	-	P
Chaetognata (Worms)				
Sagitta sp.	-	-	P	-
Crustacea (Crabs and amphipods)				
Nauplius Larva	-	-	P	-
Amphipoda indet	-	-	P	-
Caridea indet	-	P	P	-
Copeopoda Calanoida	P	P	P	P
Cumacea indet	-	-	P	P
Cancer pagurus **Zoea 1**	-	-	-	P
Pagurus bernhardus *Zoea 1*	-	-	P	-
Pisidia longicornis *Zoea 1*	-	-	P	P
Porcellana plathychelles **Zoea** 1	P	-	-	-
Xantho sp. **Zoea** 1	-	P	P	P
Pycnogonida (Sea spiders)				
Nymphonidae indet.	-	-	P	-
Mollusca (Snails)				
Polyplacophora indet	-	-	P	-
Echinodermata (starfish)				
Asteridea larva	-	P	P	P
Appendicularia				
Appendicularia indet.	-	P	-	P
No. of species	4	8	16	11

Table 9.7: **Phytoplankton Species from the Summer Sampling Survey**
P=present

Site	P1	P2	P3	P4
Species				
Bacilliaria paradox	-	P	-	-
Guinardia flaccida	P	P	P	P
Leptocylindrus danicus	-	-	P	-
N. delictissima	P	P	-	-
Nitzchia sp.	P	P	-	-
R. alata	P	P	P	-
R. setigera	-	-	-	-
Rhizosolenia shrubsolei	P	P	P	-
Ceratium longipes	-	-	P	-
Cyst	-	-	-	-
Noctiluca scintillans	-	P	-	-
Protoperidinium sp.	P	-	-	-
No. of species	5	8	5	2

9.2.3. Autumn Benthic Sampling

The Autumn benthic sampling was carried out between the 12th and 15th September 2000. A total of twenty-six sites were sampled and the locations are shown in Figure 9.2. Sampling methodology during this sampling regime were similar to the Summer sampling (see Section 9.2.1.) although efforts were made to obtain dredge samples from sites on the bank itself. A smaller size mesh (for the trawl) was used to allow smaller species of benthic fish to be caught.

Fish were sampled using an Agassiz Trawl. Sampling methodologies for zooplankton and phytoplankton and temperature and salinity profiles were similar as to the Summer sampling regime.

9.2.4. Results of the Autumn Sampling

The results of the Autumn sampling regime are detailed below.

A total of nineteen samples were taken for benthic fauna (see Figure 9.2). The location of these sampling points are given in Table 9.8.

Eight species of fish were caught, the majority of which are bottom feeding species.

The most abundant invertebrates and algae species collected in the trawls were crustaceans, echinoderms and hydroids.

Figure 9.2: Benthic Flora and Fauna Sampling Locations

Table 9.8: Site Locations and Details Subtidal Dredge Sites, September 2000

Site no.	Site name	Date	Position (Start)	Position (End)	Duration (min.)	Distance (km)
D1	North of Arklow Bank	13/09/00	340335 186585		5	0.1
D2	On the Bank (north)	14/09/00	339242 181603	339252 181568	1	0.04
D3	On the Bank (centre)	14/09/00	338649 171350	338703 171353	2	0.05
D4	On the Bank (south)	15/09/00	336945 164447	336970 164621	4	0.18
D5	South of Arklow Bank	12/09/00	336197 158384	336317 158466	2	0.15
D6	South-east of Arklow Bank	15/09/00	339736 166479	339649 166190	3	0.3
D7	North West of Arklow Bank	13/09/00	336908 183579	336951 183346	4	0.24
D8	South West of Arklow Bank	12/09/00	334760 164721	334629 164460	5	0.29
D9	West of Arklow Bank	12/09/00	335758 170721	335798 170598	2	0.13
D10	Along proposed cable route	13/09/00	333335 175227	333434 175395	3	0.19
D11	Along proposed cable route	12/09/00	330761 174256	330874 174476	3	0.25
D12	Along proposed cable route	12/09/00	328099 174284	328280 174526	3	0.3
D13	North East of Arklow Bank	13/09/00	340939 176471	340772 176942	4	0.5
D14	On the Bank (northern half)	14/09/00	338764 177973	338774 177996	2	0.02
D15	On the Bank (southern half)	15/09/00	337970 168758	337988 169032	8	0.27
D16	On the Bank (centre)	14/09/00	339012 176118	339034 176286	2	0.17
D17	On the Bank (northern half)	14/09/00	339240 180844	339206 180811	1	0.05
D18	On the Bank (southern half)	15/09/00	337570 166904	337593 166989	3	0.09
D19	On the Bank (southern half)	15/09/00	337919 168572	337987 168627	2	0.09

Similar to the Summer sampling, the species identified were dominated by hydroids, crustaceans, molluscs, bryozons and echinoderms. A total of sixty-one species of higher taxa were recorded. Full details of the species identified are given in Table 9.9.

Table 9.9: List of Species or Higher Taxa Recorded from each Site, September 2000

The list is arranged in taxonomic order. P = present, R = rare, O = occasional, F = frequent, C = common, A = abundant.

	Dredging stations - D																		
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Porifera (Sponges)																			
Porifera indet.	-	-	-	-	-	P	-	-	-	-	-	P	-	-	-	-	-	-	-
Anthozoa (Sea anemones)																			
Alcyonium digitatum	-	-	-	P	-	-	-	P	-	-	-	P	-	-	-	-	-	-	-
Urticina sp.	-	-	-	-	-	-	-	-	-	-	-	F	-	-	-	-	-	-	-
Hydrozoa (Hydroids/sea firs)																			
Tubularia sp.	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
Tubularia larynx	-	-	-	-	-	P	-	P	-	P	-	-	-	-	-	-	-	-	-
Hydractinia echinata	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-
Halecium halecimum	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-
Nemertesia antennina	-	-	-	-	-	-	-	-	-	-	P	-	P	-	P	-	-	P	-
Nemertesia ramosa	-		-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-
Abietinaria abietina	P	-	-	-	P	-	P	P	P	-	-	P	-	-	P	-	-	-	-
Hydrallmania falcata	P	-	-	-	P	P	P	P	P	P	P	P	P	-	P	-	P	P	-
Sertularia argentea	P	-	-	-	P	-	F	P	P	P	P	-	P	-	-	P	-	P	-
Sertularia cupressina	-	-	-	-	-	-	-	-	P	-	-	P	-	-	-	P	-	-	-
Laomedea flexuosa	-	-	-	-	-	-	-	-	-	-	-	P	-		-	-	-	-	-

(Table 9.9 Contd.)	Dredging stations - D																		
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Polychaeta (Worms)																			
Polychaeta indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
Sabellaria alveolata	-	-	-	-	-	-	A	-	-	-	-	-	P	-	-	-	-	-	-
Pomatoceros triqueter	-	-	-	-	-	P	-	P	-	P	-	-	P	-	-	-	-	-	-
Crustacea (Crabs, barnacles and amphipods)																			
Balanus crenatus	-	-	-	-	-	-	P	P	-	P	P	P	-	-	-	-	-	-	-
Crangon allmanni	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-
Pagurus bernhardus	-	-	-	-	-	P	P	P	-	-	-	-	P	-	P	-	-	-	-
Pisidia longicornis	-	-	-	-	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-
Ebalia sp.	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Hyas coarctatus	-		-	-	-	P	P	-	-	-	-	-	-		-	-	-	-	-
Inachus dorsettensis	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Macropodia tenuirostris	-	-	-	-	-	P	-	-	-	-	P	-	-	-	-	-	-	-	-
Cancer pagurus	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
Liocarcinus depurator	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
Carcinus maenas	-	-	-	-	-	P	P	-	-	-	-	-	P	-	-	-	-	-	-
Pilumnus hirtellus	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
Mollusca (Snails and bivalves)																			
Diodora graeca	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
Calliostoma zizyphinum	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
ucella lapillus	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
Buccinum undatum	-	-	-	-	-	-	-	P	-	-	P	-	-	-	-	-	-	-	-
Mytilus edulis	P	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
Aequipecten opercularis	-		-	-	-	P	P	P	-	-	-	-	-		-	-	-	-	-
Anomia ephippium	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-
Mactridae	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bryozoa (Sea mats)																			
Bryozoa indet.	-	-	-	-	P	P	P	P	P	P	-	P	-	-	P	-	-	P	-
Crisia sp.	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-
Alcyonidium sp.	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-
Alcyonidium diaphanum	-	-	-	-	-	-	P	-	-	P	C	P	P	-	-	-	-	-	-
Alcyonidium parasiticum	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-
Vesicularia spinosa	-	-	-	P	-	-	-	-	-	P	P	P	-	-	-	-	-	-	-
Eucratea loricata	-	-	-	-	-	-	-	-	-	-	C	P	-		-	-	-	P	-
Flustra foliacea	P	-	P	P	-	-	F	P	-	-	P	P	P	-	-	-	-	-	-
Echinodermata (Starfish and sea urchins)																			
Antedon bifida	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
Asterias rubens	-	-	-	-	-	-	F	-	-	-	P	P	-	-	-	-	-	-	-
Amphiura chiajei	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-
Ophiura albida	-	-	-	-	-	F	-	-	-	-	-	-	-	-	-	-	-	-	-
Ophiura ophiura	-		-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-
Psammechinus miliaris	-	-	-	-	-	C	F	P	-	-	-	-	P	-	-	-	-	-	-

(Table 9.9 Contd.)	Dredging stations - D																		
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Tunicata (Sea squirts)																			
Tunicata indet.	P	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-
Ciona intestinalis	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
Ascidiella aspersa	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
Dendrodoa grossularia	-	-	-	-	-	P	P	-	-	-	-	-	-	-	-	-	-	-	-
Botryllus schlosseri	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
Osteichthyes (Fish)																			
Scyliorhinus canicula	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Ammodytes tobianus	-	-	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhodophycota (Red algae)																			
Plocamium cartilagineum	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
Phycodrys rubens	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
Polysiphonia elongata	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
No. of taxa	**6**	**0**	**2**	**4**	**5**	**16**	**31**	**15**	**6**	**8**	**16**	**16**	**10**	**0**	**5**	**2**	**2**	**5**	**0**
Dredge time - minutes	**5**	**1**	**2**	**4**	**2**	**3**	**4**	**5**	**2**	**3**	**3**	**3**	**4**	**2**	**8**	**2**	**1**	**3**	**2**
Biotope No.	**1/2**	**-**	**1/2**	**1**	**1/2**	**4**	**5/6**	**2**	**1/2**	**1/2**	**9**	**3**	**1/2**	**1**	**1/2**	**1**	**1**	**1**	**-**

A total of six trawls were carried out to sample for fish within the study area. Their locations are shown in Figure 9.2 and also in Table 9.10.

Table 9.10: Location and Duration of Fish Trawls

Site	Date	Location	Position (Start)	Position (End)	Duration (min.)
T1	12/09/00	South of Arklow Bank	330069 169373		30
T2	15/09/00	East of Arklow Bank	334015 158233	340177 185472	15
T3	12/09/00	West of Arklow Bank	341101 172724	340177 185472	34
T4	12/09/00	South of the proposed cable	340639 171529	339287 178408	34
T5	13/09/00	North of Arklow Bank	334316 173227	338812 175078	4
T6	14/09/00	North East of Arklow Bank	333840 171853	340765 182045	40
T7			330774 171752	339932 177153	

A list of the fish species collected in the trawls is given in Table 9.11.

Table 9.11: List of Fish Species collected in the Trawls, September 2000

Site	Species	Common name	Abundance	Notes
T1	*Scyliorhinus canicula*	Thornback Ray	2	1 male 60 cm in length, 1 female 40 cm in length
	Pleuronectes platessa	Plaice	1	15 cm in length
T2	*Agonus cataphractus*	Pogge	2	5cm in length
T3	*Pleuronectes platessa*	Plaice	3	2 x 30 cm, 1 x 50 cm
	Limanda limanda	Dab	1	15 cm in length
T4	*Raja naevus*	Cuckoo Ray	1	female, 10 cm in length
	Agonus cataphractus	Pogge	2	5 cm in length
	Pleuronectes platessa	Plaice	2	30 cm in length
	Trisopterus minutus	Poor Cod	25	7 cm in length
	Gadus morhua	Cod	1	7 cm in length
T5	No fish species			
T6	*Callionymus lyra*	Dragonet	1	7 cm

Marine benthic fauna and alga collected in the trawls are shown in Table 9.12.

Table 9.12: List of Invertebrate and Algae collected in Trawls, September 2000
P=present, F=frequent, C= common, A= abundant.

Species	T1	T2	T3	T4	T5	T6	T7
Porifera (Sponges)							
Porifera indet.	-	-	P	-	-	-	-
Hydrozoa (Hydroids/sea firs)							
Halecium halecinum	-	-	P	-	-	-	-
Nemertesia ramosa	-	-	P	-	-	-	-
Abietinaria abietina	P	P	P	A	P	-	P
Hydrallmania falcata	P	P	P	A	P	-	P
Sertularia argentea	F	-	P	-	P	-	P
Sertularia cupressina	F	-	-	-	-	-	-
Polychaeta (Worms)							
Aphrodita aculeata	-	-	-	P	-	-	-
Crustacea (Crabs, barnacles and amphipods)							
Balanus crenatus	-	P	-	-	-	-	-
Pagurus bernhardus	P	-	P	-	-	-	P
Hyas coarctatus	-	-	-	P	-	-	-
Macropodia rostrata	-	-	-	F	-	-	-
Carcinus maenas	-	-	-	-	P	-	-
Palaemon serratus	-	A	-	-	-	-	-
Crangon crangon	-	C	-	-	-	-	-
Crangon allmanni	-	-	-	F	-	-	-
Pandalus propinquus	-	-	-	F	-	-	-
Pandalus montagui	-	-	-	F	-	-	-

Table 9.12 Ctd.

Species	T1	T2	T3	T4	T5	T6	T7
Mollusca (Snails and bivalves)							
Mytilus edulis	-	-	P	-	-	-	-
Aequipecten opercularis	-	P	-	-	-	-	P
Calliostoma zizyphinum	-	-	-	P	-	-	-
Onchidoris bilamellata	-	-	-	P	-	-	-
Sepiola atlantica	-	-	-	P	-	-	-
Bryozoa (Sea mats)							
Bryozoa indet.	P	-	P	P	-	-	P
Alcyonidium sp.	P	-	-	P	-	-	-
Alcyonidium diaphanum	-	-	P	-	-	-	-
Vesicularia spinosa	P	-	F	F	-	-	-
Eucratea loricata	P	-	P	F	-	-	-
Electra pilosa	-	-	-	-	P	-	-
Flustra foliacea	P	P	-	A	P	-	P
Scrupocellaria scrupea	P	-	-	-	-	-	-
Scrupocellaria scruposa	-	-	-	P	-	-	-
Sertularella gayi	-	-	P	-	-	-	-
Sertularella sp.	-	-	-	-	-	-	P
Bicellariella ciliata	-	-	P	-	-	-	-
Bugula sp.	-	-	-	P	-	-	-
Echinodermata (Starfish and sea urchins)							
Asterias rubens	P	-	-	F	-	-	P
Psammechinus miliaris	-	F	P	F	-	-	P
Crossaster papposus	P	-	F	C	-	-	-
Holothuria forskali	P	-	-	-	-	-	-
Tunicata (Sea squirts)							
Ascidella indet.	-	-	-	P	-	-	-
Botryllus schlosseri	-	-	P	P	-	-	P
Rhodophycota (Red weed)							
Polysiphonia elongata	P		P				
Acrosorium reptans	P		P				
Plocamium cartilagineum	P		P	P			
Cryptopleura ramosa			P	P			
Heterosiphonia plumosa	P		P				
Chromophycota (Brown weed)							
Desmerestia sp.	P						
Desmerestia aculeata			P				
Species	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**	**T7**
Dictyota dichotoma	P		P		P		
Laminaria hyperborea					P		
Laminaria saccharina					P		
No. of species	**20**	**8**	**24**	**25**	**9**	**0**	**11**

Phytoplankton and zooplankton samples were taken at four sites shown in Figure 9.2. Temperature and salinity data was also collected from these sites. The locations, positions and kinds of phytoplankton, temperature and salinity sampling are shown in Table 9.13.

Table 9.13: Locations, Positions and Times of Phytoplankton, Temperature and Salinity Samplings

Site	Date of survey	Location	Position	Time
P1	15/09/00	SE of Arklow Bank	339654 165820	13:00
P2	13/09/00	NE of Arklow Bank	340626 176521	14:25
P3	13/09/00	NW of Arklow Bank	337432 185443	11:55
P4	12/09/00	SW of Arklow Bank	334986 165104	14:50

A list of zooplankton and phytoplankton species collected in the samples and shown in Tables 9.14 and 9.15 respectively.

The temperature and salinity profiles for the top 20m within the study area show that the water around the Arklow Bank is well mixed. See Table 9.16.

Table 9.14: List of Zooplankton Species Recorded from each Site, September 2000

Numbers refer to raw counts of total sample volume

Site Taxanomic group	Z1A	Z1B	Z2A	Z2B	Z3A	Z3B	Z4A	Z4B
Protozoa								
Foraminifera indet.	5	3	-	1	3	4	5	2
Cnidaria (Jellyfish)								
Phialidium sp. (Scyphozoa)	1	0	-	0	2	3	1	0
Polychaeta (Worms)								
Spionid (larvae)	0	0	-	2	4	3	0	2
Chaetognata (Worms)								
Sagitta sp. (larvae)	0	0	-	3	3	0	0	0
Crustacea (Crabs, barnacles and amphipods)								
Barnacle Nauplius (Cirripedia)	2	0	-	0	0	0	0	0
Temora longicornis (Copeopoda Calanoida) %	38.6	56.2	-	33.1	40.3	51.6	46.3	44.7
Centropages hamatus (Copeopoda Calanoida) %	53.7	36.8	-	55.7	51.2	33.9	41.2	49.1
Para-Pseudocalanus sp. (Copeopoda Calanoida) %	1.5	2.1	-	1.7	2.3	3.2	3.4	1.8
Acartia clausii (Copeopoda Calanoida) %	0	1.2	-	0	0	0	1.1	0
Oithona sp. (Copeopoda Ciclopoida) %	3.5	2.4	-	4.2	4.1	4.8	2.3	3.4
Euterpina acutifrons (Copeopoda Harpacticoida) %	2.7	1.3	-	5.3	2.1	6.5	5.7	1
Total Copeopods	584	815	-	1543	972	667	571	995
Cancer pagurus (Crab Zoea)	1	2	-	1	1	0	0	0
Ebalia tuberosa (Crab Zoea)	0	0	-	1	0	0	0	0
Pagurus bernhardus	0	2	-	1	0	3	0	1
Pisidia longicornis (Crab Zoea)	1	0	-	0	0	0	1	0
Porcellana plathycheles (Crab Zoea)	0	0	-	0	1	0	0	0
Caridea indet.	1	2	-	1	5	0	0	0
Mollusca (Snails and bivalves)								
Bivalve (veliger larva)	6	3	-	0	0	2	4	3
Bryozoa (Sea mats)								
Cyphonautes larvae indet.	2	1	-	4	2	3	1	0
Pycnogonida (Sea spiders)								
Nymphonidae indet.	0	0	-	0	0	0	1	0
Echinodermata (Starfish)								
Ophiotrix sp. (Brittlestar, Pluteus larva)	0	0	-	0	0	0	1	0
Appendicularia								
Oikopleura sp.	3	7	-	5	3	2	4	6
Cumacea indet.	0	1	-	1	0	0	0	0
No. of taxa	14	14	0	15	14	12	14	10

Table 9.15: List of Phytoplankton Speces Recorded September 2000

Site Taxanomic group	P1	P2	P3	P4
Bacillaria paradoxa	-	P	-	-
Ceratium furca	P	P	P	P
Ceratium fusus	-	-	P	-
Ceratium longipes	-	P	-	-
Chaetoceros danicus	P	P	P	P
Coscinodiscus radiatus	P	P	-	-
Guinardia delicaula	P	P	P	P
Guinardia flaccida	P	P	P	P
Guinardia striata	-	-	-	P
Leptocylindrus danicus	-	P	-	-
Noctiluca scintillans	-	-	P	-
Odontella sinensis	-	P	-	-
Paralia sulcata	P	P	P	P
Prorocentrum micans	P	P	P	P
Protoperidinium sp.	-	P	-	-
R. setigera	-	P	-	-
Rhizosolenia robusta	-	-	P	-
Rhizosolenia shrubsolei	P	P	P	P
Thalassionema nitzschioides	-	-	-	P
No. of taxa	8	14	9	10

Table 9.16: Temperature and Salinity Measurements from the Plankton Sampling Sites

Site	P1		P2		P3		P4	
Depth m BCD	Temp. °C	Salinity ppt.	Temp. °C	Salinity ppt.	Temp. °C	Salinity ppt.	Temp. °C	Salinity ppt.
0	16	34.1	16	34.1	16	34.3	16	34.1
5	16	34.1	16	34.1	16	34.1	16	34.0
10	16	34.0	16	34.1	16	34.1	16	33.9
15	16	34.0	16	34.0	16	34.1	15	34.0
20	16	34.1	16	34.1	16.5	34.1	16	34.0

A total of 24 species were recorded from the site. The zooplankton was dominated by copepods. No fish eggs or larvae were identified in the September 2000 samples.

9.2.5. Spring Benthic Sampling (April 2001)

The Spring benthic sampling was carried out between the 19th and 22nd of April 2001. A total of 15 dredges were taken during this survey, 4 along the bank and 11 around the bank. The location of the sampling points is shown in Figure 9.3. Three dredges (D2, D7 and D10) were taken to explore the extent of the Sabellaria reef previously found in the Summer and Autumn surveys. The Spring 2001 survey revealed a total of 34 species or higher taxa.

9.2.6. Results of the Spring Sampling

The results of the Spring sampling regime are detailed below.

A total of 15 dredge samples were taken for benthic fauna (see Figure 9.3). The location of the sampling sites is given in Table 9.17.

Table 9.17: Site Locations and Details of Subtidal Dredge Sites, April 2001

Site no.	Site name	Date	Position (Start)	Position (End)	Duration (min.)	Distance (km)
D1	North of Arklow Bank	21/04/01	340474 186356	340405 186144	4	0.22
D2	North West of Arklow Bank	21/04/01	336088 184315	335976 184031	5	0.3
D3	On the Arklow Bank (middle)	20/04/01	338590 171602	338577 171854	3	0.25
D4	On the Arklow Bank (south end)	19/04/01	337119 164364	336972 163999	3	0.39
D5	South of Arklow Bank	19/04/01	335935 157834	335865 157629	4	0.22
D6	South-east of Arklow Bank	20/04/01	339593 166306	339365 165682	3	0.66
D7	North West of Arklow Bank	21/04/01	335672 181538	335527 181317	4	0.26
D8	South West of Arklow Bank	19/04/01	334500 164313	334483 164344	4	0.04
D9	West of Arklow Bank	19/04/01	335624 170063	335363 169601	3	0.53
D10	North West of Arklow Bank	21/04/01	337875 184559	337479 183803	3	0.85
D11	Along proposed cable route	20/04/01	330854 173898	330808 173805	3	0.1
D12	Along proposed cable route (Arklow Harbour)	19/04/01	328016 174122	327873 174189	4	0.16
D13	North East of Arklow Bank	22/04/01	340947 176261	340850 175792	2	0.48
D14	On the Arklow Bank (south end)	22/04/01	338975 180428	338966 180373	1	0.05
D15	On the Arklow Bank (southern half)	19/04/01	337247 166768	337164 166668	1	0.13

The list of species or higher taxa recorded from each of the sites during the Spring survey are given in Table 9.18.

Figure 9.3: Spring 2001, Benthic Sampling Locations

Table 9.18: **List of Species or Higher Taxa recorded from each Site, April 2001**
The list is arranged in taxonomic order. P = present, R = rare, O = occasional, F = frequent, C = common, A = abundant.

	Dredging stations – D														
Taxanomic group	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Porifera (Sponges)															
Porifera indet.	-	P	-	-	-	-	-	-	-	-	P	-	-	-	-
Anthozoa (Sea anemones)															
Alcyonium digitatum	-	-	-	-	-	P	-	-	-	-	-	P	-	-	-
Urticina sp.	-	-	-	-	-	-	-	-	-	-	P	P	P	-	-
Hydractinia echinata	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-
Hydrozoa (Hydroids/sea firs)															
Tubularia larynx	-	P	-	-	-	-	-	P	-	-	-	-	-	-	-
Nemertesia antennina	-	-	-	-	-	P	-	-	-	-	P	-	P	-	-
Nemertesia ramosa	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
Abietinaria abietina	-	P	-	-	-	P	P	P	P	-	P	-	P	-	-
Hydrallmania falcata	P	P	-	-	-	P	P	P	P	-	P	P	P	P	-
Sertularia argentea	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-
Sertularia cupressina	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-
Tamarisca tamarisca	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-
Laomedea flexusoa	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-
Polychaeta (Worms)															
Polychaeta indet.	P	-	-	-	-	P	P	P	-	-	-	-	-	-	-
Terebellidae indet.	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Aphrodita aculeata	-	-	-	-	-	P	-	-	-	-	P	-	-	-	-
Sabellaria sp.	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
Sabellaria spinulosa	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-
Sabellaria alveolata	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-
Nepthys hombergi	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-
Pomatoceros triqueter	-	P	-	-	P	P	-	P	P	P	P	-	P	-	-
Crustacea (Crabs, barnacles and amphipods)															
Balanus crenatus	-	P	-	-	-	P	-	-	P	P	-	-	P	-	-
Palaemon sp.	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-
Pandalus montagui	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-
Crangon crangon	-	P	-	P	-	-	-	-	-	-	P	-	-	-	-
Pagurus bernhardus	-	P	-	P	P	P	P	P	P	-	P	-	-	-	-
Macropodia sp.	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-
Macropodia rostrata	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-
Macropodia linaresi	-	-	-	-	-	-	-	P	-	-	P	-	-	-	-
Carcinus maenas	-	P	-	-	-	-	-	P	-	-	P	-	-	-	-
Portumnus latipes	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-
Hyas coarctatus	-	P	-	-	-	P	P	P	-	-	P	-	-	-	-
Xantho incisus	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-
Monodaeus couchi	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-
Maja squinado	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-
Mollusca (Snails and bivalves)															
Calliostoma zizyphinum	-	P	-	-	-	P	-	-	-	-	-	-	-	-	-
Buccinum undatum	-	P	-	-	P	P	-	-	-	-	P	P	P	-	-
Neptunea antiqua	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-
Chamelea gallina	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-
Nucula sp.	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Ensis sp.	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-
Aequipecten opercularis	-	-	-	-	-	P	P	-	-	-	-	-	-	-	-

	Dredging stations – D														
Taxanomic group	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Polyplacophora *indet.*	-	P	-	-	-	-	P	-	-	-	-	-	-	-	-
Bryozoa (Sea mats)															
Bryozoa indet.	-	P	-	-	-	P	-	P	P	-	P	P	-	-	-
Alcyonidium sp.	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-
Alcyonidium diaphanum	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-
Alcyonidium parasitica	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-
Flustra foliacea	-	P	P	-	-	P	P	P	P	P	P	P	P	-	-
Cellaria sinuosa	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-
Vesicularia spinosa	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-
Eucratea loricata	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-
Echinodermata (Starfish and sea urchins)															
Asterias rubens	-	-	-	-	-	P	P	P	-	P	-	P	P	-	-
Astropecten irregularis	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Crossaster papposus	-	P	-	-	-	-	P	-	-	-	-	-	-	-	-
Henricia oculata	-	P	-	-	-	-	P	-	-	-	-	-	-	-	-
Ophiothrix fragilis	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-
Ophiura albida	-	-	-	-	-	P	-	-	-	-	-	P	-	-	-
Ophiura ophiura	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-
Psammechinus miliaris	-	P	-	-	-	P	P	P	-	-	P	-	P	-	-
Tunicata (Sea squirts)															
Tunicata indet.	-	P	-	-	-	-	-	-	-	P	P	-	-	-	-
Dendrodoa grossularia	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-
Osteichthyes (Fish)															
Agonus cataphractus	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-
Ammodytes tobianus	-	-	-	-	P	-	-	-	-	-	-	-	-	P	-
Rhodophycota (Red algae)															
Plocamium cartilagineum	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
No. of taxa	2	23	1	4	5	21	14	16	8	6	26	17	12	2	0
Biotope No.	2	9	1	1	1	9	9	2	2	5	5	8	2	1	-
Dredge time – minutes	4	5	3	3	4	3	4	4	3	3	3	4	2	1	1

Three fish trawls were taken from the east, south and west of the bank. Three species of fish were recorded as well as macroinvertabrate species. The identification of the macroinvertabrate species is ongoing. The location and the duration of the fish trawls is given in Table 9.19.

Table 9.19: Location and Duration of fish trawls, April 2001
The positions given are Irish National Grid references.

Site	Date d/m/y	Location	Position (Start)	Position (End)	Duration (min.)
T1	19/04/01	South of Arklow Bank	334762 158215	334005 156685	32
T2	20/04/01	East of Arklow Bank	341208 171286	339992 167968	32
T3	20/04/01	West of Arklow Bank	331195 172382	330381 169686	44

A list of the fish species collected in the trawl is given in Table 9.20.

Table 9.20: List of Fish Species collected in the Trawls, April 2001

Site	Species	Common name	Abundance	Notes
T1	*Gadus morhua*	Cod	1	Juvenile 8cm in length
T2	*Ammodytes tobianus*	Sandeels	1	
	Trisopterus minutes	Poor Cod	2	8cm in length
T3	*Limanda limanda*	Dab	1	8cm in length

Four phytoplankton samples were taken at the NW, W, NE, SE, and SW of the bank. Three zooplankton samples were taken at the NW, SW, and SE of the bank. Seventeen species of zooplankton were recorded in total. These were dominated by bryozoans. Fish eggs represented 1-2% of total counts and approximately 30% of the eggs were presenting advanced embryo stages.

The location of the phytoplankton samples and the zooplankton samples are given in Table 9.21 and 9.22 respectively.

Table 9.21: Locations, positions and times of phytoplankton, temperature and salinity samples, April 2001
The positions given are Irish National Grid references.

Site	Date of survey	Location	Position	Time
P1	20/04/01	SE of Arklow Bank	339760 166476	13:50
P2	22/04/01	NE of Arklow Bank	340513 174654	12:15
P3	21/04/01	NW of Arklow Bank	336608 182155	11:30
P4	20/04/01	SW of Arklow Bank	334785 164712	16:50

Table 9.22: Locations, Positions and Times of Zooplankton Samples, April 2001
The positions given are Irish National Grid references.

Site	Date of survey	Location	Position (start)	Position (end)	Duration (min.)
Z1	20/04/01	SE of Arklow Bank	339768 166471	339406 165789	5
Z2	21/04/01	NW of Arklow Bank	336943 183307	336895 182879	5
Z3	19/04/01	SW of Arklow Bank	334672 164819	334623 164825	5

Temperature data collected from each of the phytoplankton sampling sites showed little variation between depth and site and further show that the waters in the top 20m around the Arklow Bank are well mixed. The temperature profiles are shown in Table 9.23.

Table 9.23: Temperature and Salinity Measurements from the Plankton Sampling Sites, April 2001

Site	P1	P2	P3	P4
Depth m BCD	Temp. °C	Temp. °C	Temp. °C	Temp. °C
0	8.5	8.1	8.6	8.5
5	8.3	8.2	8.4	8.4
10	8.3	8.3	8.4	8.2
15	8.2	8.3	8.4	8.4
20	8.2	8.3	8.5	8.2

Table 9.24: List of Invertebrate and Algae collected in the Trawls, April 2001

Taxanomic group	Trawl sites T1	T2	T3
Hydrozoa (Hydroids/sea firs)			
Hydrallmania falcata	P	P	-
Ctenophora indet.	P	-	-
Polychaeta (Worms)			
Aphrodita aculeata	P	-	-
Sabellaria spinulosa	-	P	-
Sabellaria alveolata	-	P	-
Crustacea (Crabs, barnacles and amphipods)			
Balanus crenatus	-	P	-
Pagurus bernhardus	-	P	-
Macropodia rostrata	-	-	P
Crangon crangon	P	P	P
Crangon allmanni	P	P	P
Pandalus montagui	P	-	-
Mollusca (Snails and bivalves)			
Buccinum undatum	-	P	P
Bryozoa (Sea mats)			
Flustra foliacea	-	P	P
Echinodermata (Starfish and sea urchins)			
Asterias rubens	P	P	-
Psammechinus miliaris	-	P	P
Crossaster papposus	P	P	-
No. of taxa	**8**	**11**	**6**

A list of the zooplankton and phytoplankton species collected in the April 2001 sampling effort are given in Tables 9.25 and 9.26 respectively.

Table 9.25: List of Zooplankton Species Recorded, April 2001
(Figures represent percentage species composition.)

Site	Z1A	Z1B	Z2A	Z2B	Z3A	Z3B
Taxanomic group						
Cnidaria (Jellyfish)						
Phialidium sp. (Scyphozoa)	1	-	-	-	-	-
Polychaeta (Worms)						
Spionid (larvae)	7	3	4	3	11	8
Crustacea (Worms)						
Barnacle Nauplius (Cirripedia)	5	3	21	20	31	17
Calanus helgolandicus/finmarchicus	1	1	-	-	-	-
Temora longicornis	8	4	20	21	5	9
Centropages hamatus	11	19	8	17	41	54
Para-Pseudocalanus sp.	12	14	13	5	3	1
Acartia clausii	3	2	7	9	4	4
Oithona sp.	-	1	2	2	-	-
Cancer pagurus (Crab Zoea)	3	1	-	2	1	2
Pagurus bernhardus	1	1	-	-	-	2
Porcellana plathycheles (Crab Zoea)	1	-	-	-	-	-
Bryozoa (Sea mats)						
Cyphonautes larvae (indet.)	42	46	21	17	2	2
Echinodermata (Starfish)						
Ophiothrix sp. (Brittlestar, Pluteus larva)	1	1	-	1	-	-
Appendicularia						
Oikopleura sp.	1	1	4	-	-	-
Fish eggs	2	2	1	2	2	2
Invertebrate eggs	1	1		1	-	-
Total	**100**	**100**	**100**	**100**	**100**	**100**

Table 9.26: List of Phytoplankton Species Recorded, April 2001

Site	P1	P2	P3	P4
Taxanomic group				
A. glacialis	-	-	-	P
Actinoptychus senarius	P	P	P	P
Asterionellopsis kariana	-	P	-	P
Bacillaria paradoxa	P	P	P	P
Chaetoceros danicus	-	-	P	-
Coscinodiscus sp.	P	P	P	P
Odontella sinensis	P		P	P
Paralia sulcata	P	P	P	P
Pseudonitzschia sp.	-	-	P	-
No. of taxa	**5**	**5**	**7**	**7**

9.3. Biotopes

9.3.1. June 2000 Survey

Seven biotopes were identified from the 21 dredges. All of these biotopes are common on the east coast of Ireland (EcoServe, unpublished data). Descriptions of these biotopes can be found in Section 9.3.4. In order to facilitate mapping biotope 9, (MCR.Flu.HBys) was described as its higher biotope, (MCR.Flu.).

9.3.2. September 2000 Survey

Seven biotopes were identified from the 19 dredges. All of these biotopes are common on the east coast of Ireland (EcoServe, unpublished data). In order to facilitate with mapping, biotope 9 (MCR.Flu.HBys) was described as its higher biotope form (MCR. Flu).

9.3.3. April 2001 Survey

Five biotopes were identified from the 15 stations.

The biotopes are illustrated in Figure 9.4 and are described in Section 9.3.4.

Figure 9.4: Main Biotopes on the Arklow Bank and Study Area

9.3.4. Biotope Descriptions

Biotope list

No.	Biotope
	Biotopes recorded during this survey
1	IGS.Mob
2	IGS.ScupHyd
3	IMS
4	MCR
5	MCR.Csab
6	MCR.MolPol.Sab
7	MCR.Flu
8	MCR.Flu.HbyS
9	MCR.Flu.SerHyd
	Biotopes recorded during SensMap survey
10	MIR
11	MCR.SnemAdia
12	IGS.Sell
13	IMS.EcorEns
14	ECR.Alc

No. 1 IGS.Mob Sparse fauna in infralittoral mobile clean sand

Biotope Description

Coarse sandy sediment in shallow water, often duned, on exposed or tide-swept coasts often contains very little infauna due to the mobility of the substratum. Some opportunistic populations of infaunal amphipods may occur, particularly in less mobile examples. Sand eels *Ammodytes* sp. may occasionally be observed in association with this biotope (and others). This biotope is more mobile than IGS.NcirBat and may be closely related to LGS.BarSnd on the shore. Common epifaunal species such as *Pagurus bernhardus*, *Liocarcinus depurator*, *Carcinus maenas* and *Asterias rubens* may be encountered and are the most conspicuous species present. A similar biotope, IGS.MobRS, occurs in reduced salinities but differs in that the sparse fauna of IGS.Mob are not tolerant of reduced salinities.

No. 2 IGS.ScupHyd *Sertularia cupressina* and *Hydrallmania falcata* on tide-swept sublittoral cobbles or pebbles in coarse sand

Biotope Description

Shallow sands with cobbles and pebbles, exposed to strong tidal streams, with conspicuous colonies of hydroids, particularly *Sertularia cupressina* and *Hydrallmania falcata*. These hydroids are tolerant to periodic submergence and scour by sand. Both diving and dredge surveys will easily record this biotope. *Flustra foliacea* and *Alcyonidium diaphanum* may also occur on the more stable cobbles and pebbles, whereas *Lagis koreni* is often a common component of the infaunal sand community. The less scoured biotope MCR.Flu.SerHyd occurs where there is less sand. Infaunal elements of the 'Venus' associations may occur in this biotope; indeed, this biotope may be at one extreme of the spectrum of such associations (E.I.S. Rees pers. comm. 1997).

No. 3 IMS Infralittoral muddy sands

Biotope Description

Muddy sand habitats in the infralittoral zone, extending from the extreme lower shore down to more stable circalittoral zone at about 15-20 m. The habitat supports a variety of animal-dominated communities, particularly of polychaetes, bivalves and the urchin *Echinocardium cordatum*, but also includes beds of seagrass (IMS.Sgr).

No. 4 MCR Moderately exposed circalittoral rock

Biotope Description

Circalittoral rock subject to moderate wave exposure or some degree of tidal currents in more sheltered conditions. Such habitats occur very widely around the coast and are highly variable in their character, depending on quite subtle differences in water quality (e.g. the degree of suspended silt or sand), tidal current strength, rock topography and rock type. A wide range of biotopes are currently defined, but these may require expansion to fully account for all parts of Britain and Ireland.

No. 5 MCR.MolPol.Sab Dense ascidians, bryozoans and hydroids on a crust of *Sabellaria spinulosa* on tide-swept circalittoral rock

Biotope Description

Tide-swept rock in areas with high levels of suspended sand with a *Sabellaria spinulosa* crust which supports a wide variety of other species. A dense carpet of ascidians *Molgula manhattensis, Polycarpa* spp. and *Polyclinum aurantium,* a turf of bryozoans (*Cellaria sinuosa, Bugula plumosa* and *Flustra foliacea*) and sponges such as *Scypha ciliata* and *Polymastia* spp., bryozoans *Alcyonidium diaphanum* and *Scrupocellaria* sp. and *Antedon bifida* may also be present. In some cases this biotope occurs adjacent to MolPol although in deeper water and more tide-swept (scour/turbulent) conditions.

No. 6 MCRCSab Circalittoral *Sabellaria* reefs

Biotope Description

Circalittoral rock or mixed substrata dominated by a crust of *sabellaria spinulosa.*

No. 7 MCR.Flu *Flustra foliacea* and other hydroid/bryozoan turf species on slightly scoured circalittoral rock or mixed substrata

Biotope Description

A widespread biotope which has been split into several related entities. The biotope is characterised by silt- and scour-tolerant species which occur in varying proportions around the country, but *Flustra foliacea* tends to dominate. This biotope is characteristic of silty rocky habitats, tending to be moderately exposed to wave action and with a moderate tidal flow which create the slight scour conditions (compared to silted rocky habitats in sheltered conditions). The species associated with and therefore characterising the different *Flustra* biotopes vary from region to region, ranging from the relatively low species-rich Flu.Flu found on North Sea coasts to the similar but far richer biotopes with sponges and hydroids on the west of Britain and Irish Sea coasts (Flu.HByS). There are also several other related biotopes: these include the *Urticina* (Urt.Urt) and *Ciocalypta* (Urt.Cio) biotopes which occur at rock-sediment interfaces; ascidian-dominated biotopes with *Flustra* (StoPaur) and several other biotopes characterised by other slight scour-tolerant or turbid-water species such as *Sabellaria spinulosa* which include *Flustra* (Sspi and MolPol.Sab) and *Alcyonidium diaphanum* (SNemAdia). Only use this biotope if records do not fit into other categories.

No. 8 MCR.Flu.HbyS *Flustra foliacea* with hydroids, bryozoans and sponges on slightly tide-swept circalittoral mixed substrata

Biotope Description

Often dense *Flustra foliacea* with a variety of slightly scour/silt-tolerant species forming a dense turf on bedrock, boulders, cobbles and mixtures of sediment. This biotopes does not include the ascidians found in the silty biotope StoPaur although it can have similar suite of 'ubiquitous' species and the more scour-tolerant ascidian *Polyclinum aurantium*. Other species can include *Alcyonidium diaphanum* (see SNemAdia which has more hydroids and less *Flustra*), various robust hydroids such as *Abietinaria abietina* and *Nemertesia antennina* and sponges such as *Dysidea fragilis*, *Polymastia boletiformis* and *Cliona celata*. Has been recorded adjacent to exposed circalittoral rock communities with dense *Corynactis viridis*, although the data has not always been recorded separately. *Securiflustra securifrons* often occurs in this biotope.

Similar Biotopes

MCR.Flu See other *Flustra*-dominated biotopes

No. 9 MCR.Flu.SerHyd *Sertularia argentea*, *S. cupressina* and *Hydrallmania falcata* on tide-swept circalittoral cobbles and pebbles

Biotope Description

Circalittoral cobbles and pebbles amongst clean sand or shell gravel in strong tides were covered in hydroids over *Balanus crenatus*. *Sabella pavonina* and *Lanice conchilega* were often common in the coarse sediment around the stones. With increased scouring *S. cupressina* becomes more common (see ScupHyd) although eventually, as tidal stream strength increases to a point at which the stones are kept mobile, all hydroids are scoured off leaving just *Pomatoceros*, bryozoan crusts, *Balanus crenatus* and coralline algae (PomByC).

Similar Biotopes

IGS.ScupHyd This biotope tends to be primarily on sand with fragments of hard substratum but has a similar suite of species as Flu.SerHyd.

No. 10 MIR Moderately exposed infralittoral rock

Biotope Description

Infralittoral rock subject to moderate wave exposure, or moderately strong tidal streams on more sheltered coasts. On bedrock and stable boulders there is typically a narrow band of kelp *Laminaria digitata* in the sublittoral fringe which lies above a *Laminaria hyperborea* forest and park. Associated with the kelp are communities of seaweeds, predominently reds and including a greater variety of more delicate filamentous types than found on more exposed coasts (EIR.KFaR). In some areas the rock is subject to intense grazing by urchins and may be devoid of erect seaweeds (MIR.GzK).

In areas where rock lies near sediment or is less stable (as in winter storms) different communities develop (MIR.SedK). In particular the kelp *Laminaria saccharina* or sea oak *Halidrys siliquosa* may dominate or the habitat may include more robust scour-tolerant species such as *Polyides rotundus* and *Furcellaria lumbricalis* (MIR.PolAhn).

No.11 MCR.SNemAdia Sparse sponges, *Nemertesia* spp., *Alcyonidium diaphanum* and *Bowerbankia* spp. on circalittoral mixed substrata

Biotope Description

Mixed substrata of cobbles and coarse silty sediment with occasional boulders and small outcrops of bedrock. A variety of small sponges including erect sponges and fast growing cushions such as *Esperiopsis fucorum*, ephemeral and robust hydroids and bryozoans tolerant of some silt such as *Nemertesia* spp., *Cellaria* spp., *Bugula* spp., *Bowerbankia* spp. and sparse *Flustra*. There are also some records with *Epizoanthus couchii* and *Isozoanthus sulcatus*.

This biotope sits somewhere between the *Polymastia* and erect sponge biotope (ErSPbolSH) which occurs on fairly stable substrata and the ephemeral hydroids biotope Flu.SerHyd which cannot develop further presumably because of periodic disturbance from wave and/or tide-scouring action. It therefore has a mixture of scour-tolerant species, ephemeral species and a few 'stable' substratum species on the larger or more consolidated rocks and boulders. Large areas of cobbly seabed in open but moderately exposed bays (e.g. Cardigan Bay) may comprise this biotope.

No.12 IGS.Sell ***Spisula elliptica*** **and venerid bivalves in infralittoral clean sand or shell gravel**

Biotope Description

Coarse, loose sands subject to moderately strong water movement and containing *Chamelea gallina* may be characterised by a prevalence of *Spisula elliptica*. IGS.Sell differs from IGS.FabMag because it has generally coarser loose sands influenced by greater water movement and populations of the more robust *Spisula elliptica* rather than the brittle-shelled *Fabulina fabula*. The community is less stable in its species composition than IGS.FabMag to which it is closely allied and collectively considered to be the 'Shallow *Venus* Community', the 'Boreal Off-shore Sand Association' and the '*Goniadella-Spisula* association' of previous workers (see Petersen 1918; Jones 1951; Thorson 1957; Salzwedel, Rachor & Gerdes 1985). Epifaunal communities may be reduced in this biotope when compared to IGS.FabMag; both types may have surface sand waves which may be indicative of the presence of venerid bivalves (Warwick & Davies 1977). This hypothesis, however, requires testing. Remote grab sampling is likely to under-estimate deep-burrowing and more dispersed species such as *Paphia*, *Ensis* and *Spatangus*.

This biotope may give way to others characterised by *Angulus tenuis*, *Donax vittatus* and *Nephtys caeca* on exposed lower shore sands (LGS.AP.Pon) (Jones 1950). In southern regions of the UK, *S. elliptica* is replaced by *S. subtruncata* in this biotope. It is possible that *Spisula solida* may also be characteristic of this habitat (needs clarification) (see Kühne & Rachnor 1996) and it should be noted that for some workers the three species of *Spisula* commonly encountered in UK waters may present difficulties in identification.

No.13 IMS.EcorEns ***Echinocardium cordatum*** **and** ***Ensis*** **spp. in lower shore or shallow sublittoral muddy fine sand**

Biotope Description

Sheltered lower shore and shallow sublittoral sediments of sand or muddy fine sand in fully marine conditions, support populations of the urchin *Echinocardium cordatum* and the razor shell *Ensis siliqua* or *Ensis arcuatus*. A rich variety of polychaetes, such as *Notomastus latericeus*, *Mediomastus fragilis* and *Scoloplos armiger*, may occur in abundance.

Bivalves such as *Mysella bidentata, Tellimya ferruginosa, Dosinia lupinus, Chamelea gallina* and *Gari fervensis* are typical of this habitat (but may not be present all at once), as are the predatory worms *Pholoe inornata* and *Harmothoe* spp. Seagrass *Zostera marina* may occur in low density (see also IMS.Zmar). *Amphiura brachiata* is common in fine sandy sediments and *Labidoplax media* in slightly muddier sediments. This biotope is currently broadly defined and needs further consideration, especially in relation to IGS.FabMag and IMS.MacAbr.

No.14 ECR.Alc ***Alcyonium*-dominated communities (tide-swept/vertical)**

Biotope Description

A series of biotopes which are characterised by moderate to dense aggregations of dead man's fingers *Alcyonium digitatum*. *Alcyonium* typically thrives in areas with moderate water movement, often on exposed rocky coasts, especially where moderate tides sweep steep and vertical rock faces. Although *Alcyonium* occurs in many, if not most, sublittoral rocky biotopes it only forms dense masses of large colonies in these conditions. Massive sponges such as *Pachymatisma johnstonia* and *Cliona celata* are found amongst the *Alcyonium* on open coasts as well as in tide-swept narrows (ECR.AlcMas) although grazing by *Echinus esculentus* can reduce the species richness so that encrusting forms predominate (ECR.AlcC; see also ECR.AlcSec and MCR.FaAlC). In strongly tide-swept narrows *Tubularia indivisa* thrives, particularly noticeable early in the year before the hydranths are grazed away, and is co-dominant with the *Alcyonium* (ECR.AlcTub).

9.4. Littoral Survey

The littoral sites were sampled from the shore at low water spring tides on the 10th June 2001. The littoral habitats, and communities (biotopes) at two proposed cable routes (A and B see Figure 2) were surveyed in order to provide an assessment of the marine fauna, flora and habitats present and the likely impact of the development. Landfall C was not sampled because there was no littoral marine fauna or flora at this site. Each habitat present was described and a species list compiled for each. Species were identified to species level where possible.

Sediment cores were sampled using a 6.5 cm diameter corer. At each station four replicate samples were taken to a depth of 20 cm. Stations were placed on the shore. Samples were passed through a 1 mm mesh sieve and the material collected were preserved in 70 % Industrial Methylated Spirits (IMS) and returned to the laboratory for identification. A voucher collection of specimens were retained.

9.5. Results of Littoral Fauna and Floral Survey

9.5.1. Landfall A

This site was located at the southern end of Ennereilly Beach adjacent to a rocky outcrop (Irish National Grid reference 273500 177300). The beach was gently sloping and backed by a bank (circa 20 m high) which was thickly vegetated with ferns, horsetails, marram grass, other grasses, gorse, dandelion and brambles. The extreme upper shore consisted of very coarse sand with empty oyster shells. No obvious fauna or flora occurred in this zone. The midshore below this consisted of a wide zone of fine and coarse mobile sand with gravel and cobbles. Further down the shore there was a narrow band of shingle with oyster and mussel shells and drift weed with talitrid amphipods. The lower shore consisted of coarse gravely sand with talitrid amphipods. Patches of bedrock outcrops on the lower shore and were colonised by mussels, *Mytilus edulis*, limpets, *Patella vulgata*, with sparse barnacles, the green ephemeral algae, *Enteromorpha* sp., the algae *Mastocarpus stellatus* and the dog whelk *Nucella lapillus* were sparse. A patch of kelp, *Laminaria* sp. was visable a few metres offshore but was not surveyed in detail.

At the south of the site, the shore was backed by a 10 m cliff of grass with the sea pink, *Armeria maritima*, on top of a 2 m base of bedrock. The bedrock had a very narrow yellow and green lichen zone and an extensive black lichen, *Verrucaria maura* zone. The base of the rock was scoured. A rocky outcrop on the lower shore to the south of the site was colonised by grass and *Armeria maritima* on the top with *Verrucaria* sp., *Porphyra* sp. and *Littorina saxatilis* below this. Lower down the rock supported *Mastocarpus stellatus* and *Enteromorpha* sp. The base of the rock was scoured with sparse *Patella vulgata*, barnacles, mussels *Mytilus edulis*, *Nucella lapillus* and *Enteromorpha* sp.

9.5.2. Landfall B

Landfall B has been selected to follow the same route as the Irish Fertilizer Industries Ltd (IFI) ammonia intake on the northern Arklow pier. The intake consisted of a large construction in the centre of the pier which was connected into pipes which ran westwards under the pier. The pipes surfaced at the main road where they were attached to the side of the pier wall above the high water mark, and ran under the Arklow bridge, and along the National Heritage Area (NHA) salt marsh. There was no littoral marine fauna or flora at this landfall site and was therefore beyond the scope of this study.

9.6. Discussion on the Benthic Flora and Fauna

The species recorded in the study area are commonly found on the east coast of Ireland (Ecoserve unpub. data, Picton and Costello, 1998). The substratum ranged from sandy shell and gravel generally to the west, north and south of the bank to coarse shell and gravel and some rock to the east of the bank.

The bank consisted mainly of sand, cobbles and with shells and pebbles at the northern end of the bank to fine sand at the southern end. Closer to Arklow Port the substratum was muddy sand.

The benthic surveys have shown that species diversity and abundance was highest in the areas of sandy shell and gravel with cobbles and generally occurred at the north-west and south-west of the bank and along the proposed cable route. The species richness was highest at the north-west of the bank and along the proposed cable routes where the reef building polychaete, *Sabellaria alveolata* was recorded.

The extent of the sabellaria species reef, from the work done to date, can be seen on the biotope map (Figure 9.4).

None of the species recorded in the survey area are uncommon, rare or are protected. All are commonly found on the east coast of Ireland (Ecoserve. Unpublished data, Picton & Costello, 1998). Species diversity was highest in areas of sandy shell, gravel and cobbles in the north-west, south-west and south-east of the Bank and inshore along the proposed cable route. Of interest was the occurrence of the reef building polychaete *Sabellaria alveolata* (the honey comb worm) and *S. spinulosa* (the ross worm) at the north west of the bank and at a site opposite Arklow Harbour. Both species were recorded from the same 'colonies' indicating that they can co-exist. *Sabellaria* species consolidate the sedimentary seabed into hard "reef" like structures, providing additional habitats for colonisation. George & Warwick (1985) and the National Rivers Authority (1984) found that sites with *Sabellaria* sp. had more than twice as many species and almost three times as many individuals as sites with low or no *Sabellaria* present. *Sabellaria alveolata* was also recorded from dredge site number 13 on the east of the Bank (from the September and April surveys), but was not abundant.

The community *Sabellaria* forms is noted as important by the Marine Conservation Society (Gubbay 1988) and NCC (Davidson *et al.* 1991). Although no statutory conservation status has been assigned to it. However, 'reefs' are recognised as a priority habitat in the EU Habitats and Species Directive and Dúchas, the Heritage Service have recently designated the Wicklow Reef, just north of Arklow Bay, as a proposed candidate Special Area of Conservation (pcSAC) because of the *Sabellaria* sp 'reef' present. *Sabellaria* spp. however has been recorded at several other subtidal locations along the east coast of Ireland (EcoServe, unpublished data), suggesting it is not restricted to the Arklow Bank area and is likely to be under recorded in Irish waters (Chris Emblow pers. comm.).

At the present stage of planning it is not envisaged that the cable routes will pass through the *Sabellaria* 'reefs' and thus will not impact upon them. However, should these routes change and cross the *Sabellaria* 'reefs' they will be impacted upon. However the Marine Life Information Network (MarLIN) initiative in the UK (MarLIN 2001) consider that the recovery of *Sabellaria alveolata* and *Sabellaria spinulosa* to substratum removal is moderate (only partial recovery is likely within 5 years and full recovery is likely to take up to 10 years) and high (full recovery will occur but will take many months [or more likely years] but should be complete within about five years) respectively.

MarLIN considers the sensitivity of both species of *Sabellaria* to smothering by sediment to be low (i.e. up to several weeks burial with no effect) with immediate recoverability (within a few days of being uncovered). It also considers both species to have low sensitivity to suspended solids. However although recoverability for *S. spinulosa* is considered immediate, for *S. alveolata* the recoverability from the effects of suspended solids is considered very high (full recovery is likely within a few weeks or at most 6 months).

Very few species were recorded from sites on the bank itself. Here the substratum consisted mainly of clean mobile sand with shell and gravel. The species found on the bank include hydroids, bryozoans, hermit crab and the occasional sand eel.

The greatest number and diversity of species of fish recorded within the study area was on the western side of the bank and in the area of the proposed cable routes. The summer and autumn sampling in 2000 recorded 11 species of fish, which were predominantly bottom feeding species and large in size with the smallest being 20cm. The dominant species of fish recorded in June 2000 were rays. The September 2000 sampling found poor cod, small pelagic fish, pogge and dragonet. Only two fish species were recorded during the April 2001 survey.

The zooplankton species recorded from the survey area are typically found in coastal areas of the Irish Sea (Williamson, 1956; Gowen *et al*, 1998). The dominance of calanoid copepods in autumn and the high abundance of benthic invertebrate larvae, such as barnacle nauplii and bryozoans in spring, are a common feature of coastal waters. The most numerous copepod species found in the samples were *Centropages hamatus* and *Temora longicornis*, both of which are usually common along the Irish Sea coast. The other zooplankton species observed in both autumn and spring samples are also very common in this region with no particular species of conservation importance or unusual zooplankton species of Atlantic origin present.

The fish eggs recorded from the spring survey could not be identified. Fish eggs are notoriously very difficult to identify to species level particularly if they do not present any distinct morphological feature and if the embryo is at a very early stage of its development as was the case. However, in the western Irish Sea, the majority of fish larvae belong to cod (*Gadus morhua*), whiting (*Merlangius merlangus*), sprat (*Sprattus sprattus*) dab (*Limanda limanda*), witch (*Glyptocephalus cynoglossus*), *Callionimidae* and *Gobidae*. These fish species spawn in shallow (< 40 m) vertically mixed waters 15-25 km off the Irish coast during late March to May whereas the newly settled 0-group fish larvae appear in late summer early autumn (Nichols *et al*., 1993).

Although, none of the coastal copepods recorded are of conservation importance they represent a very important food source for first feeding fish larvae and thus for the productivity of a region (Brander and Dickson, 1984).

The phytoplankton species recorded around the Arklow Bank are distinctive because of the dominance of diatom species, as opposed to dinoflagelate species, and the very heavy sediment load at all seasons. The presence of benthic diatom forms such as *Bacillaria* sp., *Odontella* sp. and *Paralia* sp. and relatively few dinoflagellate species (*Ceratium* sp. and *Protoperidinium* sp.) are typical of a well mixed water column where stratification does not occur due to strong tidal currents. Such currents re-suspend huge quantities of bottom sediments and their associated diatom flora. The absence of water stratification inhibits the development of dinoflagellates.

In general species diversity and abundance was low from all of the surveys. This may be due to the heavy sediment load in the samples which reduces the availability of light for phytoplankton species and made sample examination difficult. This reduced availability of light will in turn reduce the depletion of nitrate and phosphate due to light induced growth of plankton. The heavy sediment load reflects the strong tidal mixing and absence of stratification that is known to be characteristic of the south-west Irish Sea. Satellite imagery of the coast off Arklow suggest a moderate algal concentration and very obvious plumes of sediment running parallel to the coast. Wafar *et al.* (1987) have described the biological oceanography of such well mixed coastal water. They note that the spring bloom is not well developed and algal biomass is most developed in mid summer. Similarly nitrates and phosphates are only depleted by late summer. While diatoms are the dominant type of phytoplankton. This type of phytoplankton cycle appears to match the cycle off the Arklow Bank. It should be noted that such an environment is unusual in Irish coastal waters where generally weak tidal currents result in water stratification, early Spring blooms and large dinoflagellate blooms in Autumn.

The phytoplankton samples from the surveys were similar and were dominated by diatoms, with *Guinardia* and *Rhizosolenia* being common. This is unusual compared to the Atlantic coast where *R. shrubsolei* is the commonest species present. All these species have a similar form, being large, cylindrical diatoms with many small chloroplasts. This may be an adaptation to the well mixed, but sediment laden water which probably results in light rather than nutrient shortage. None of the species recorded are known to be of conservation or toxicological interest.

The lack of a marked seasonal succession suggests that hydrographic conditions do not change greatly during summer. One unusual species, the large *Rhizosolenia robusta*, occurred at the north west of the Bank during the Autumn survey. This is a warm water species but may also prefer the mixed water of the Irish Sea, rather than the stratified water of the west coast. This species has only been recorded once before in Irish waters (Cillian Roden, unpublished data).

One of the earliest studies of Irish phytoplankton was conducted at the South Arklow Bank light ship in 1904 (Gough 1906). This survey differed from the present investigation in that samples were collected by net rather than a water bottle, and samples were taken every 14 days. More species were recorded by Gough, although this is primarily due to the different sampling technique used. However the same general pattern of common diatoms and relatively few dinoflagellates occurred in both surveys. The benthic diatom species *Bacillaria* sp., *Odontella* sp. and *Paralia* sp. were as frequent in 1904 as in 2000. Of the 23 species recorded during the present survey, only five species were not recorded in 1904 and these were probably too small to be taken in the coarse net used by Gough.

In conclusion, the plankton around the Arklow Bank is distinctive in comparison to other Irish coastal waters and has persisted for at least the last hundred years. The very heavy sediment load reduces light penetration so it is possible that any extra disturbance will not greatly affect the existing biota. However it is anticipated that a reduction in tidal current speed would affect the ecology of the plankton.

The shore at Landfalls A consists of a sandy, gravely beaches with rocky outcrops which are typical along this stretch of the east coast of Ireland (Ecological Consultancy Services Ltd, EcoServe 2001). Very few species of flora or fauna were recorded from the site. The sediment provides an unsuitable habitat for macroinvertebrates as it is coarse and mobile and only supports talitrid amphipods (sandhoppers). The small rocky outcrops are scoured by the sediment, making it difficult for species to colonise. Larger rocky outcrops are only scoured at the base and support the most species at the site, mostly sand scour tolerant species such as barnacles and limpets and ephemeral green algae. No rare species or species of conservation importance were recorded. Previous surveys in the area conducted by the SensMap survey in 1997 recorded a similar range of species (Ecological Consultancy Services Ltd, EcoServe 2001).

The siting of the IFI ammonia intake on the harbour wall meant that no littoral marine fauna or flora occurred there (Landfall B). Once the route linking into the IFI intake has been established it may be necessary to conduct further littoral surveys.

9.7. Impacts of the Development on the Marine Benthos

Two types of impact will be described, the temporary impact during construction and the permanent impacts during the operation of the wind park.

9.7.1. Temporary Impacts During Construction

The preliminary engineering design has been completed for the wind park. As discussed in previous sections, three main types of foundation; caissons, monopiles or tripods, will be used in this development. The temporary impacts of the concrete caisson foundations will be greater than the monopile or tripod type foundations. Placement of the caissons will mean that sediment will be suspended. However as the species in this area are already naturally adapted to a very high suspended solids concentration and elevations during storm conditions, it is considered that this temporary impact will not have a detrimental effect on any of the marine benthos.

The habitats and feeding grounds around the cables will be lost and disturbed during the placement of the cables. As a result sensitive species and spawning grounds may also be temporarily lost. However, these impacts will be minimal as the area disturbed will represent a small proportion of the entire area within the study area. When the trenches are backfilled habitat recolonisation will commence again and through time will return to their original state. Some mobile species such as the Sabellaria, reef building polychaete recorded at the north west and west of the bank will be disturbed during the cable laying operation. In general the fish species identified are mobile and will readily move from one area to another if disturbed or if the environmental conditions are not suitable.

Species of macroinvertebrates may also be lost as a direct result of loss of feeding and spawning grounds. Mussel sea beds have been located on the north-western side of the Arklow Bank and south of Mizen Head. Mussel seed is normally fished between the periods June and July. These mussel beds will only suffer temporary disturbance provided that cable laying during the months of June and July in this area can be avoided. Discussion held with Bord Iascaigh Mhara are described in detail in Chapter 8 of this EIS.

Noise pollution from activities such as seismic and drilling during the construction phase of the wind park may disturb the surrounding marine fauna, particularly fish. The impact is likely to be minimal and short term and is mainly restricted to the construction phase. Impacts due to noise from the turbines in the operational phase is likely to be negligible.

Contamination of the seabed and seashore due to accidental spillage of pollutants, e.g. oil and other chemicals, or waste, e.g. litter, may occur during the construction phase. However, if suitable precautions are taken this should be minimal.

9.7.2. Impacts During Operations

There will be a permanent direct loss of seabed habitat from the 'footprint' of the turbine foundations. As a result non-mobile sensitive species occurring in the 'footprint' will be lost and mobile species utilising these habitats for feeding and spawning will lose this resource. However the total area of the turbine 'footprints' is likely to be low compared to the total available habitat in the area and these impacts are likely to minimal as they will be restricted to the 'footprint' of the turbine foundations.

Habitat may also be altered due to a change in water movement both locally around the base of the turbines.

The addition of substantial areas of hard substrata (the turbine foundations and tower bases), will provide a new habitat within the area. Areas of hard substrata are very limited on the Arklow Bank and it is predicted that the additional habitat will result in the colonisation by species new to the Arklow Bank. Areas of hard substrata are usually more diverse than mobile sediment and the turbine bases will quickly become colonised.

No long term impacts are predicted on the seashore at the landfall sites if habitats are reinstated.

The effects of noise and vibrations from turbines during the operational phase are not well documented. However, they may have an impact on fish and other species, although this is likely to be minimal.

Contamination of the area due to accidental spillage of pollutants or waste from vessels maintaining the turbines, may occur during the operational phase of the wind park. However, if suitable precautions are taken this should be minimal.

The effects of electromagnetic radiation from submerged electric cables are not well documented. However they may have an impact on fish and other species. Although this is likely to be minimal.

9.8. Mitigation Measures

The siting of the turbine foundations and cable trenches in low species diversity habitats will minimise the loss of species. Although the cables have been routed to avoid the habitats associated with the *Sabellaria* sp. which occur to the north west of the bank and the mussel seed beds. To minimise habitat loss and disturbance, efforts will be made to keep the area of seabed disturbed by the cable trench (at the landfall and sublittoral sites) and turbine foundations to a minimum. Following construction of the cable trenches, efforts will be made to restore habitats to their current condition, if impacted upon. Cable trenches will be filled to their pre-construction level, minimising changes in water flow regime, and with material of a similar particle size to allow recolonisation of benthic species.

Should a gravity caisson design be used for the turbine foundations, the design will consider the criteria used in the development of artificial reefs. This would maximise the potential of the foundation to be colonised by marine life including species of nature conservation importance.

To minimise the amount of suspended solids released into the water column during construction, efforts will be made to minimise the area of seabed and intertidal area disturbed. Where possible construction will be carried out over periods of slack tide to minimise the dispersion and removal of material from the area.

The cables are sited to avoid sensitive habitats, or high biodiversity habitats such as the *Sabellaria* communities recorded from the north and west of the Bank and therefore, the short term loss of species will be negligible.

Noise pollution will be kept to a minimum and the area of seabed impacted upon during dredging will be kept to a minimum.

Contamination of the area may occur due to accidental spillage of pollutants from onshore and offshore construction sites and boat traffic. The extent of the impact will depend on the volume and material that is spilt. To minimise the impact of pollution and waste it is necessary to minimise the likelihood of any spillage or contamination. This is discussed at length in Chapter 4. Potential contaminants will be stored in suitable storage facilities, such as bonded containers, both on land, and at sea.

Waste and litter generated during construction will be returned to the shore for authorised disposal at suitable facilities. Utmost care and vigilance will be followed to prevent accidental contamination of the site and surrounding environment during the construction of the wind park. Construction and on site operating procedures will be followed to the highest standard to minimise unnecessary disturbance and prevent accidental spillage of contaminants.

The Contractors will be required by the developer to prepare an environmental management system and a waste management plan during construction. This will ensure that strict environmental controls are put in place by the Contractors to ensure that the probability of an environmental incident is kept to a minimum. The waste management plan will facilitate the tracking of all wastes generated and disposed of both on-shore and offshore.

A monitoring programme for the pre-construction and operational phases of the wind park will be developed. Specific sites, such as those containing vulnerable or species of interest; e.g. *Sabellaria* species will be monitored prior and during the construction phase and on a regular basis during the operational phase of the windpark. Other sites at key locations around the development will also be monitored on a regular basis during the operational phase to detect any change in habitat or species composition. The colonisation of a selection of piles at the base of the turbines will also be monitored on a regular basis.

9.9. References

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10. BIRDS

10.1. Background

Sure Partners Ltd. plan to build an offshore wind park on the Arklow Bank off Co. Wicklow in the Irish Sea. It is envisaged that 200 turbines will be built over 4 to 5 years from 2002, generating 520 MW. The bank, which is between 8 and 13 km offshore, runs approximately NNE to SSW for 27 m roughly parallel to the Co. Wicklow coastline. It is about 2.5 km wide and, at it centre, 13 km from Arklow Pier.

Coveney Wildlife Consulting Ltd. was commissioned to carry out a survey of seabirds and marine mammals by Fehily Timoney and Company who are preparing an Environmental Impact Statement (EIS) in accordance with guidelines on offshore electricity generating stations issued by the Department of the Marine and Natural Resources (DoMNR 2000).

EU Directives 97/11 and 85/337 on Environmental Impact Assessment are implemented in Irish law by regulations (SI 93 of 1999). The DoMNR guidelines state that these regulations require the preparation of an EIS for projects of more than five turbines. The guidelines further state that the EIS is required so that the Minister for the Marine & Natural Resources can make a decision on the licensing of the project "*in the full knowledge of the project's likely significant impact on the environment*". According to the guidelines, information for the EIS can be obtained *inter alia* from previously published sources, field surveys, and consultation with relevant Government agencies and other bodies.

10.1.1. The Main Issues Relating to Seabirds and Marine Mammals

The seabird and marine mammal survey will provide the information required by the DoMNR to assess the likely significant impacts of the proposed development on these groups of fauna. The birds are discussed in this section while the marine mammals are addressed in Chapter 11 of the EIS. This report addresses the following issues: -

1. Description of the proposed development and the existing environment;
2. Description of aspects of the environment, relating to birds likely to be significantly affected by the development. Effects include direct, indirect, secondary, cumulative, short, medium, long-term, permanent and temporary; and
3. Mitigation measures during construction, operation and decommissioning.

10.2.1. Proposed Development Site

Two hundred turbines capable of generating greater than 2 MW are proposed along the Arklow Bank in depths of up to 30 m of water. Construction of the first phase of 30 turbines is planned in 2002. Individual turbines will be connected to offshore substations, which in turn will be connected to the electricity grid on shore by cables under the seabed. This will come ashore somewhere on a 4km stretch running north from Arklow.

The turbines will be spaced at intervals of 500 m from north to south and 350 m from east to west. The turbine towers will be up to 100 m high and the rotor diameters will be up to 120 m. Thus the blade tips will be 40 m above the sea at their lowest points.

A map of the Arklow Bank and the survey routes are shown in Figure 10.1. A description of the routes chosen for the survey are as follows:

1. The small green box encloses the unshaded "**Bank**" survey area. The large red box encloses the shaded "**Box**" survey area. The "**Cable**" route is shown in blue. Where, appropriate, these colour codes are used in later figures.
2. **Depths** in metres. Blue areas are less than 10m, white areas are greater than this. Land areas are in yellow.
3. Survey transects (in black) were done along 5 "**Legs**" numbered 1 – 5. Legs 2, 3 & 5 were normally surveyed in full on all days (full coverage was not achieved during initial survey runs and on the shortest winter days). On alternate survey days, either legs 1 and 4 or legs 1a and 4a were surveyed. Alternate legs were done to ensure a representative sample of the Box area.
4. To allow the identification of any localized concentrations of seabirds and marine mammals, Legs along the Bank were divided into 5km sections. Legs along the Box were divided in half. These divisions are indicated by **numbered waypoints (WP)**, that is fixed positions, along the survey routes.
5. Data from the **dashed sections** of legs 2 and 3 (i.e. between WPs 4 & 9 and between WPs 14 & 19, respectively) were used to estimate numbers and density of birds and marine mammals in the **Bank** area. Data from the **solid** extremities of legs 2 and 3 (WPs 3 – 4 & WPs 9 – 10 and WPs 13 – 14 & 19 – 20, respectively) and from legs 1 or 1a and 4 or 4a were similarly used for the **Box** area.
6. The "**LANBY**" or Large Automatic Navigational Buoy is located some 1.5 km SE of the Bank area. It is mounted on a circular floating platform, which was used as a roost by kittiwakes and terns during the summer. Much smaller numbers of these species roosted on two of the smaller buoys in the survey area, the "North Arklow" and the "South Arklow" at the extremities of the bank. Two other small buoys are located along the eastern side of the Bank between Legs 2 and 1a but we normally did not pass close enough to these to see if they were used as roosts.

Figure 10.1: Map of the Arklow Bank Area and the Survey Routes

10.3.1. Introduction

The DoMNR (2000) require a general description of the study area up to 20 km from the proposed wind farm and its cables to the shore. This can be based on existing information. As 20 km is not a biologically meaningful boundary in the context of seabirds and marine mammals, many of which range over much wider areas, the literature review normally covers the whole of Irish Sea with particular emphasis on studies closer to the project site. The review focuses on the most important species of bird found to date around the Arklow Bank in the field surveys.

The birds are: -

1. Red-throated Diver *(Gavia stellata)*
2. Fulmar *(Fulmarus glacialis)*
3. Manx Shearwater *(Puffinus puffinus)*
4. Gannet *(Sula bassana)*
5. Shag (*Phalacrocorax aristotelis)*
6. Little Gull *(Larus minutus)*
7. Common Gull (*Larus canus)*
8. Kittiwake *(Rissa tridactyla)*
9. Common Tern *(Sterna hirundo)*
10. Arctic Tern (*Sterna paradisaea)*
11. Guillemot *(Uria aalge)*
12. Razorbill *(Alca torda)*

10.3.2. The Arklow Bank's surroundings

The bank sits on a c. 20 km wide shelf in the western Irish Sea which slopes gently to some 40m before dropping off to depths in excess of 100m in the Celtic Trough. The bank is one of series of such shallow areas on the shelf running from Lambay Island off Co, Dublin to Carnsore Point in Co. Wexford. The substrates around the bank are mainly gravel or gravelly sand. Salinity off Co. Wicklow exceeds 34% unlike the eastern Irish Sea where there is a higher input of fresh water. The Arklow Bank is an area of high tidal stream amplitudes of up four knots at spring tides. In the field, this was regularly observed as an addition or subtraction of two to three knots to or from the boat's normal speed of 10 knots.

To the north, running from Dublin Bay to the southern tip of the Isle of Man, is the Irish Sea Front. This separates a deep basin in the western Irish Sea that is thermally stratified in summer from well mixed shallower waters in the eastern Irish Sea. To the south, the Celtic Sea Front forms the southern boundary of the Irish Sea (Begg & Reid 1997, British Admiralty 1991, Dickson & Boelens 1988, Holt et *al.* 1990, Mackie 1990, Marine Institute 1999).

10.3.3. Birds of the Irish Sea

Knowledge of breeding seabird sites and populations around Britain and Ireland has developed from surveys in the late 1960's and early 1970's (Cramp *et al.* 1974) and again in the mid 1980's (Lloyd *et al.* 1991). A further breeding survey, Seabird 2000, started in 1999 and will be completed in 2001. By comparison, information gathering on seabirds at sea developed later. However the work of the JNCC in the 1990's has provided good baseline information on seabird distributions in the Irish Sea at a broad scale (Pollock *et al.* 1997). A recent local study of seabirds on the Kish Bank off Co. Dublin showed that auk densities were up to 10 times the peaks recorded by JNCC and that tern densities were also higher than those of JNCC (Newton & Crowe 1999).

10.3.4. Offshore Conservation Status

Under the EU Birds Directive (79/409), no offshore Special Protection Areas (SPAs) have been designated or proposed for marine birds listed on Annex I of the Directive. Listing on Annex I requires member states to take "*special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution*". Similar measures must also be taken for migratory species. All existing SPAs for these species relate to their breeding areas and waters immediately adjacent to them. Similarly there are no proposed Natural Heritage Areas for marine birds on the informal listings proposed to date.

Red-throated Diver

The red-throated diver has a circumpolar breeding distribution that reaches its southern European limits in Donegal. It nests on the edges of pools, lakes and sheltered marine inlets in treeless terrain. It winters on most European coasts from Norway to the northern Mediterranean. Its biogeographic population is 75,000. In Cos. Dublin, Wicklow and Wexford, the main wintering concentrations are in Wexford Bay, Brittas Bay and off the North Wicklow Coastal Marshes with mean peaks in the five winters to 1998/99 of 92, 47 and 28 birds, respectively. However, the national population is poorly known because the species is widely dispersed around the coast in smaller numbers and because accurate counts are dependent on very calm weather conditions (Colhoun 2001). JNCC only recorded it close to Dublin Bay and off south Wexford. The species does not normally come to land other than to nest. At sea it feeds by diving from the surface and catching fish. It flies at a range of heights. It was generally not recorded in the Irish Sea by JNCC because "seabirds at sea" type surveys do not record inshore species well. (Colhoun 2001, del Hoyo *et al.* 1992, Hutchinson 1989, Pollock *et al.* 1997).

The red-throated diver is listed on Annex I of the EU Birds Directive. It was listed by BirdLife International as SPEC 3, i.e. a species with an unfavourable conservation status whose global distribution is not concentrated in Europe. It received this listing because of a large decline in its breeding population due to loss and deterioration of breeding habitat and disturbance of breeding sites. It is not known to be threatened on its marine wintering areas. As with all marine species, however, oil spills are always a potential danger (Tucker & Heath 1994).

As with all bird species, the red-throated diver is protected in Ireland under the 1976 Wildlife Act. It was listed as a rare breeding species in the Irish Vertebrate Red Data Book (Whilde 1993). In BirdWatch Ireland's "red, amber green" categorisation of Irish birds it received an amber listing as a rare breeder and because of its SPEC 3 status (Newton et al. 1999). "Red" is defined as high conservation concern, "amber" as medium conservation concern and "green" as no concervation concern (Newton et al. 1999).

Fulmar

The fulmar is essentially a circumpolar species of petrel with Iceland as its European headquarters. Up to 250 years ago, it was largely confined to there and St. Kilda west of the Hebrides. However, it has since spread through the Faeroes and Britain and began to colonize Ireland from 1911. It now breeds around most of the country where ever there are cliffs. However, there are large gaps in its distribution along the mainly low coasts of the eastern counties. Some 1,400 pairs breed in Cos. Dublin, Wicklow and Wexford out of an Irish Sea population of 11,000 pairs, which in turn is some 0.15% of the biogeographical population of some 7.5 million pairs. The largest colonies are on Lambay Island (635 pairs) in Co. Dublin and on Great Saltee Island in Wexford with smaller colonies at Ireland's Eye, Howth (both Co. Dublin), Bray Head, Wicklow Head (both Co. Wicklow) and perhaps a scattering of pairs elsewhere. Other than at breeding sites, it does not normally come to land. It winters in the North Atlantic mainly north of a line from Brittany to New England. At sea it is normally a low flier which practices "dynamic soaring" to take advantage of differing wind speeds between waves and troughs. Densities in most of the Irish Sea are typically less than 1 bird/km^2 but a late summer concentration of greater than 5 birds/km^2 occurs at the Irish Sea front. It feeds at or near the surface on a wide variety of marine items including shrimp, squid, fisheries discards and carrion (del Hoyo *et al.* 1992, Hagemeijer & Blair 1997; Hutchinson 1989; Lloyd *et al.* 1991; Merne & Madden 1999; Nairn *et al.* 1995; Pollock *et al.* 1997; Pollock *et al.* 2000, Snow & Perrins 1998).

The fulmar's conservation status is secure in Europe and green in Ireland (Newton et al. 1999, Tucker & Heath 1994).

Manx Shearwater

The manx shearwater's global distribution is centered on Britain and Ireland, with the main breeding concentrations on Rhum off western Scotland, in Pembrokeshire in west Wales and on the Kerry Islands. Other than at Great Saltee it probably breeds irregularly in Cos. Dublin, Wicklow and Wexford. Some 150,000 pairs breed in the Irish Sea, mainly on the Pembrokeshire Islands. This is some 51% of the biogeographical population of 294,000 pairs. Other than at breeding sites it does not normally come to land, and then only at night to avoid gull predation because of its clumsiness in accessing its burrows. It winters mainly off the east coast of South America. At sea it is normally a low flier which practices "dynamic soaring" like the fulmar. It often "rafts" (i.e. roosts on the surface in flocks) in calm weather. Birds arrive back in the Irish Sea during March and April. Densities increase to 5 birds/km^2 by June and reach 10 birds/km^2 in the adjoining Celtic Sea near the Pembrokeshire colonies. By July and August they are spread throughout the Irish Sea in numbers and exceed 10 birds/km^2 off Pembrokeshire and on the Irish Sea front. In September, they concentrate even more on the Irish Sea front before departure by October. It feeds at or a little below the surface mainly on small fish, often in flocks (Begg & Reid 1997; Stone *et al.* 1994; other references as fulmar).

The manx shearwater is a migratory species requiring conservation measures similar to Annex I species. BirdLife International listed it as a SPEC 2, i.e. a species with an unfavourable conservation status whose global distribution is concentrated in Europe. It received this listing because of its localized distribution. It is not imminently threatened but colonies have been lost on islands invaded by rats. It was amber listed by BirdWatch Ireland as a localized breeder and because of its SPEC 2 status (Newton et al. 1999, Tucker & Heath 1994).

Gannet

The gannet's global distribution is centered on Britain, Ireland and Iceland. In Cos. Dublin, Wicklow and Wexford, the main breeding site is at Great Saltee with some 1,300 pairs. A new colony at Ireland's Eye in Co. Dublin is growing rapidly and had 106 apparently occupied sites in 1996 (Madden & Cooney 1997). Some 54,000 pairs breed in the Irish Sea, mainly in two large colonies at Grassholm in Pembrokeshire and at Ailsa Craig in Strathclyde. This is some 21% of the biogeographical population of 263,000 pairs. Other than at the breeding cliffs it does not normally come to land. In winter, it tends to migrate south, especially the young birds, which may reach the equator. However, considerable numbers also remain in our waters. At sea, it is often one of the highest flyers reflecting its habit of making spectacular dives to catch fish. Densities in the Irish Sea are typically 1–2 birds/km^2 but drop off markedly during November to February (other references as fulmar).

The gannet was listed by BirdLife International as SPEC 2 because of its localized distribution. It is not currently threatened and its population has increased considerably since the cessation of human exploitation for food early in the last century. It was amber listed by BirdWatch Ireland as a localized breeder and because of its SPEC 2 status (Newton et al. 1999, Tucker & Heath 1994).

Shag

The shag is an essentially European species ranging from the Barents Sea to the Mediterranean Sea and Morocco. Its population is centered on Britain with Norway, Iceland and Ireland also being important. In Cos. Dublin, Wicklow and Wexford, the main breeding sites are Lambay Island and the Saltee Islands. Over 1,700 pairs breed in Dublin and nearly 600 in Wexford but only 7 in Wicklow. A total of some 3,600 pairs breed around the Irish Sea, which is some 4% of the biogeographical population of 85,500 pairs. Shags breed on cliffs and rocky coasts. They feed on nearby marine areas and roost on land at night. They dive to catch fish. In our area they are mainly sedentary except for some juvenile dispersal. They are normally low flyers. JNCC recorded it year round close to Irish Sea coasts with densities of up 0.5 birds/km^2 off Co. Dublin.

The shag's conservation status is secure in Europe and green in Ireland (Newton et al. 1999, Tucker & Heath 1994).

Little Gull

The little gull's breeding distribution extends in three disjunct areas from Scandinavia to eastern Siberia. There is also a small population in North America. It breeds on inland marshes and winters offshore. Its main European wintering areas are around the Mediterranean, Black and Caspian Seas. The biogeographical population is only 25,000 pairs (Colhoun 2000). There were only 15 records of little gull in Ireland prior to 1950. However, numbers have steadily increased since then. Nowadays, a wintering concentration off Co. Wicklow, which may be linked to a concentration in Liverpool Bay is considered to be the largest in northwest Europe. This was initially identified through observations of flocks off Co. Wicklow during wet weather with strong winds from the south or east. Since then, most records of the species have been concentrated along a 35km strip of coast between Wicklow Harbour and Dun Laoghaire. Peak flock sizes were typically less than 300 during the 1970's and 1980's but reached 600 by the early 1990's (Madden & Ruttledge 1993). High numbers continued through the 1990's and peaks of 604 and 830 birds were recorded at Wicklow Harbour in January 1995 and January 1998, respectively. However, the occurrence of large numbers close to land has remained sporadic. During these periods, they may feed and roost in or near Wicklow Harbour (McAdams *et al.* 2000, Whelehan 1995).

Recently, similar concentrations have been reported off western Denmark (Noer *et al.* 2000), which is consistent with reports of a northward extension of the wintering range. At sea, it flies slowly into the wind low over the water feeding on small items taken from the surface. The diet of wintering birds is unknown, but probably comprises marine invertebrates and small fish (Cramp & Simmons 1982). JNCC recorded winter densities off Co. Wicklow and in Liverpool Bay of up to 0.5 birds/km^2 (Other references as fulmar).

The little gull is a migratory species requiring conservation measures similar to Annex I species. BirdLife International listed it as a SPEC 3, on the basis of a moderate decline in its European breeding population. The main threats are natural and man induced flooding of breeding sites and recreational disturbance. It was amber listed by BirdWatch Ireland because of its internationally important wintering population localized on the Wicklow coast and because of its SPEC 3 status (Newton et al. 1999, Tucker & Heath 1994).

Common Gull

Although the common gull breeds across a large swathe of the northern temperate zone from Iceland through northern Europe to Siberia and western North America, 80 – 90% of its population is concentrated in northern Europe. Most populations migrate to warmer areas such as the Mediterranean and the Persian Gulf but they are less migratory in northwest Europe. It usually breeds near coasts or inland wetlands. JNCC give the biogeographic population as 124,000 pairs but Wetlands International lists it at 530,000 (Colhoun 2001). In Ireland some 900 pairs breed on the north and west coasts from Down to Kerry and a further 2,700 pairs breed inland in western counties. Some 67,500 birds winter around all coasts of Ireland (Lack 1986). There are estuarine concentrations exceeding 1,000 birds in Cork, Donegal and Wexford. The most important of these is on the North Wexford Coastal Marshes with a five year mean peak to 1998/99 of 2,900 (Colhoun 2001). JNCC recorded coastal concentrations in winter of up to 1 bird/km^2 mainly off Dublin and Wexford. Wintering birds mainly feed on earthworms but they exploit a variety of other habitats such as landfills and marine areas. At sea it flies at a variety of heights (Other references as fulmar).

The common gull is a migratory species requiring conservation measures similar to Annex I species. BirdLife International listed it as a SPEC 2, on the basis of a moderate decline in its European breeding population for reasons which are unclear. It was amber listed by BirdWatch Ireland because of its SPEC 2 status (Newton et al. 1999, Tucker & Heath 1994).

Kittiwake

The kittiwake is by far the most abundant gull with a circumpolar distribution. In Cos. Dublin, Wicklow and Wexford some 10,000 pairs breed on cliffs with the main sites at Lambay Island (4,000 – 5,000 pairs) and at Great Saltee. There are smaller colonies at Bray and Wicklow Heads, with fewer than 1,000 pairs at the latter (BirdWatch Ireland information). The Irish Sea population is some 35,000 pairs, which is some 1% of the biogeographical population of some 3 million pairs. The species is mainly pelagic and moves west into the Atlantic during the winter. Some regularly come to roost on land, however. When feeding at the surface it often flies low over the water. However it flies higher on other occasions. Kittiwake densities in the Irish Sea are lowest in February and March, typically less than 1 bird/km^2. They rise to 5 birds/km^2 in June and July off Dublin and north Wicklow and go higher than this in late summer around the Irish Sea Front. Kittiwakes feed mainly on small fish such as sandeels and clupeids, and also take crustaceans and fisheries discards. (Begg & Reid 1997, Cramp & Simmons 1982, other references as fulmar).

The kittiwake's conservation status is secure in Europe and green in Ireland (Newton et al. 1999, Tucker & Heath 1994).

Common Tern & Arctic Tern

Common terns breed in mid-latitudes across most of Eurasia and North America and winter on most tropical and southern hemisphere coasts. Some 680 pairs breed in Cos. Dublin and Wexford mostly at Rockabill and at Ladys Island Lake, respectively with the balance at two small colonies in Dublin Bay (Hannon *et al.* 1997). The Irish Sea population is 3,200 pairs, which is some 2.6% of the biogeographical population of 122,500 pairs. Terns normally dive for small fish but from lower heights than gannets. They often fly relatively high.

The arctic tern is very similar to the common tern but as its name suggests, has a more northerly circumpolar breeding distribution. The Irish breeding population is the most southerly in Europe. It is a famous long distance migrant to Antarctic waters. Some 220 pairs breed in Cos. Dublin and Wexford. Of these 150 are at Ladys Island Lake in Wexford, 50 are at Rockabill in Dublin and the balance are at two small colonies in Dublin Bay (Hannon *et al.* 1997). The Irish Sea population is 1,350 pairs, which is some 0.15% of the biogeographical population of 900,000 pairs.

Data for common and the similar arctic tern (see next species) were presented together by JNCC because they are often difficult to separate at sea. Densities of up 0.5 "commic" terns/km^2 occur in the Irish Sea in late summer, and somewhat higher north of Dublin Bay. Several thousand of both species also use an evening roost on Sandymount Strand in Dublin Bay from late July into September. The feeding areas of the birds using this roost are not known although it is presumed to be the shallow offshore banks in the Irish Sea. Some evidence such use of the Kish Bank was obtained in 1999 (Newton & Crowe 1999 & 2000; other references as fulmar).

Both the common and arctic terns are Annex I species on the EU Birds Directive. The conservation status of both is secure in Europe. Both were amber listed by BirdWatch Ireland as localized breeders (Newton et al. 1999, Tucker & Heath 1994).

Guillemot

Guillemots have a circumpolar breeding distribution at temperate to Arctic latitudes and disperse across continental shelf waters at similar latitudes in winter. Some 76,000 individuals breed in Cos. Dublin and Wexford, with perhaps 500 in Co. Wicklow, mainly at Wicklow Head. The main site is Lambay Island with 60,000, second only to Rathlin Island in Ireland. Great Saltee has about a third as many as Lambay. The Irish Sea population is 162,000, which is some 5% of the biogeographic population of 3.3 million. Other than at the breeding cliffs it does not normally come to land. At sea it is normally a low flier and is flightless for some weeks after the breeding season, while moulting it wing feathers. The chicks jump from the cliffs when about one-third grown and complete their development at sea, usually accompanied by the father. They feed on small fish that they catch by diving from the surface. They are present in the Irish Sea all year round but densities of 50 to 100 birds/km^2 build up from July along the entire east coast. By September these have concentrated around the Irish Sea front. From October they disperse around the coast and into the Celtic Sea (Begg & Reid 1997; other references as fulmar).

The conservation status of the guillemot is secure in Europe. It was amber listed by BirdWatch Ireland as a localized breeder (Newton et al. 1999, Tucker & Heath 1994).

Razorbill

Razorbills are restricted to the cool temperate to Arctic zone of the Atlantic with Iceland as their stronghold. They show a partial southern migration as far as Mediterranean latitudes. Some 8,500 individuals breed in Cos. Dublin and Wexford, with perhaps 100 in Co. Wicklow, mainly at Wicklow Head. The main sites are Lambay Island with 4,300 and Great Saltee. The Irish Sea population is 16,600 which is some 2% of the biogeographic population of 858,000. Its habits are very similar to the guillemot, as just described. They are present in the Irish Sea year round but densities well in excess of 5 birds/km^2 build up in July east of Co. Wicklow. However, they do not share guillemots' marked preference for the Irish Sea Front later in the summer (Begg & Reid 1997; other references as fulmar).

The conservation status of the razorbill is secure in Europe. It was amber listed by BirdWatch Ireland as a localized breeder (Newton et al. 1999, Tucker & Heath 1994).

10.4. Ecology of the Arklow Bank in relation to birds and marine mammals

Prior to this EIA, the Arklow Bank did not attract much attention from ecologists. It is well away from high interest features such as the Irish Sea and Celtic Sea Fronts. It is presumably not a coincidence that major seabird colonies of auks on Lambay Island and terns on Rockabill Island are both near the Irish Sea Front. The bank is also well away from the main shellfish grounds and the spawning grounds of cod, whiting, plaice, sole and herring. On the Irish coast these are concentrated between Dublin Bay and Co. Down (Hillis & Grainger 1990). Indeed, the Arklow Bank's main claim to fame to date is for wrecking ships (Bourke 1994).

10.4.1. Observations during this project

In places the ridge is within a few metres of the surface and the Admiralty chart shows a spot which "dries" some 6 km from the northern end, just south of the line joining waypoints 8 and 18. At sea, the bank is often clearly identifiable by the "break" in the water between the shallowest areas over the ridge and surrounding deeper waters. In near calm or light wind conditions, this break is obvious as the boundary between shallower water with waves and calmer deeper water. In rougher conditions, these waves often break giving rise to a line of surf especially around the shallower parts of the bank. Surf lines are most noticeable at low tide.

On 5 July 2000 a special visit was made to the area marked "dries" (west of WP 18) at a spring low tide at 08.00 in near calm conditions (tides in Wicklow Harbour are 41 minutes earlier than Dublin Port; Dublin Port 2000). However, no land was observed in the area during this visit. It is possible that this spot no longer dries as changes regularly occur in recorded depths (British Admiralty 1991, G Hunter (boat skipper), pers. comm.).

10.5. Conservation Designations and the Arklow Bank

10.5.1. Main Conservation Designations

Special Areas of Conservation (SACs) arise from the EU Habitats Directive (92/43) and are designated to maintain or restore the favourable conservation status of threatened habitats and species as listed in Annexes I and II of the Directive. Species listed in Annex II that might occur in the survey box are grey seal, bottle-nosed dolphin and harbour porpoise. Developments in SACs must be subject to appropriate assessment such as EIA and can only proceed if they do not adversely affect the integrity of the site. If they do, mitigation and/or compensation measures must be put in place.

Special Protetection Areas (SPAs) arise under the EU Birds Directive (79/409) and designated to protect the most important sites for threatened (Annex I) and migratory bird species, e.g. Ramsar sites (see below). Threatened species such as divers and migratory species such as manx shearwater occur in the survey area. Developments in SPAs must proceed on the same basis as those in SACs.

Natural Heritage Areas (NHAs) will arise as the recent Wildlife Amendment Act (2000), comes into force. They will cover a range of sites of wildlife value not meeting SAC and SPA criteria. Developments in NHAs will probably be allowed to proceed under somewhat less strict terms than in SACs and SPAs.

Ramsar sites are internationally important wetlands under the Ramsar Convention – signed in the Iranian town of that name in 1971. One of the criteria for international importance is that the site regularly (i.e. over a period of five years) holds 1% of the biogeographic population of a species or 20,000 individuals.

10.5.2. Current Designation Status of the Arklow Bank

Currently, none of the Arklow Bank or the surrounding 5 km box is designated as or proposed for designation as a Special Area of Conservation (SAC), or a Special Protection Area (SPA), or a Natural Heritage Area (NHA) or as a Ramsar site. However, there is a proposed marine SAC at Wicklow Reef in the vicinity of Wicklow Head, which will just overlap the NW corner of the Box. In general, however, work on designation of offshore areas has hardly begun compared to terrestrial and coastal areas.

However, it should be also noted that the series of banks off the east coast, including the Arklow Bank, would appear to qualify as "*Sandbanks which are slightly covered by sea water all the time* [less than 20m]" (Habitat code 1110) in the European Commission's "*Interpretation Manual of European Union Habitats*". Characteristic animals listed for such sites are red-throated divers, which use them as wintering habitats (European Commission DG Environment 1999). All of these banks were recently proposed as SACs by the voluntary nature conservation organizations in an analysis of Irish progress to date in implementing the EU Habitats Directive (Dwyer 2000). On the basis of past experience, Duchás is likely to come under pressure from the European Commission to evaluate these banks for SAC designation in the next few years.

This study was carried out in accordance with the requirements of the EU Habitats Directive (92/43) to ensure compliance with any future designations that may arise.

10.5.3. Designations around the Arklow Bank

There is a series of coastal proposed NHAs along the east coast in Cos. Dublin, Wicklow and Wexford, some of which have SPA and/or SAC status also. Most are wetlands designated on the basis of their wildfowl and wader populations. No more than a handful of waders and no wildfowl have been observed to date on the survey and it is considered that the project will have no significant impacts on the birds of these coastal wetlands.

The local small seabird colonies at Wicklow Head and Bray Head are also proposed NHAs as are the major seabird colonies at Lambay Island and Rockabill in Co. Dublin. The latter are also SPAs.

10.5.4. Conservation Requirements in Designated Areas

While possible designation of the Arklow Bank as an SPA or SAC on the basis of the results obtained during this survey is a matter for Dúchas, consideration of the potential impacts of this project has been undertaken in the context of the EU Habitats Directive. By doing this from the start, the manner in which nature conservation issues are dealt with will be compatible with whatever designations may apply in the future.

Articles 6.3 and 6.4 deals with proposed developments in SPAs and SACs. For offshore developments such as this that require a foreshore licence, the Habitats Directive is implemented by Section 31 of the Natural Habitats Regulation (94/97).

Section 6.3 says:

Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.

Section 6.4 says:

"If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.

Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest."

The European Commission has provided detailed guidance on the implementation of these provisions (European Commission 2000).

10.6. Field Survey

10.6.1. Survey Methodology

The JNCC survey method for seabirds and marine mammals was used in this study (Komedeur *et al.* 1992, Tasker *et al.* 1984, Webb & Durnick 1992). The JNCC (Joint Nature Conservation Committee) is a UK body that co-ordinates the work of statutory nature conservation agencies in England, Scotland and Wales. One of its longstanding undertakings is the Seabirds at Sea survey project around Britain and Ireland. The JNCC method was also used in BirdWatch Ireland's Kish bank survey (Newton & Crowe, 1999), with minor modifications.

Caroline Weir, an experienced JNCC surveyor, trained the author and an assistant in these methods on 3 July 2000 during the first survey run.

The basic methodology is to record all birds in a 90° scan from dead ahead out to 300m on one side of the boat. Within this transect most or all birds can be picked up with the naked eye. Binoculars of 7x or 8x magnification were used to scan for missed birds and to confirm identifications. Within the 300m transect, birds were assigned to 100m bands (A = 0 – 100m, B = 100 – 200m, C = 200 – 300m). This assignment allowed assessment of the efficiency of detection rates of species in the outer parts of the transect. This is of particular importance for the less conspicuous species. Distances were estimated using a simple range finder made by marking a transparent plastic ruler according to the method of Heinemann (1981). Rare or more conspicuous birds beyond the 300 m transect were also recorded but were normally excluded from analyses.

JNCC analysis of these methods has shown that inclusion of all flying birds may lead to significant overestimates. Therefore, scans for flying birds were made every minute (using a timer) and only those seen during the scan and within the 300m transect were recorded as "in transect" and used for analyses. This method was not fully applied until the sixth survey visit and all flying birds from the first five surveys were included in the analyses. This may lead to a small over estimate of those species that were mainly in flight.

Birds flying above the eye level of the observer (7m) were recorded as "high", to give an indication of the species most vulnerable to collisions with turbines. Estimating the height of seabirds at sea is difficult, so this approach was considered more reliable than trying to estimate whether birds were flying above 30m (the distance to which the turbine blades will approach the sea surface). As the majority of most species flew below this height, it is considered that the fraction of flying birds above 7m provided a useful data set for a "worst case" analysis.

Wind force and direction, precipitation, visibility, sea state and swell height were recorded at the start and end of each leg of the route. Nearby shipping, evidence of human use (e.g. fishing floats, litter etc.), the occasional non-seabird species, and anything else of note.

For most bird species, the level of use of the Arklow Bank by seabirds is typical of the surrounding study area (the Box) and the western Irish Sea. The main exceptions to date are little gulls and red-throated diver, both migratory species. Peak mid-winter numbers on the Bank were over 1,200 and 250, respectively. Both species favoured the Bank very considerably over the Box. However, little gulls virtually disappeared from January to March before showing a smaller peak in April. One of the few wintering concentrations of little gulls in north west Europe occurs in the Wicklow area and up to 830 birds have been sporadically recorded on the coast in recent years. It seems likely that the Bank is an important feeding area in the early to mid-winter period. Prior to this study, it was not known where these birds fed. The concentration of red-throated divers on the Bank, if it is shown to occur regularly, may be the most important in the country. The next most important bird species were guillemots and razorbills, which used the Bank and Box equally. Feeding studies indicated that the little gulls, as well as kittiwakes which showed a similar pattern of occurrence, may be feeding on northern krill. As this shrimp like species normally migrates to deeper water by day, it may be being washed up on the Arklow Bank in bad weather.

10.6.2. Survey Boat

The boat used was the MV Kilquade out of Wicklow Harbour owned and skippered by Gordon Hunter, of Hunter Marine Ltd. It is a 24m former Royal Navy tender capable of some 10 knots. In 1996, the JNCC found this boat met their requirements for seabird and marine mammal surveys.

10.6.3. Survey Routes

The survey route was set up on 3 and 5 July 2000 (see Figure 10.1). Depending on tides and weather, this route takes 11-12 hours to cover from port to port. It was not possible to complete the whole route during the months November to January inclusive, as daylength was too short (Table 10.1).

The latitude and longitude of all waypoints (WP) in Figure 10.1 were entered on the boat's global positioning system (GPS) and in the surveyors' handheld GPS. This was a Garmin GPS II Plus set on the WGS 84 datum. The time of arrival at each waypoint was recorded by the observer and communication was maintained between the observer and wheelhouse in relation to position.

"**Bank**" transects comprise legs 2 and 3 except for the 5 km sections at each end. There is up to 1 km between the bank transects directly over the Arklow Bank itself. During these legs, the boat is travelling in roughly 25 to 30 m of water to avoid uncharted shallow water. In practice, the bank transects deviate a little away from the Arklow Bank where they cross shallow water and towards it when where the skipper judges it is safe to do so. This means that the waters directly over the Arklow Bank are outside the transects. However, all bank transects were done looking towards the bank allowing it to be observed while surveying. This allowed concentrations of birds (e.g. little gulls) that were outside the transect to be recorded and added in to the analyses where appropriate.

The "**Box**" is composed of legs 1 or 1a and legs 4 or 4a, as well as the 5km sections at each end of legs 2 and 3. The use of alternate routes east and west of the bank allowed a more representative sampling of the Box area. The "**Cable**" route is a single run from just north of the town of Arklow due east to the bank.

To avoid any bias that might arise by doing each of the legs at the same time on each day (e.g. due to early morning or evening passage of seabirds along the coast), survey legs were done in different sequences and directions on different days. This randomization element was, however, constrained by avoidance of route sequences that resulted in observers looking into the sun. Weather also had to be taken into account in choosing the route on individual days. For example, on Trip 8 the same sequence of legs was chosen as on Trip 7 to take advantage of shelter from the bank when surveying legs 3, 4a and 5 as a south easterly wind blew up during the afternoon. In addition, all surveys were started at the north end of the Box because the boat was based in Wicklow Harbour.

Finally, the initial surveys showed that flocks of kittiwakes and terns used the large automatic navigational buoy (LANBY) some 2.7 km SE of the South Arklow buoy for roosting. Therefore, a diversion to it was made on the appropriate traverses between survey legs.

10.6.4. Survey Schedule

It was decided to carry out survey runs twice per month in the period July to September 2000. JNCC's work (Pollock *et al.* 1997) indicates that this is the time of the year when usage of the Irish Sea by seabirds is highest. From October the frequency was reduced to once per month. However, an extra standard survey was done in December using the Kilquade and three extra non-standard surveys were made between December and February 2000 using the engineers' boat, the Firehawk, out of Arklow. An initial familiarization visit to the bank area was made with on the EcoServe marine survey boat on 15 June 2000.

Details of standard survey runs are in Table 10.1. Dates were staggered during months surveyed twice to get a mix of tidal conditions – a fortnightly schedule could result in surveys being always done on neap tides, for example.

Table 10.1: Survey Conditions and Coverage (July 2000 – June 2001)

Table 10.1 Continued

10.7. Data Handling

Data for individual days was double entered into an Excel spreadsheet. Table 10.2 shows the basic data unit which was used for the commoner birds species for 5 km stretches along legs 2 and 3, and for 12.5 km stretches along legs 1/1a and 4/4a. The entire Cable route was treated as one unit. Double entry of the data and subtraction of one data set from the other minimized data entry errors. Several crosschecks were also set up to ensure internal consistency in the spreadsheet formulas. Similar spreadsheets were used for the rare bird species and marine mammals and the one turtle seen. As with the data entry spreadsheets, intermediate analysis spreadsheets were also set up in duplicate and subtracted from each other to minimize errors.

Table 10.2: Sample Data Entry Template for Main Bird Species

		Entry set 1								Entry set 2						Check set (Set 1 - Set 2)					
		Transect band								Transect band						Transect band					
		A	B	C	F	F	Total	Total	Total	A	B	C	F	F	Total	A	B	C	F	F	Total
Species	Code				in	out	set 1	set 2	chksm				in	out	set 2				in	out	chksm
Fulmar	F	1	1	1	1	1	5	5	0	1	1	1	1	1	5	0	0	0	0	0	0
Manx Shearwater	Mx	1	1	1	1	1	5	5	0	1	1	1	1	1	5	0	0	0	0	0	0
Gannet	Gan	1	1	1	1	1	5	5	0	1	1	1	1	1	5	0	0	0	0	0	0
Little Gull	LG	1	1	1	1	1	5	5	0	1	1	1	1	1	5	0	0	0	0	0	0
Kittiwake	Kt	1	1	1	1	1	5	5	0	1	1	1	1	1	5	0	0	0	0	0	0
Common Tern	CT	1	1	1	1	1	5	5	0	1	1	1	1	1	5	0	0	0	0	0	0
Arctic Tern	AT	1	1	1	1	1	5	5	0	1	1	1	1	1	5	0	0	0	0	0	0
"Commic" Tern	CCT	1	1	1	1	1	5	5	0	1	1	1	1	1	5	0	0	0	0	0	0
Guillemot	G	1	1	1	1	1	5	5	0	1	1	1	1	1	5	0	0	0	0	0	0
Razorbill	Rz	1	1	1	1	1	5	5	0	1	1	1	1	1	5	0	0	0	0	0	0
Auk sp.	A	1	1	1	1	1	5	5	0	1	1	1	1	1	5	0	0	0	0	0	0
Sum row sums							55	55							55						0
Col. Sums		11	11	11	11	11	55	55		11	11	11	11	11	55	0	0	0	0	0	0
Checksums							0		0						0						0
Totals set 2		11	11	11	11	11															

Notes to Table 10.2 :

F(in) and **F(out)** are flying birds within and without the transect

"Commic" terns are unidentified common or Arctic terns

Auks are unidentified guillemots or razorbills

Data from individual survey units were assigned to the bank or box as appropriate and intermediate totals for these areas were calculated. These intermediate totals were then extrapolated according the proportion of the bank and box areas that were surveyed on the day - typically 37.5% of the bank and 5.7% of the box (no extrapolations were done on the cable data). Finally, species densities were calculated by dividing the extrapolated totals by the size of the area concerned. In the cases of little gulls and kittiwakes, flocks were often observed along the centre of the bank outside the transect. These flocks were counted separately and added at the end to the extrapolated totals. It should be noted that that totals for the bank, box and cable area cannot be directly compared as they refer to different sized areas of 40, 366 and 3.3 km^2, respectively. However, the densities for the three areas can be compared.

10.8. Results & Discussion

10.8.1. Survey Effort and Raw Numbers Recorded

Details of weather, route and the extent of coverage on each trip are given in Table 10.1. Surveys were normally done in good or fairly good weather to maximize detection rates. Other than on the first two days during when routes were set up, full coverage of the planned survey routes was normally achieved. The main exception was during the shortest winter days, when coverage of the Box and Cable routes could not be completed. Also, on 3 August 2000 coverage of the bank had to be reduced by 10% due to strong tides, which slowed the boat. Due to a boat breakdown, the late July 2000 visit was done over two days.

Table 10.3 summarizes the actual observations of the 12 commonest seabird species.

Table 10.4 summaries the occurrences of a further 16 species of seabirds which were sporadically recorded.

Table 10.3: Raw Numbers of Commoner Seabirds Recorded on All Days

Species	Box	Bank	Cable	Total	% Flying	No. days	LANBY[1]
Red-throated Diver[2]	12	117	2	**131**	82.4	8	0
Fulmar	52	35	6	**93**	84.9	16	0
Manx Shearwater	775	373	34	**1182**	38.3	12	0
Gannet	80	96	3	**179**	86.6	16	0
Shag	9	85	4	**98**	15.0	12	0
Little Gull[3]	80	301	57	**438**	44.5	11	1
Common Gull	44	30	32	**106**	66.2	6	0
Kittiwake[3]	440	2176	82	**2698**	64.4	18	902
Common Tern	41	21	0	**62**	32.3	7	84
Arctic Tern[4]	5	151	0	**156**	100.0	2	3
"Commic" Tern[4]	18	31	3	**52**	73.1	3	11
Guillemot	1686	2252	153	**4091**	8.9	18	0
Razorbill	447	465	42	**954**	3.8	18	0
Auk sp.[5]	493	502	38	**1033**	18.2	17	0
Totals	**4129**	**6520**	**420**	**11069**	**30.9**		**1001**

Notes to Table 10.3 :

[1] Birds on LANBY not included in the Totals

[2] All unidentified divers were treated as red-throated as no other species was definitely identified

[3] Additional observations of large flocks over Bank included in Figure 4.11 and 4.13, but excluded here

[4] Arctic & "commic" (unidentified common or Arctic) terns combined with common terns in later analyses

[5] "Auk sp." are either guillemots or razorbills – they were allocated in later analyses

Table 10.4: Raw Numbers of other Seabirds Recorded

Species	No.	No. days
Storm Petrel	4	4
Cormorant	51	6
Common Scoter	18	3
Eider	1	1
Pomarine Skua	4	3
Arctic Skua	11	5
Great Skua	5	3
Black-headed Gull	17	5
Mediterranean Gull	2	2
Lsr. Black-backed Gull	11	6
Herring Gull	32	13
Grt. Black-backed Gull	18	8
Sandwich Tern	7	3
Roseate Tern	1	1
Black Guillemot	1	1
Puffin	6	4
Total	**393**	

Table 10.5: Correction Factors

Species	JNCC 1995[1]	JNCC 2000[1]	This study	Sample size
Fulmar[2]	1.1	1.2	**1.0**	10
Manx Shearwater	1.3	1.1	**1.3**	720
Gannet[2]	1.0	1.0	**1.0**	24
Shag[3]	1.1	1.1	**1.0**	n/a
Little Gull	1.4	1.2	**1.3**	243
Common Gull[3]	1.4	1.2	**1.0**	n/a
Kittiwake	1.4	1.2	**1.0**	940
"Commic" Tern[2]	1.7	1.7	**1.0**	56
Guillemot[4]	1.4	1.3	n/a	n/a
Razorbill[4]	1.5	1.3	n/a	n/a
Auk sp.[4]	1.5	1.3	**1.4**	5455

Notes to Table 10.5 :

[1] Stone *et al.* 1995 and Pollock *et al.* 2000.

[2] Fulmar, gannet, & "commic" tern factors calculated as < 1.0

[3] Correction factors not used for these species.

[3] All auks were pooled for correction factor calculation

Table 10.6: Bird Unit (BU) Thresholds

Species	BU[1]	RBU[2]
Red-throated Diver	750	n/a
Fulmar	226,000	340
Manx Shearwater	8,800	4,300
Gannet	7900	1,600
Shag	2,600	n/a
Little Gull	750	n/a
Common Gull	3,700[3]	n/a
Kittiwake	95,000	1,050
Common Tern	3,700	97
Arctic Tern	27,000	n/a
Guillemot	50,000	2,400
Razorbill	13,000	500

Notes to Table 10.6

[1] BU = Bird Unit (individuals)

[2] RBU = Regional Bird Unit (individuals)

[3] 15,900 is Wetlands International Figure

10.8.2. Correction Factors and Definition of Bird Units

For the commoner seabirds, correction factors (Table 10.6) were applied. These take account of birds that may have been missed in the more distant parts of the transect. They are calculated according to the formula 3nA / (nA + nB + nC) where nA is the number of birds seen in the nearest 100m of the 300m transect, nB is the second 100m and nC is the outermost 100m (Pollock *et al.* 2000). Normally a sample size of at least 1,000 observations is required for this correction. To date, this has only been achieved for auks and it is reassuring that this study's auk correction factor fell within the range obtained by JNCC. The next commonest species was kittiwake with 940 eligible observations. The correction factor obtained of 1.0 was a little lower than JNCC for unknown reasons. The third commonest species, manx shearwater with 720 observations fell within the range observed by JNCC as was that of little gull. Sample sizes were too small for remaining species to judge the validity of the correction factors obtained (Pollock *et al.* 2000; Stone *et al.*1995). Correction factors were not applied to either flying birds or birds on the LANBY.

As guillemots and razorbills are difficult to separate with increasing distance, many were recorded as "auk sp.". These were divided up amongst the two species according to the ratios observed on each survey trip. The overall ratio was 81.0 to 19.0 but this varied from day to day (see the species accounts). Arctic and common terns can be similarly difficult to identify. However, the only definitely identified arctic terns in the summer and autumn were three on the LANBY. Therefore all "commic terns" noted along the survey routes during the this period were taken as common terns. In contrast virtually all terns seen in the spring were arctic terns.

To allow quantitative species comparisons and assessment of the aggregate bird usage of the study area, the concept of "bird units" (**BU**) was developed (Table 10.6). For each species, one BU is defined as 1% of its biogeographical population. The idea of using 1% of the biogeographical population as a threshold value for assigning "international importance" to a site has been well developed by Wetlands International in the context of the Ramsar Convention on the conservation of wetlands (Colhoun 2000, and references therein). However, the bird unit concept and its use in the analyses here have been developed by John Coveney. JNCC have also ranked the species by their biogeographical populations in identifying vulnerable concentrations (Webb et al. 1995).

For some seabird species such as gulls, which regularly use wetlands, 1% thresholds or BU's have been set by Wetlands International. For example, the 1% threshold for little gull is 750 (i.e. 1% of the breeding biogeographical population of 25,000 pairs plus 50% for non-breeding birds). BU's for the other species in Table 10.6 are based on JNCC biogeographical breeding population estimates (Pollock *et al.* 2000). In calculating BU's for these species, JNCC estimates were converted to individuals and again 50% was added to allow for non-breeders.

In addition to using 1% of the biogeographical population as the threshold value for international importance, the practice of using 1% of the country's population as a threshold for national importance has also developed (Colhoun 2000). For this study, it was considered more appropriate to use Irish Sea (Lloyd *et al.* 1991) rather than Irish populations as the basis for this threshold. As in BU's, these Irish Sea populations can be used as the basis for "Regional Bird Units" (**RBU**'s). Where available, 1 RBU was plotted as a bar on the species charts to allow the results to be put in a regional context.

However, RBU's differ from BU's in a key way. BU's are based on a species' biogeographical population. By definition, this is 100 BU's for each species and BU's are comparable across the species' range and between species. In contrast, RBU's are based on the proportion of the species' population that happens to occur in the reference regional area. As this proportion differs from species to species, RBU's cannot be compared between species and are thus not appropriate for the quantitative analyses than can be performed using BU's. As one BU is quite a high threshold, it was normally more convenient to use milli bird units (**mBU**'s) for plotting on charts. Again it must be stressed that the mBU's can be compared from chart to chart. However, they cannot be compared with RBU's nor can RBU's be compared between charts.

10.8.3. Bird Species Accounts

Two graphs are presented for ten of the twelve commonest bird species while common and arctic terns are combined. The line graph gives total numbers on the left axis in the Box and the Bank, and along the Cable route. The right hand scale is in milli bird units (mBU) and is comparable between charts. For some species a black bar indicates one RBU. The barcharts presents densities for the Box, Bank and Cable areas. These are given in the context of the density ranges mapped by the JNCC for the ICES cells overlapping the Arklow Bank area, where available (Pollock *et al.* 1997).

The cumulative usage of the area by these bird species and their ranking by this criterion is presented in Figure 10.24. The importance of the five sections of the bank for the main species is shown in Figure 10.25 using a bird unit scale. The numbers of these species in each of the sections is shown for comparison in Figure 10.26. This is followed by charts showing the proportion of each species flying above 7m in Figures 10.27 (all areas) and 10.28 (birds over the bank only). Finally, Figure 10.29 gives a breakdown of auk numbers in the Box.

Red-throated Diver (Figures 10.2 & 10.3)

Divers are winter visitors to the Arklow Bank area. The relatively small numbers observed (Figure 10.24) were of quite high significance, as this species has a low threshold for 1 BU. Thus red-throated diver ranks fifth in the significance table (Figure 10.24). Densities over the bank were markedly higher than those in the Box.

Numbers remained low until November, and peaked in February, when there were almost 200 birds extrapolated for the bank area. They then declined as the spring progressed, though a few birds were still present into early June. No red-throated divers were recorded in this area by the JNCC, but their survey routes would normally avoid shallow areas such as the bank. No other diver species were observed, so all unidentified divers were allocated to this species. Some 82% were recorded flying (Table 10.3). Of these, almost 60% were above 7m (Figure 10.27). Most of the divers took flight at some distance as the boat approached, as they are rather easily disturbed. Along the Bank, the majority of divers occurred in the second section from the north (Figure 10.25). Sections 3 and 4 were also important.

Figure 10.2: Red-Throated Diver Numbers

Figure 10.3: Red-throated Divers Densities

Fulmar (Figures 10.4 and 10.5)

Cumulatively, fulmar is the least significant species (Figure 10.24). It occurred at low density throughout the study area, with no apparent preference for the bank. Numbers declined through the autumn from a high of about 0.7 birds/km^2 in July, and none were seen in October or November. Small numbers returned to the area from December. Densities were in the range observed by JNCC (Pollock *et al.* 1997). Around 85% of these birds were flying (Table 10.3). Only one bird was seen to fly above 7m (Figure 10.28).

Manx Shearwater (Figures 10.6 and 10.7)

This species was not present in the study area from October to February, but ranks second in significance on the basis of the high numbers observed in spring and summer (Figure 10.24). Densities were higher in the Box than the bank. Those that did occur on the bank avoided the middle of it (Figure 10.25).

During the brief peak in late July, nearly one RBU was recorded. Numbers then dropped off rapidly as birds departed for wintering areas off South America. Manx shearwaters were not recorded after September, until two were observed in March. Numbers increased in April and peaked in May, when over 2 RBU were extrapolated for the Box alone. Densities were usually in the range observed by the JNCC (Pollock *et al.* 1997) except in April and May 2001, when they greatly exceeded it. Only 38% of these birds were flying, again low over the sea (Table 10.3). Many of the birds in April and May were resting on the water in "rafts" (flocks), which accounts for the low proportion in flight. None were recorded above 7m (Figure 10.27). While manx shearwaters fly somewhat higher during stronger winds than would apply during the surveys, they are unlikely to exceed 7m to any significant extent.

Figure 10.4: Fulmar Numbers

Figure 10.5: Fulmar Densities

Figure 10.6: Manx Shearwater Numbers

Figure 10.7: Manx Shearwater Densities

Gannet (Figures 10.8 and 10.9)

Numbers of gannets in the study area were of relatively low overall significance and it ranks seventh in Figure 10.24. Densities were markedly higher over the bank than in the Box from July to October, but this pattern was not continued into 2001.

Numbers in the Box were always well below one RBU, and dropped still further during the winter months. They remained low from November to January, before increasing slightly from February. Densities were in the range observed by the JNCC (Pollock *et al.* 1997). Birds in flight accounted for 87% of the total (Table 10.3). Of these birds, 37% were flying above 7m (Figure 10.27) though the proportion was slightly lower for birds flying over the bank (Figure 10.28).

Shag (Figures 10.10 and 10.11)

Although relatively small numbers of shags were recorded, they are included because of their clear preference for the bank. They rank similarly in significance to kittiwake because of their much lower bird unit threshold (Figure 10.24).

Shags occurred in greatest numbers from October to March, with a peak in January. Densities were consistently highest over the bank. This species is coastal in its distribution, and so is not adequately monitored by JNCC surveys. Shags tend to fly low over the water, and none were recorded above 7m (Figure 10.27).

Figure 10.8: Gannet Numbers

Figure 10.9: Gannet Densities

Figure 10.10: Shag Numbers

Figure 10.11: Shag Densities

Little Gull (Figures 10.12 and 10.13)

Little gull is by far the species of greatest significance on the Arklow Bank. On the significance scale, it was three times as important as the next most significant species, manx shearwater (Figure 10.24). Densities were also far higher over the bank than in the Box.

Large numbers were recorded in mid-winter, with a peak of 1,200 in December. These were almost all over the bank. The bank appears to be a feeding area of major importance for the species in early winter. The peak in numbers was short-lived, however, and numbers were low throughout January, February and March. The numbers on the Arklow Bank this winter are higher than the previous peak at 830 birds in January 1998 (McAdams *et al.* 1999). In contrast, relatively low numbers were reported along the coast this year with 53 birds in Greystones on 31 December 2000 and 70 in Wicklow Harbour on 10 February 2001 (Birds of Ireland News Service, 2001).

High numbers were again present in April; these may have been birds on their return journey to breeding grounds in the Baltic. Up to 400 little gulls were recorded in Crosby, Lancashire, six days after the April 2001 survey (E. Archer, in litt.). These may have included some of the same birds that occurred on the Arklow Bank.

Densities throughout the survey period greatly exceeded those recorded by the JNCC, though none were recorded by them in January (Pollock *et al.* 1997). However, the JNCC surveys are likely to have avoided the shallow bank waters that held the high concentrations.

Little gulls were present in greatest numbers in the middle three sections of the bank, particularly over shallow water near waypoints 7 and 17 (Figures 10.25). However, mapping of concentrations recorded on different dates showed that they occurred all along the shallowest areas (less than 10m) of the bank (results not shown).

Almost 45% of the birds in transect were flying (Table 10.3), including 23% above 7m. Of the little gulls flying over the bank, less than 10% flew above 7m. However, the "birds in transect" sample excluded the large flocks observed feeding over the bank which were normally observed feeding low over the water. However, on 15 December 2000, a flock of little gulls was observed flying well in excess of 30m over the bank.

Figure 10.12: Little Gull Numbers

Figure 10.13: **Little Gull Densities**

Kittiwake (Figures 10.14 and 10.15)

Although it was the second most abundant in overall numbers after guillemot (Figure 10.26), kittiwake is low on the scale of significance, in eighth place (Figure 10.24). Almost half of the cumulative total was recorded over the bank. The pattern of use in terms of timing and concentration on the bank was very similar to the little gull.

Numbers over the Bank alone exceeded one RBU by a factor of 2.6 in mid-December. Numbers were highest from October to January, low in February, and increased again in March with a second peak in May. Densities greatly exceeded those recorded by the JNCC (Pollock *et al.* 1997), particularly over the bank. Birds were concentrated over the southern two-fifths of the bank (Figure 10.26). Over 64% were flying (Table 10.3), with 23% above 7m (Figure 10.27). As with little gull, a lower percentage of birds were flying high over the bank (10%). Again this analysis excludes the "out of transect" flocks, which fed low over the bank.

Numbers of birds roosting on the LANBY about 2km SE of the southern end of the bank were a significant fraction of the totals in the study area in summer/early autumn, but this roost site was very little used during the winter. Usage resumed in early June. A few birds were occasionally seen roosting on the much smaller North and South Arklow buoys at each end of the bank. There are two more small buoys between legs 2 and 1a but the survey routes were not close enough to see if they were used as roosts. As they are similar in size to the North and South Arklow buoys, at most they are likely to be used at a similarly low level.

Figure 10.14: **Kittiwake Numbers**

Figure 10.15: **Kittiwake Densities**

Common Gull (Figures 10.16 and 10.17)

Despite the small numbers recorded (Table 10.4), common gull was sixth in overall significance (Figure 10.24). However, this significance would drop considerably if the higher wetland international threshold figure for a BU of 15,900 was used. This species showed no preference for the bank and occurred at highest density on the Cable route. Although not systematically recorded, it is considered that many of the cable route birds were on the inshore section of the route, where they would be expected to be commoner.

Common gulls were only seen in the study area from November to March. The densities recorded were higher than those reported for the area by the JNCC, but this is a coastal species and their surveys are likely to have underestimated its presence. Three-quarters of the common gulls observed in flight were above 7m (Figure 10.27).

Common/Arctic Tern (Figures 10.18 and 10.19)

Common and Arctic terns were combined for analysis due to time constraints in setting up a new chart with the arrival of the latter late in the project. However, this overstates the importance of the arctic tern, whose threshold for a BU is seven times that of common tern.

Even with this overstatement, however, together they were only tenth on the signficance table (Figure 10.23). Birds were not present during the winter, and there was a preference for the bank area in spring. There was a brief peak of birds in late July, perhaps coinciding with the departure from breeding colonies. This peak would have risen to some 860 birds if a correction factor of 1.7 was used, as per the JNCC (Pollock *et al.* 2000, Stone *et al.* 1995). Numbers remained high during August before departure to wintering quarters. None were recorded after the end of September. The vast majority of birds specifically identified in autumn were common terns, while most identified in spring were Arctic terns.

Densities were notably higher than those observed by the JNCC, though this is based on small sample sizes. Some 32% of common terns, 100% of Arctic terns, and 73% of unidentified birds were flying (Table 10.3), with 11%, 1% and 15% above 7m respectively (Figure 10.27). In the autumn, numbers roosting on the LANBY were on a par with those using the bank. In spring, terns showed a preference for the southern three fifths of the bank (Figure 10.25).

Figure 10.16: Common Gull Numbers

Figure 10.17: Common Gull Densities

Figure 10.18: **Common/Arctic Tern Numbers**

Figure 10.19: Common/Arctic Tern Densities

Guillemot (Figures 10.20 and 10.21)

Guillemot was the most numerous species recorded, but behind little gull and manx shearwater in significance (Figure 10.24). They were concentrated in the SE quarter of the Box in summer, and showed a preference for the southern part of the bank in winter.

Highest numbers were recorded in early July, when over 50 birds/km^2 were present in the Box. Similarly high densities have been recorded by the JNCC on the east coast of Ireland in the post breeding period in past years. BirdWatch Ireland recorded peak densities twice as high again on the Kish Bank in late August and early September 1999 (Newton & Crowe 1999). This later Kish Bank peak is consistent with observations by the JNCC of high densities of guillemots north of Dublin Bay from July through September. This contrasts with the briefer July peak off Co. Wicklow observed both in this study and by the JNCC.

Guillemot numbers declined through the autumn, and remained close to one RBU (2,400 birds) from September to January. Numbers declined further through the spring and increased again in May. During the winter, densities over the bank were considerably higher than in the Box area. In July and August, numbers were highest in the SE quarter of the Box, and lowest in the NW. When the July peak is excluded, numbers were highest in the eastern half of the Box (Figure 10.29).

Only 9% of the birds overall were flying (Table 10.3), although this is up from 2% in the period to October. Guillemots were largely flightless due to wing moult in July and August, when they were accompanied by growing chicks. They always flew close to the surface.

Figure 10.20: Guillemot Numbers

Figure 10.21: Guillemot Densities

Razorbill (Figures 10.22 and 10.23)

Razorbill was the fourth most significant species recorded (Figure 10.24). Numbers were highest in July in the SE quarter of the Box, and this species showed a marked preference for the bank in winter and spring.

The overall pattern was similar to guillemot, with a peak in July, low numbers in September and October, and a small increase in November/December. Numbers declined in early spring and increased again in May. Densities were much lower than guillemot, but razorbill has a smaller BU threshold, and was not far below guillemot and manx shearwater in significance. Peak densities were less than twice as high as those recorded by the JNCC (Pollock *et al.* 1997) and the pattern of a brief July peak off Co. Wicklow is in agreement with their observations. As for guillemot, numbers were highest in the eastern half of the Box (Figure 10.29). Just 3.8% of razorbills were in flight (Table 10.3), because, like guillemots, they were accompanied by growing chicks and moulting their flight feathers in late summer.

It was not possible to identify some 20% of the auks seen as guillemots or razorbills. These birds were assigned for each day according the proportions observed of identified birds on the same day. Overall the ratio of identified guillemots to razorbills was 81:19. Between July and February the percentage of guillemots varied between 72% and 95% but dropped to 57% in March. The proportion of flying "auk sp." (18%) was much higher than the proportions of flying guillemots and razorbills, indicating that flying birds were less often identified than swimming birds. The 18% figure, combined with the very low figure of 4% for flying razorbills, indicates that they were disproportionately unidentified or misidentified as guillemots in flight. While this may have led to an understatement of the position of razorbills relative to guillemots, this is not likely to very significant given the large majority of both species that were not in flight.

Figure 10.22: Razorbill Numbers

Figure 10.23: Razorbill Densities

Cumulative Bird Usage (Figure 10.24)

Figure 10.24 ranks the twelve commonest species by cumulative bird usage. To correct for differing monthly survey efforts, only the peak count in each month was used for each species. The proportion of use allocated to the bank varied between 6% for manx shearwater and 61% for little gull. The bank occupies 9.9% of the study area. Among the more important species, little gulls had the most marked preference for the bank at 61%. They were followed by red-throated diver at 60%, shag at 58% and kittiwake at 49%. Only manx shearwater and possibly common gull and fulmar appeared to avoid the bank.

The bird unit system also allows the entire bird usage of the study area to be compared with a wetland such as Dublin Bay, one of the most important in the country. Mean peak counts for 18 wildfowl and wader species which attained an average of at least 1 RBU over the four winters from 1994-95 to 1997-98 (Colhoun 2000) were converted to mBU. This gave a total of 23,800 mBU for the whole bay or 1,190 mBU/km^2 for the approximately 20 km^2 of intertidal habitat. The peak counts from the first year for the twelve commonest species gave 4,819 mBU. With 406 km^2 in the study area, this gives an average bird unit density of 11.9 mBU/km^2. However, there was a marked contrast between the bank at 51.1 mBU/km^2 and the Box at 7.0 mBU/km^2. Thus the density of bird usage along the bank is 4.3% of that of the intertidal parts of Dublin Bay.

In summary, area for area, the bank is about one twentieth as important for birds as intertidal habitat in Dublin Bay. However, it is clearly much more important than the surrounding Box. It seems likely that the bank will be recognized as a seabird concentration of some note if the patterns observed this year were repeated over several years. Until comparable multi-species numerical analyses become available for other seabird areas it will, however, be difficult to put the bank in a broader marine context. Quantitative analyses of the vulnerability of seabirds to surface pollution has been done for the Irish Sea for each month of the year (Webb et al. 1995). However, it is not comparable with the analyses here because it also included an "offshore vulnerability index" factor as well as the numbers of birds. Furthermore, data was not available to the vulnerability analysis from the Arklow Bank area for the months of February, April and October to December. Data from the remaining months highlighted the general importance of the western Irish Sea for auks in May and July to September.

Figure 10.24: Cumulative Bird Usage

Figure 10.25: **Cumulative Bird Usage along the Five Sections of the Arklow Bank (Bird Units)**

Figure 10.26: Average Bird Usage along the Five Sections of the Arklow Bank (Nos. of Birds)

Figure 10.27: Birds Flying above 7 m as a Proportion of all Birds observed in Flight

Figure 10.28: Birds Flying above 7 m as a Proportion of all Birds observed in Flight over the Bank

Figure 10.29: Average Numbers of Guillemots and Razorbills in Different Sections of the Box, August 2000-June 2001

Rarer Seabird Species

To date, 16 other seabird species have been recorded (Table 10.4). The most numerous are herring gull and cormorant. All are insignificant in EIA terms. The low numbers of common scoters is noteworthy because the Wicklow coast was an important wintering area for the species up to the early 1960's (Hutchinson 1989). In general, the low occurrence of these species parallels JNCC observations for the study area (Pollock *et al.* 1997). It is probable that this general trend will continue as most of these species are mainly coastal rather than truly marine and thus are not likely to favour the Arklow Bank area. The skuas, which are marine outside the breeding season, only pass through as uncommon passage migrants. However, tentative extrapolation of the small numbers of skuas observed showed a bird unit importance similar to gannet because of their small populations (results not shown).

One potentially important species that might have been expected was roseate tern. They are listed on Annex I of the EU Birds Directive and classified as SPEC 3 by BirdLife International because they are endangered in Europe. They were red listed by BirdWatch Ireland (Newton et al. 1999, Tucker & Heath 1994). Some 70% of the north west European population of 870 pairs breed off Co. Dublin on Rockabill Island and several hundred use the Kish Bank in late summer and early autumn. Offshore banks are also used by the species in New England and SE Canada. However, only six were observed in the Irish Sea by JNCC between 1980 and 1997 (Pollock et al. 1997). Some hundreds of roseate terns also roost in Dublin Bay as part of a mixed flock of common, arctic and roseate terns that numbers up to 5,000 (occasionally 20-30,000) birds in August (Newton & Crowe 1999; Newton & Crowe 2000; Coveney, pers. obs.). Because their European population is so small, the cumulative occurrence of 143 birds (an average of 29 birds/day over five summer months) or 5.5 BU would have put it on top of the significance league. Indeed, the recorded occurrence of one bird computes as of greater significance than fulmar – if it was valid to draw conclusions from a sample size of one.

A second potentially important tern species is the little tern. Again they are on Annex I of the EU Birds Directive. They are classified as SPEC 3 by BirdLife International as a declining breeder and amber listed by BirdWatch Ireland as a local breeder. There is a colony of some 40 pairs at the Breaches on the Murrough shingle ridge between Kilcoole and Newcastle. It is some 20km north of the bank and along with a site in Kerry, one of the two biggest in Ireland. It has been wardened since 1986 (Hannon et al 1997). However, none were observed on the Arklow Bank and it is considered unlikely they would fly that far from their breeding colony to fish. Additionally, only one was observed in the Irish Sea by JNCC between 1980 and 1997 (Pollock et al. 1997).

10.9. Additional Survey Trips to search for Gull and Zooplankton Concentrations

In addition to the standard surveys, a number of extra trips were made from December 2000 to February 2001 (Table 10.7). Three visits were made to the Arklow Bank, to assess its use by feeding gulls and the availability of zooplankton prey. A further two visits were made to other offshore banks in the western Irish Sea, to place the Arklow Bank's little gulls in context. Observations of gulls from the extra visits to the Arklow Bank are included in the relevant charts, and discussed in the species accounts.

Table 10.7: Additional survey trips in winter of 2000/2001

Date	Time	Observers	Purpose
28 Dec 2000	11:30 - 14:00	JC	Record concentrations of gulls
13 Jan 2001	07:30 - 17:00	JC, BP, C. Emblow	Record concentrations of gulls, collect zooplankton samples (3)
18 Jan 2001	07:45 - 17:45	BP	Preliminary bird surveys of India, Codling, Bray, Kish, Bennet and Burford Banks (N of Arklow)
29 Jan 2001	07:45 - 15:45	BP	Preliminary bird surveys of Glassgorman, Rusk, Blackwater, Lucifer, Long and Holdens Bed Banks (S of Arklow)
22 Feb 2001	07:50 - 16:20	BP, M. McCrea	Record concentrations of gulls, collect zooplankton samples (10)

10.9.1. Preliminary surveys of other banks – methods

Two one-day assessments were made of the birds and marine mammals observed near banks to the north and south of the Arklow Bank. The main aim of these surveys was to locate large concentrations of seabirds, particularly little gulls and kittiwakes, so as to place the results of the Arklow Bank surveys in context. The much larger area to be covered necessitated a less detailed approach, and standard JNCC methods were not used. The surveys were carried out in January 2001 from the "Firehawk". The greater speed and shallow draft of this boat allowed a large area to be covered in one day, and the boat could travel close to the shallowest parts of the banks, which were targeted in the surveys (less than 20m). All concentrations of seabirds were recorded, and the location of large feeding flocks was marked using GPS.

10.9.2. Preliminary surveys of other banks – results and discussion

Total numbers of seabirds recorded are shown in Table 10.8. The numbers refer to crude total counts and are uncorrected for area and effort. They are mostly underestimates, as not every bird seen was recorded. Very few little gulls were found. The surveys were done as numbers dropped off rapidly on the Arklow Bank and it would therefore appear they had not simply moved to other banks.

The largest concentrations of gulls were over the Kish and Bray banks, which held practically all of the kittiwakes seen on 18 January, and about half of the common gulls. Three little gulls, all adults, were seen, all over the Kish Bank. Few gulls were recorded over the India and Codling banks, but large numbers of auks (mostly flocks of guillemots in flight) were found there. Only two kittiwakes were seen at the small Bennet Bank, and around 40 common gulls over the Burford.

Table 10.8: Birds and marine mammals observed on banks N and S of Arklow, January 2001

Species	Banks north (18-Jan-01)	Banks south (29-Jan-01)
Red-throated Diver	-	56
Fulmar	5	2
Gannet	11	7
Shag	30	4
Common Scoter	-	3020
(Arctic?) Skua	-	1
Little Gull	3	11
Black-headed Gull	31	50
Mediterranean Gull	2	1
Common Gull	144	250
Great Black-backed Gull	5	5
Herring Gull	13	16
Kittiwake	990	50
Auks (Guillemot & Razorbill)	1620	300
Harbour Porpoise	3	6

Common scoter was the most numerous species observed on the banks south of Arklow. Of the total of 3020 seen, 2600 were found on the Blackwater Bank, 370 on the Glassgorman Bank, and smaller numbers inshore near Roney Rock and Arklow Rock. These totals are approximate as the scoters typically took flight one or two km ahead of the boat, and were counted as they flew back past the boat. Only 11 little gulls were seen, nine of them over the shallowest part of the Blackwater/Money-weights Bank. There were very few kittiwakes or auks, but 56 divers were recorded, most or all red-throated. Surprisingly, no divers were recorded on the banks north of Arklow. The most numerous gull species was common gull, which was concentrated in inshore waters near Courtown and Arklow Harbour. A single skua, probably an arctic skua, was seen at the south end of the Blackwater Bank. Skuas are uncommon, but not unknown, in the Irish Sea in winter (Pollock *et al.* 1997).

The surveys of other banks were probably done too late in the winter to allow a valid comparison of gull distribution with that over the Arklow Bank. By January, little gull and kittiwake numbers had declined on the Arklow Bank. The fact that little gulls were observed on the Kish and Blackwater banks, even in small numbers, suggests that these banks may be important feeding areas earlier in the winter. In addition, there have been apparently reliable observations of little gulls in the vicinity of the India and Codling banks in autumn and late winter from fishing boats (Madden & Ruttledge 1993). However, the timing of these observations suggests that the birds may have been on passage from and to their breeding grounds in northern Europe.

As Table 10.8 shows, there were considerable differences between the banks to the north and south of Arklow in the numbers and proportions of species recorded. This underlines the importance of obtaining good baseline information on the species present on the Arklow Bank.

10.9.3. Preliminary assessment of Planktonic Prey on the Arklow Bank - Methods

An assessment of the potential prey available to the large numbers of little gulls feeding over the Arklow Bank was made, in conjunction with EcoServe. The diet of little gulls in their winter quarters is unknown, but believed to consist of marine invertebrates and fish (Cramp & Simmons 1982). This is similar to the diet of kittiwakes, although the latter are larger and able to handle larger prey. The food of little gulls during the breeding season consists mainly of insects, including adult and larval chironomids, water bugs and mayflies, many of which are very small. They can therefore be expected to take prey items as small as a few millimetres in length.

Zooplankton samples were collected on 13 January and 22 February 2001 (Figure 10.30). The three January samples (J1-J3) were taken in the vicinity of a flock of kittiwakes and little gulls, which were mostly resting on the water. Samples F1-F4 and F9-F10, taken in February, were collected by tows through or near flocks of kittiwakes and little gulls. Samples F5-8 were taken away from seabird concentrations, for comparison. Samples were collected in surface tows of 5-15 minutes' duration in a zooplankton net of 500µm mesh and 50cm in diameter. They were preserved in 70% Industrial Methanated Spirits (IMS) and later examined under a binocular microscope. Larger zooplankton within the samples were identified and measured.

10.9.4. Results of the Preliminary Assessment of Planktonic Prey on the Arklow Bank

Analysis of the samples concentrated on the larger organisms, which would be most likely to feature in the diet of little gulls (Table 10.9). The largest organisms found were northern krill (*Meganyctiphanes norvegica*), which were up to 29mm in length. Chaetognaths up to 20mm long were present. These are small transparent predators whose streamlined shape gives them the alternative name of arrow worms. Mysids (small shrimp-like crustaceans) and polychaetes (marine worms) up to 9mm long were also found in the samples. The krill, being largest, are most likely to be eaten by little gulls. However, these other species are comparable in size to freshwater chironomids and are also potentially suitable prey. Smaller zooplankton, such as copepods, cumaceans and amphipods, are less likely to be eaten by gulls.

Table 10.9: Number of Zooplankton Taxa Larger than 3mm from the Arklow Bank, January (J1-J3) and February (F1-F10) 2001

Size range (mm)	Mean size (mm)	Species	J1	J2	J3	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
6 - 29	19.7	Northern krill (*Meganyctiphanes norvegica*)		4		4	2	3	31	6					8
11 - 20	13.8	Chaetognath (*Sagitta* sp.)		•	•	1	•	•		3	3	1			2
6 - 9	8.0	Mysid (*Schistomysis spiritus*)										3			
6.5 - 9	7.8	Polychaete (*Tomopteris* sp.)							1		1				
3 - 7		Polychaete (indet.)		•								•			
4		Amphipod (Gammaridea)										1			
3		Copepod (Calanoida)	•	•		•	•	•	•	•	•	•	•		•
3		Crab zoea				•		•							

• = present in sample

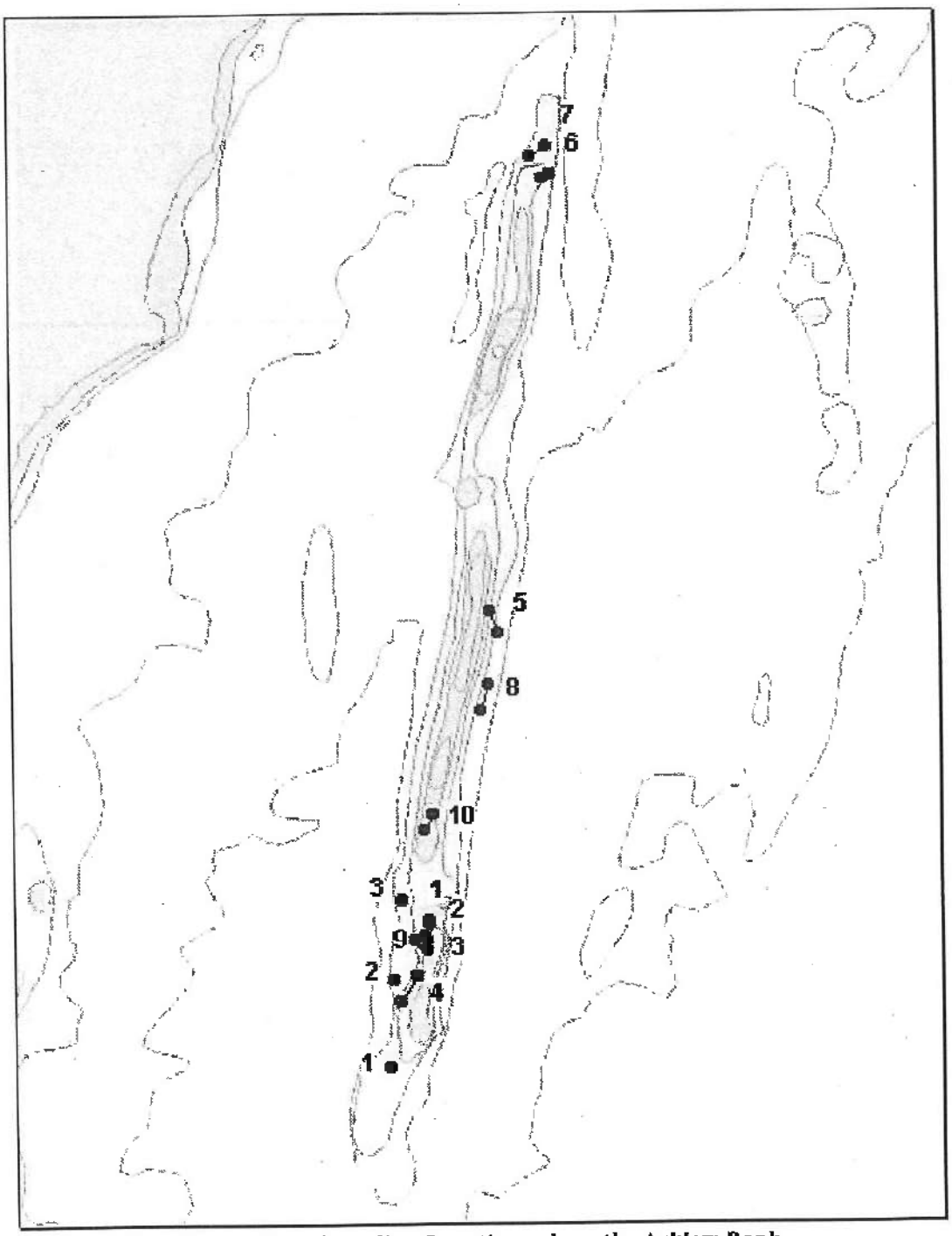

Figure 10.30: Zooplankton Sampling Locations along the Arklow Bank
Red dots: J1 – J3 (13 January 2001)
Green dots: F1 – F10 (22 February 2001)

Without analysing the stomach contents of the birds, it is impossible to know for certain what they are feeding on. However, the results of zooplankton sampling on the bank suggest that northern krill may be a prey species of some importance. This crustacean species is common in the Irish Sea, but is not normally found near the surface except at night. During the day, northern krill are normally found at depths greater than 60m (commonly 100-400m). They ascend to the surface around dusk, to feed on copepods and phytoplankton. The krill return to deeper water by morning, probably to avoid diurnal predators such as seabirds (Lass *et al.* 2001). Stormy weather and strong currents may be involved in occasionally bringing large numbers to the surface, and mass strandings have been recorded on Irish Sea coasts (Aitken 1960; Mauchline 1984).

Insufficient samples were obtained to show a correlation between the distribution of gull flocks and that of the krill. Krill were found from samples taken away from gull flocks, while some tows through or near flocks did not contain any. Zooplankton samples taken by EcoServe in the vicinity of the bank did not contain krill, but this may reflect different sampling methods rather than an absence of krill. The fact that krill were found at the surface over the bank suggests that strong currents may bring them to the surface there. A detailed knowledge of where currents over the bank originate would help predict where concentrations of krill are likely to occur. The concentrations of gulls observed during the winter over the bank are likely to have been feeding on such a food source, but further sampling would be necessary to firmly establish a link.

10.10. Effects Of Wind Farms On Birds And Marine Mammals

10.10.1. Impacts on Birds from Terrestrial Wind Farms

The large increase in terrestrial wind farms in recent decades has been accompanied by concerns about their impacts on birds. However, studies to date in several European countries and in the USA have typically shown no significant adverse impacts. In some cases, relatively small numbers of birds were killed but this was considered not to have reduced the populations concerned. It was also low compared to other human-related causes of deaths. For example, in Holland strike rates by all species were 0.04 to 0.09 birds per day per turbine. Detailed studies of a nine turbine project on the breakwater at Blyth Harbour in Northumberland showed that the initial low collision rate of eider duck decreased to zero over four years even as the local eider populations increased. There was, however, a possible correlation between severe weather or reduced visibility and the strikes that did happen. On the other hand, in Britain and Sweden falcons and waders have been observed breeding in close proximity to wind turbines. (Morrison *et al.* 1998, Neau & Pages 1999, Percival 1988, Percival & Percival 1998, Phillips 1994, Still *et al.* 1994, Still *et al.* 1997, Winkelman 1994).

Overall in Britain, wind turbines do not seem to have had any significant impact (Percival 2000). Furthermore established environmental organizations such as Friends of the Earth and Greenpeace have strongly supported onshore and offshore wind farms and have disputed claims of impacts on birds (Border Wind for Greenpeace 1998, Friends of the Earth 1999, Söker 2000).

Two possible exceptions to this scenario have been observed at Tarifa near the Straits of Gibraltar in southern Spain and at Altamont Pass in California. At both sites large numbers of migrating birds of prey pass through. This migration combined with the dense layout of turbines and the availability of perches led to significant numbers of collisions. These were of concern because the species involved tend to have relatively low populations that reproduce slowly. While it is unclear if these projects had any significant effect on populations, it has been recommended that such sites should be avoided in future (Percival 1988 & 2000).

10.11. Impacts of Marine Wind Farms on Birds

10.11.1. Assessment of Impacts of Existing Wind Farms on Seabirds

Up to the end of 2000 there were are only six operational offshore wind farms comprising 30 turbines in total i.e. only 20 more than the first phase alone of the Arklow Bank project (Lemming 1999, British Wind Energy Association 2000). Furthermore, at an average of about 0.5 MW, these turbines are much smaller than the turbines planned for the Arklow Bank. There are two projects each in of Sweden, Denmark and the Netherlands. For various reasons, the experience from these projects is of limited value in developing predictions of likely impacts on the Arklow Bank.

The world's first offshore wind turbine was built 250m offshore from Nogersund in Sweden. It generates 0.2MW. It was a test project to examine *inter alia* impacts on bird and fish and it was built in the centre of a migration path used twice a year by millions of migrating birds. A five year study showed an almost 50% reduction in migrating birds within 500 m of the turbine (Anon 1999a). No ecological information was found on the other Swedish project at Bockstigen, which has five turbines generating 2.75 MW.

The first Danish windfarm, comprising 11 turbines at Vindeby off the eastern coast, was a technical feasibility project. Environmental assessment showed that it led to a local increase in marine life (Lemming 1999), however, there were few birds at the site so no ornithology studies were feasible (Krohn 2001).

The second Danish project, a 10 turbine project at Tuno Knob, also off the eastern coast was built in 1995. It is widely cited as showing that offshore wind farms have little impact on birds although some industry quotes (e.g. Krohn 2001) do recognize the need for additional studies at other wind farm sites which hold different bird species. At Tuno Knob, assessment of bird impacts focused on two species of sea duck, eider and common scoter. The former occurred in large numbers in the vicinity of the wind farm. Initially, it was believed that it caused a decline in duck usage of the area. However, further studies showed that the changes the changes in duck usage were related to changes in the distribution of their mollusc prey species and not due to the wind farm (Anon. 1999, Guillemete *et al.* 1999, Krohn 2001). More recent studies at this site have shown that flight movements of these species tended to avoid the site at night by up to 1.5 km. This reduced their risk of collision (Dirkson et al. 2000).

The two Dutch projects are not really offshore as they are in the Ijsselmeer, a very large lagoon that was cut off several decades ago from the Waddensee, itself a relatively enclosed offshoot of the North Sea. The first of these was the Lely project built in 1994 800m off a dyke near the town of Medemblik. It has four 0.5MW turbines. An industry review of the project reported that the site had very little bird and fish life and that ecological concerns were addressed by an environmental research programme (van Zanten undated). The second project at Dronten has 19 turbines of 0.6MW each and is similarly close inshore (http://www.offshorewindfarms.co.uk/faqs.html).

A seventh project, which comprises two turbines located 1 km off Blyth Harbour in Northumberland, went into operation late in 2000. This is a different project from the nine turbine Blyth Harbour breakwater installation. The environmental statement for the offshore project considered that there would be no significant impacts on coastal birds and their shoreline habitats. These habitats have been designated or proposed for designation as a Special Protection Area under the EU Birds Directive and as a wetland of international importance under the Ramsar Convention. However, the environmental statement does not include any assessment of impacts on birds in the marine environment (Border Wind 1998; British Wind Energy Association 2000).

The world's largest offshore wind farm to date is at Middlegrunden near Copenhagen. It has 20 turbine generating 40 MW and has just (June 2001) gone into service. This project was reported to affect only some 400 unspecified birds (Associated Press 2001, Voland & Hansen 2000, www.middelgrunden.dk).

10.11.2. Assessment of Impacts on Seabirds from Proposed Offshore Wind Farms

Out of a large number of proposed offshore wind farms in The Netherlands, Denmark, Sweden, the UK and Ireland (Border Wind for Greenpeace 2000, British Wind Energy Association 2000, EWEA 2001, Farrier *et al.* 1999), detailed information on assessment of impacts on birds and marine mammals was found for three. Two are Danish at Horns Rev (or Reef) and Rodsand, off the western and eastern coasts, respectively. These will generate about 150 MW each and it is planned they will go into service in 2002/03. The third is at Scroby Sands off Great Yarmouth in East Anglia where an 80MW wind farm is planned on a sandbank that runs some 3 km offshore.

10.11.2.1 Horns Rev in Denmark

A detailed assessment of the likely impacts of this project on birds is available (Elsamprojekt A/S 2000; Noer *et al.* 2000). Along with the Rodsand project (see below), this is one of two large demonstration projects and represents the next stage after the Vindeby and Tuno Knob projects in the development of Denmark's offshore wind industry. It is intended that these two wind farms will go into operation in 2002. Denmark's long term goal is that wind power will produce up to 50% of the country's electricity needs by 2030, or 5,500 MW. Of this, some 4,000 MW will be generated offshore (Lemming 1999).

Currently, 80 x 1.8 MW turbines are planned on a 27.5 km^2 site at Horns Rev in water depths of 6.5 to 13m. Horns Rev is 14 km west south west of Blavands Huk on the west coast of Denmark.

The Danish Energy Agency's approval for the Horns Rev project requires "*a programme for monitoring environmental impacts during the construction and the following initial phase of operation*" with particular attention to waterbirds and migrating birds. Of "*decisive importance*" was the requirement that natural variability should not mask impacts. The work reported on to date is the first step in establishing a baseline against which these objectives can be measured.

Between April 1999 and May 2000, nine aerial and three ship surveys were made of 1700 km^2 surrounding the site. The most important species observed were eider and common scoter but these were concentrated on the coastal edge of the survey box in less than 6 m of water. They were virtually absent from Horns Rev and the surrounding offshore waters.

Black-throated or red-throated divers, gannets, kittiwakes, sandwich terns, common or arctic terns, and guillemots or razorbills were also observed in significant numbers in the survey box. However, the authors considered that, in the absence of an adequate mathematical model to take account of various biases that might arise during data collection, they could not calculate species densities. Therefore, the Horns Rev and the Arklow Bank results cannot be directly compared. However, it is clear that the overall numbers of birds were considerably lower on the 27.5 km^2 Horns Rev site than on the 40 km^2 Arklow Bank (the 'Bank' area in this study).

The distribution of the seabird species was variable and this was thought to reflect variable prey fish distributions. Large numbers of lesser black-backed, herring and great black-backed gulls were often observed associated with fishing boats. Smaller numbers of skuas, mainly arctic skuas were also observed. Most of these species occurred in disproportionately low numbers on the some 1.6% of the study area occupied by the wind farm site. The exceptions were divers and kittiwake, which occurred, in roughly proportionate numbers. However the sample sizes for these two species were small at 8 out 554 and 11 out of 1,118 respectively.

The potential impacts were considered to be physical effects on habitats, disturbance/avoidance effects and collision risk. The impacts on habitats were considered to insignificant in that the turbines' "footprint" will only be 0.3% of the 27.5 km^2 site and thus be too small to be measurable. Equally it is predicted that any reef habitat development around the turbine bases will not have a measurable impact on bird populations. Lastly it is considered that the laying of the connecting cable, which will pass through protected areas as it nears the coast, will have negligible effects – provided it is laid outside the common scoter moulting season of July to September.

Because of the low numbers of birds using Horns Rev, it was considered that even if there was complete avoidance of the site, the impact would be negligible. Analysis of bird usage out to 4 km from the site, a very conservative worst case avoidance scenario, indicate that 7 to 10% of divers, kittiwakes, terns and auks and 13% of gannets from the entire study area would be affected. Apart from birds simply avoiding the wind farm, the other potential source of disturbance is use of helicopters for access and maintenance. Helicopters are known to cause significant disturbance impacts in some situations.

In general the risk of collisions between wind turbines and seabirds is poorly documented. It was considered that actively hunting species such as gannets and skuas would be most likely to approach the turbines if they were pursuing fish and seabirds, respectively. Notwithstanding the poor knowledge base, it was considered that the collision risk would not have a negative impact on species populations.

10.11.3. Rodsand in Denmark

Currently, only the summary of the environmental statement for the proposed Rodsand wind farm has been accessed (SEAS Distribution 2000). At this site, 72 x 2.1 MW turbines are planned in water depths of 6.5 to 9 m at the edge of the Femer Belt strait separating south eastern Denmark from northern Germany. The wind farm site is some 10 km offshore and is just outside a large bay that is protected under the EU Birds and Habitats Directives, under the Ramsar Convention and by national nature reserve regulations. The cable route will pass through this protected area

The key bird species using the area are cormorants and two duck species, red-breasted merganser and eider. In addition, much larger numbers of eider migrate through the area. It is considered that direct impacts on habitats will be minimal and that construction will have only temporary impacts. Some 10% of cormorants, eiders and gulls flying past a nearby observation site were at rotor height but it is not known if this applies at the wind farm site.

The Rodsand EIA concluded that it was not possible to determine if avoidance or collision effects would be significant as these could only be measured by monitoring once the wind farm was built. To maintain environmental compliance with the project's license, monitoring of birds and seals and further investigation of the cable habitats is proposed up to and during construction. During the early years of the operating phase, it is proposed to add habitat studies of the wind farm site and assessments of the impacts of noise on fauna.

10.11.4. Scroby Sands in England

It is planned to generate 80MW from 38 turbines on a shallow sand bank, called Scroby Sands, some 3km off Great Yarmouth in Norfolk. The wind farm will be built on the shallow but submerged northern section of the sands. Parts of the southern section are tidal. Initial consultations identified a colony of 200 – 300 pairs of little terns on the coast opposite the sands as the most important ornithological issue. There was also concern about collisions between the turbines and migratory waterfowl as they arrived at and departed from nearby coastal wetlands. These breeding and wintering sites are SPAs under the EU Birds Directive.

Surveys of the feeding usage of the sands by little terns were done in 1995 and 1999. These showed that up to one third of the colony fed in an area of sheltered area of water at low tide 1 – 2 km south of the wind farm site. Less significant numbers of common terns also fed there. It was concluded that given the separation between the feeding area and the wind farm that there would be no significant impact. It was also noted that little terns nest in close proximity to a coastal wind farm in Cumbria. It was, however, recommended that monitoring of the little terns should continue after the wind farm is built.

Worst case analyses was done of the collision risk for bean geese and Bewick's swans, the most sensitive of the migratory waterfowl species in the area. Up to 310 and 750, respectively, might pass through the site twice a year. The analysis demonstrated insignificant collision risks. Risks to migrating landbirds were also considered to be negligible.

Assessment of the signficance of the site for seabirds was done by a desk analysis of standard JNCC seabird survey results. This showed the numbers in the area were very low and therefore any losses due to disturbance or collisions would be insignificant. It was also concluded that the 15+ red-throated divers in the area would be unlikely to be significantly disturbed on the basis that the species nests close to onshore turbines in Orkney (Harris 1999, Percival & Percival 2000, Powergen Renewables Offshore Wind Ltd. 2001, Watson et al. 1995). However, no seabird survey was done of the site. This may a be weakness in the assessment given that standard JNCC type surveys may not have surveyed the shallow sands area adequately.

10.11.4.1 Carnsore Point in Wexford

Although a terrestrial wind farm, because of its location near a major seabird colony, An Bord Pleanala's assessment of this project provides the only relevant Irish insight into how the Arklow Bank's possible impacts on seabirds might be considered (An Bord Pleanala 2000).

The project comprises 14 turbines producing 12 MW on an 84 ha site at Carnsore point, the south easternmost corner of the country. After requesting an EIS, Wexford Co. Council rejected the proposal, though not in relation to its impact on seabirds. This rejection was then appealed An Bord Pleanala, which included the possible impact on seabirds in its assessment. The board's inspector recommended refusal of planning permission but again not in relation to seabirds. However, the board overruled the inspector and granted permission. They attached a condition that *"bird surveys and monitoring of bird casualties be carried out"* to evaluate the effect of the development on the area's fauna.

Concerns about seabird impacts arose because the wind farm site is just to the east of a coastal lagoon called Lady's Island Lake. This holds Ireland's largest tern colony with 50 – 140 pairs of roseate terns (averaging about 10% of the north west European population), over 1000 pairs of sandwich terns, 400 – 500 pairs of common/arctic terns and over 500 pairs of black-headed gulls (Newton & Crowe 2000). As a result, the lagoon and its islets have been designated as SPAs under the EU Birds Directive. They are also protected under the 1976 Wildlife Act.

The terns and gulls nest on two islets at the north end of the lagoon. BirdWatch Ireland carried out a study of the terns' flight lines to the sea for the EIS. This showed that terns accessed the sea mainly by flying south along the lake, but that 7 to 29% of them cut across land in a north easterly direction (although not normally through the wind farm site). In view of this result, both BirdWatch Ireland and Dúchas, the statutory nature conservation agency, were satisfied that the project would not have significant effects on the terns. However, both recommended monitoring during construction and operation, a position endorsed by the inspector and the board.

10.11.5. Possible Impacts of Offshore Wind Farms on Non-Seabird Species

10.11.5.1 Geese

Brent Geese (SPEC 3 & amber) are known to commute on a near daily basis over the sea from Dublin Bay to the Kilcoole Marshes between Greystones and Wicklow Town during the second half of the winter (Coveney, pers. obs.; McMillan 1988). However, there is no known history of such goose movements near the Arklow Bank area.

It is also possible that the some of the 10,000 or so Greenland White-fronted Geese (Annex I, amber) which winter on the Wexford Slobs and to a lesser extent at Cahore in north county Wexford could fly through the wind park site on their spring and autumn migration flights. However, their normal route to and from their Icelandic stopover between Ireland and their breeding grounds in Greenland is overland on a NW/SE axis, which would take them away from the site. (Colhoun 2001, Fox et al. 1994). None were observed during the survey. It would appear, therefore, that any possible impacts on geese are unlikely.

This contrasts with a proposed onshore wind farm at Islay in southwest Scotland. In that case a small proportion of one of the two largest wintering flocks of Greenland white-fronted geese in the world (the other being on the Wexford Slobs) had flightlines across the site. The Secretary of State for Scotland refused permission because it could not be ascertained that the proposed development would *'not adversely affect the integrity of the site concerned'* (Firth 1998).

10.11.5.2 Passerines

Concerns have also been expressed that the wind might kill large numbers of passerine migrants as lighthouses have done in the past. However, radar studies in the western part of Denmark, where a 2 megawatt wind turbine with a 60 meter rotor diameter is installed, show that birds - by day or night - tend to change their flight route some 100-200 meters before the turbine and pass above the turbine at a safe distance (Pettersson & Pettersson 2000).

When combined with passerine studies at Nogersund, it would appear that wind turbines do not cause significant impacts on migrating passerines on the heavily used Scandinavian migration routes. Therefore, it would seem unlikely there would be any such impact on much less used routes through the Irish Sea.

10.12. Guidelines on Ecological Risk Assessment of Offshore Wind Farms

While actual experience of assessment of the impacts of offshore wind farms on seabirds and marine mammals is scanty, several reports have been published with guidance on how these impacts might be measured, mitigated and monitored. Perhaps the most comprehensive is Greenpeace's assessment of the ecological considerations that should be taken into account in developing an offshore wind industry in the North Sea (Söker et al 2000). Scottish Natural Heritage has drafted a methodology for assessing the ornithological impacts of wind farms and has agreed much of it with the British Wind Energy Association (SNH 2001). Others have been developed by BirdWatch Ireland (Galvin 2001, BirdWatch Ireland 2000), the Countryside Council for Wales (Hill et al 1999), the Department of Trade and Industry in England and Wales (DTI 2001), English Nature (Percival 1998), the German Federal Nature Conservation Agency (von Nordheim 2000), and Percival (1999).

On the legal side several highlight the requirement to comply with the EIA Directives. If SPAs or SACs are going to be affected, the necessity to comply with Article 6.3 and 6.4 of the Habitats Directive is stressed. In addition, some advocate assessment at earlier stages such as a Strategic Environmental Assessment (SEA) of the region and the overall place of the industry in it. This is likely to be a legal requirement in the next few years when the SEA directive comes into force. Greenpeace advocate a strong research programme on the environmental issues associated with offshore wind farms to reduce these uncertainties as the industry grows. They also advocate a scoping review at the start of the EIA process. While these are not legal requirements, their implementation will reduce concerns that might slow the growth of the industry.

Next come recommendations on doing the EIA itself. It should cover all stages of the project from installation and connection through operation and maintenance and finally dismantling. Assessment is required of potential impacts on birds and marine mammals from direct loss of habitat to the turbine bases and indirect loss of habitats due to disturbance. Additionally, potential collision impacts on birds will need to be quantified. In most cases, the indirect loss of habitat is considered to be potentially the most serious. There may also be positive impacts due to the slowing of climate change. However, it is not likely that this can be measured for any one project. A second positive impact may be an increased knowledge of species and their conservation needs in previously little studied habitats.

Impact assessment should proceed through a number of phases starting with desk studies of existing information, followed by field surveys to fill gaps. Such surveys will normally need to be done over at least a year and some recommend at least two years (e.g. Galvin 2001). Survey information then needs to be combined with assessment of effects to identify any significant adverse impacts on the more sensitive species. If such impacts are identified, then measures will be required to offset these, especially in SPAs or SACs. These can range from the structure of the turbine, to installation of appropriate lighting and foghorns, to construction at the least sensitive time of the year, to minimization of disturbance. If these do not deal with significant adverse impacts, then it may not be possible to proceed with the project, as it is unlikely that habitat compensatory measure can be implemented in the marine environment. In this regard, however, it should be noted that some early assessments may have taken an over-cautious approach in recommending that turbines and potentially sensitive species be separated by at least 800m (Percival 1998). On the other hand, in Germany it has been recommended that initial offshore projects should have no more than 10 – 15 turbines because of the paucity of knowledge about their impacts (von Nordheim 2000).

In any case, it is generally agreed that a strong monitoring programme focusing on the most sensitive species will be essential to build up a body of experience on the assessment of the ecological impacts of offshore wind farms. This should operate through the construction phases and into the operational phase.

10.13. Likely Impacts of the Arklow Bank Wind Park on Seabirds

10.13.1. Introduction

An analysis of these effects was prepared in the same manner as for Scroby Sands (Percival 2000), based on the results of the field and literature surveys to date (Table 10.1). Because of the lack of previous experience of the impacts of offshore wind farms on the species on the Arklow Bank, it must be stressed that only potential maximum significant effects can be identified at this stage. The monitoring programme (see Appendix A) may show that the effects are considerably less. Furthermore, the possibility of one off catastrophic impacts e.g. collisions of large numbers of roseate terns on migration through the wind park in extreme weather was not considered because it would very difficult to work out even a vague probability of such an event.

10.13.2. Birds

As outlined above, it is considered that the main potential impacts relate to collision risks for birds and habitat loss and avoidance for birds. Currently, there is no obvious reason why direct loss of habitat should be any more significant for birds on the Arklow Bank than it was judged to be at other existing and proposed offshore wind farms. Therefore, the maximum potential signficance of this effect was always judged to be negligible at most.

Collision risks were judged to be negligible at most for low flying species and those with less than a moderate sensitivity baseline. This leaves little gull, red-throated diver and kittiwake. Little gull and red-throated diver were given a moderate magnitude rating because of their high numbers and high flying habits, respectively. They were not given a high potential significance rating because birds generally collide with wind turbines at a low rate and there is no obvious reason why the situation should differ on the Arklow Bank.

The signficance of disturbance impacts leading to effective loss of habitat were judged to be potentially moderate or major for six bird species. Little gull received a major potential significant rating because of the high numbers feeding on the bank. Red-throated diver was next because of it observed reaction to the survey boat, although this may not apply to fixed turbines. It is, however, likely to be a factor during construction and maintenance. The monitoring programme will show whether this disturbance actually leads to a reduction in the use of the area. Overall, red-throated diver was given slightly lower rating than little gull because of the much greater baseline sensitivity of that species. Guillemot and razorbill received moderate ratings of potential significant effects because of the numbers favouring the bank in winter. Kittiwake and shag received the same rating because they were not far behind the auks in terms of BUs on the bank. Manx shearwater was downgraded to low/moderate because it tended to avoid the bank.

Before concluding on the potentially significant impacts on seabirds, three important points must be made. Firstly, if these impacts do not occur, it will be easily observed during the monitoring programme unlike with collision impacts. Any collision effects will be much more difficult to measure.

Secondly, most European seabird populations, with exceptions such as roseate and little terns, are generally stable or increasing since the reduction in direct human exploitation over the last several decades. This contrasts notably with farmland birds (Newton *et al.* 1999). Increases in fishery discards and of prey fish species due to over-fishing of predatory fis species may also have contributed (Berrow 1998). Even oil spills and large bycatches of European seabirds in nets have not caused long term declines. The major cause of seabird declines have been active human exploitation, introduction of alien predators to nesting sites and more recently bycatches of albatrosses on long line fisheries in the southern oceans. Indeed, this problem is now so serious that many albatross species are threatened with extinction. To address this, an Agreement on the Conservation of Albatrosses and Petrels was recently concluded in South Africa under the Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention). The agreement aims to reduce the bycatch of albatrosses attracted to the baited hooks on the long lines by various technical adjustment to the fishing gear and methods. In the case of wind farms, there is no such destructive "pull factor" (Anon. 2001, Tucker and Heath 1994).

Thirdly, many bird species, especially gulls, become quite tolerant of changes such as new human structures or fixed boat routines that do not actively threaten them. In this context it is noteworthy that up to 830 little gulls have chosen to roost in or near Wicklow Harbour after strong easterly winds. Based on current knowledge, it would be surprising if a wind farm was to destroy or significantly reduce the bank's attractiveness to birds by its simple presence – particularly if there is a good food source.

Finally, the cable route does not run through any currently listed protected marine areas, unlike the Danish projects. The cable routes also avoid two small coastal proposed Natural Heritage Areas at Arklow Town Marsh and Arklow Sand Dunes.

Table 10.10: Worst Case Summary of Effects on Birds and Marine Mammals

Species (Birds)	Baseline Sensitivity[1]	Possible Adverse Effect	Maximum Magnitude[2]	Potential Significance[3]
Little Gull	**High**	Collision **Habitat loss** **Disturbance**	Moderate Negligible **Unknown**	*Moderate* Negligible **Major**
Red-throated Diver	**High**	**Collision** Habitat loss Disturbance	Moderate Negligible **High**	*Moderate* **Negligible** **Major/Mod.[3]**
Razorbill	Moderate	Collision Habitat loss Disturbance	Negligible Negligible Moderate	Negligible Negligible *Moderate*
Guillemot	Moderate	**Collision** **Habitat loss** Disturbance	Negligible **Negligible** Moderate	Negligible Negligible *Moderate*
Manx Sheawater	Moderate	**Collision** **Habitat loss** **Disturbance**	**Negligible** **Negligible** Minor	Negligible Negligible Low/moderate
Kittiwake	Moderate	Collision Habitat loss Disturbance	Minor Negligible Minor	**Low/Moderate** Negligible Low/moderate
Shag	Moderate	**Collision** Habitat loss Disturbance	Negligible Negligible Mod./Minor	Negligible Negligible Low/moderate
Common/ Arctic Tern	Low/moderate	**Collision** **Habitat loss** Disturbance	Minor **Negligible** Mod./Minor	Low **Negligible** Low
Common Gull	Low	**Collision** Habitat loss Disturbance	Minor Negligible Minor	Negligible Negligible Low
Gannet	Low	Collision Habitat loss **Disturbance**	**Minor** Negligible Minor	Low Negligible **Low**
Other seabirds	Low	**Collision** **Habitat loss** Disturbance	**Negligible** **Negligible** **Negligible**	Negligible Negligible Negligible
Roseate Tern	Low/none	**Collision** **Habitat loss** Disturbance	**Negligible** **Negligible** Negligible	**Negligible** Negligible Negligible
Little Tern	Low/none	Collision Habitat loss **Disturbance**	**Negligible** Negligible Negligible	**Negligible** **Negligible** Negligible
Geese	Low/none	**Collision** **Habitat loss** Disturbance	Negligible **Negligible** Negligible	Negligible Negligible Negligible
Passerine migrants	Low/none	**Collision** **Habitat loss** Disturbance	**Negligible** **Negligible** Negligible	**Negligible** Negligible Negligible

Notes to Table 10.10

[1] The sensitivity ranking was based on a qualitative aggregation of the importance of three factors. These are the numbers in the study area (on an international, national, regional and local scale), their preference for the Bank, and the proportion that flew above 7m.

[2] Major: total or major alteration of baseline conditions. Moderate: partial alteration of baseline conditions. Minor: small change in baseline conditions. Negligible: slight or no change in baseline conditions.

[3] Given as potential significance because of lack of previous experience in the assessment of such developments. See text also. Effects of **major or major/moderate** significance are defined as potentially significant adverse effects. *Moderate* effects are also italicized.

10.14. Monitoring of Likely Impacts on Seabirds

A monitoring programme is proposed from July 2001 up to and through construction and for a period afterwards. An outline of the programme for the next two years is in Appendix A. Extensive consultation on this monitoring programme have taken place with Duchás, BirdWatch Ireland and the Irish Whale and Dolphin Group. This programme includes provision for regular review as our knowledge increase of the Arklow Bank and the effects of the wind park.

The aim of the programme is to detect any significant changes in the patterns of bird and marine mammal usage of the Bank that are caused by the wind farm and to distinguish these from other factors such as natural variability. The monitoring programme will also contribute to measuring any cumulative impacts that may arise should other proposed wind farms on other Banks go ahead.

Continuation of the box survey as well as the bank survey will show if the changes are restricted to the bank or are taking place across a wider area. For changes restricted to the bank, it will be necessary to establish that they are not linked to changes in prey species. Prey species monitoring and comparisons between sections of the Bank with and without turbines during the construction phases should allow separation of natural variation from the effects of the project.

The frequency of visits to the Bank will be increased to two per month year round. This will improve the understanding the Bank's seabird concentrations and the reasons for their occurrence. Seabird concentrations are more prone to variation than background levels of seabirds (O'Brien 1999).

Monitoring of collisions will be more difficult than on land as it will not be possible to pick up dead birds under turbines. Fitting the turbines with some kind of net, even if feasible, may be counter productive by increasing the risk of collisions and disguising the collision rate in the absence of nets.

As the turbines will be spread out over a large area, at approximate intervals of 500m, an impractibley large number of observers would be required to measure a statistically significant number of collisions, especially of less numerous species. It is not currently known it would be feasible to attach some sort of automatic collision detectors and/or cameras to a sample of turbines. In considering the necessity for developing the necessary equipment it is worth noting that a significant adverse impact scenario could develop from a low collision rate involving a rare species. Assuming that the approximately 1200 adult roseate terns breeding on Rockabill spend 120 days per year in the Irish Sea. A collision rate of 0.005 birds per turbine per day in a 200 turbine project would result in an additional annual adult mortality of 10%. This would undoubtedly be significant in a long-lived slow breeding species such as roseate tern. While this scenario seems most unlikely given that only one roseate tern has been seen to date on the Arklow Bank, it does show that some kind of automatic collision detection and observation equipment is likely to be needed to improve our understanding of collision risks in the offshore situation.

10.15. Measures To Mitigate Effects Of Windfarms On Birds

If the proposed wind park has significant adverse impacts due to collisions and avoidance, it is difficult to see how these could be mitigated while the wind park continues to operate other than by stopping construction. A similar condition that has been applied regarding archaeological fetures could be provided for in the lease on the direction of DoMNR and Duchás.

Concerns have been expressed that collisions may be more likely in poor visibility and that this may be addressed by lighting. However, the turbines will have to carry lighting in relation to air and ship safety. This and any additional lighting for birds would have to be monitored to ensure that it did not exacerbate the collision problem in the manner of lighthouses and passerine migrants. The installation of foghorns could also be assessed for collision avoidance.

The main mitigation measures are likely to relate to disturbance reduction from fast boats and helicopters. Such journeys should be minimized and kept to set routes. During the early years of operation there should be a monitoring programme specifically targeted at the impacts of these activities. Finally, all best practice measures should be taken to avoid pollution, particularly by oil, and litter.

Construction impacts will be mitigated by timing. The two most important species to date on the bank both peak in the winter time, while construction will take place during the summer. Again, best practice during construction should be employed to minimize footprints, sediment disturbance and pollution.

10.16. Conclusions

If monitoring shows that the potentially significant adverse impacts identified in Table 10.10 do not arise, then this proposed development will comply with the requirements of the Habitats Directive.

If this is not the case, then the first step will be to consider alternative sites. Present technology limits turbines to shallow waters such as the Arklow Bank. There are other banks off the east coast such as the Kish/Bray and the Codling Banks of Dublin and north Wicklow and the Blackwater Bank off Co. Wexford. It is not currently known whether the impacts of wind farms on seabirds at these sites would be more or less than on the Arklow Bank.

Given the recent Government assessment of offshore wind energy resources (Kirk McClure Morton *et al.* 2000) which identified (a) the need for development of the sector in the context of imminent power shortages and the need to meet Kyoto emission targets; (b) the concentration of suitable sites on the south and east coasts; and (c) the fact that investigation licenses have been granted for most of these sites, alternative sites may not exist in the sense that all alternative sites are being considered for wind farm development. Thus it can be argued that there is an overriding public interest and an absence of alternatives.

Alternatives must also be considered in a broader context. Offshore wind farms are being proposed because they do not contribute to greenhouse gas emissions unlike most other forms of electricity generation and they are generally supported by environmental organizations, subject to appropriate siting (Border Wind & Greenpeace 1998, An Taisce, Söker et al 2000).

Furthermore, the Habitats Directive allows beneficial consequences of primary importance to the environment to be taken into account in considering developments on sites holding priority species and habitats. Although none of the species and habitats occurring on the Arklow Bank have priority status, it is reasonable in this less strict scenario to similarly strengthen the overriding public interest argument by linking it to the need to slow down damage to the global environment by the generation of carbon dioxide free electricity.

Finally, the requirement to take compensatory measures must be considered. It has already been argued that it seems unlikely that there will be a significant adverse impact e.g. by rendering unsuitable a large part of the feeding grounds of the Wicklow population of little gulls. In the event of this occurring, however, it is difficult to see how compensatory measures could be taken.

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APPENDIX A:

PROPOSED MONITORING PROGRAMME

The overall aim of the programme is to identify any significant adverse impact on birds and marine mammals caused by the wind park project and to distinguish these from natural variation.

Year 1: July 2000 - June 2001

1. Bird & marine mammal monitoring work commenced in July 2000 and the first year (Year 1) will finish in early June 2001. The main component was eighteen JNCC type surveys (1 day each) of the Box, Bank and Cable Route as detailed in the Second Interim Report to March 2001.
2. Three extra day trips along the Bank were made between December and February. During these visits, counts were made of bird concentrations along the Bank and plankton samples were collected on the second and third trips.
3. Finally during January, two day trips were made to banks north and south of the Arklow Bank.
4. Review full Year 1 results in July 2001.

Year 2: late June 2001 to expected construction start in summer 2002

1. Monthly JNCC type surveys of the Box, Bank & Cable Route - one day each. Data will be linked to individual kilometre stretches.
2. Monthly Bank surveys to count bird concentrations and cetacea, take plankton samples and attempt to take a small number of kittiwakes for stomach analysis (subject to licence from Duchás) – one day each. Again data will be linked to individual kilometre stretches.
3. Preliminary monitoring of Wicklow Head seabird colony June to July 2001 – using comparable subunit areas to 1999 survey.
4. Early in year 2, feasibility testing of the POD (porpoise detector) acoustic logger at a fixed point and in boat towing. If this is successful, a cetacean monitoring programme using the POD will be set up. It is likely this will aim to gather porpoise usage data in the vicinity of phase 1 construction and at a control site or sites along the bank, as well as towing studies to compare sight and acoustic records.
5. In April/May 2000, prior to construction start, review work to date. Also set down – as far as possible – parameters for defining significant adverse impact

Year 3 Programme – from summer 2002 to 2003

13.0 Items 1 and 2 as year 2.

14.0 Full monitoring of Wicklow Head seabird colony as per seabird manual to track any local impacts on numbers or productivity..

15.0 After health and safety review, it is now considered that fixed point observations from the anemometer mast and the sub station are not feasible for reasons of access and electrical risk, respectively. However, when doing the JNCC and bank surveys during Year 3, all data collected will be allocated to three zones. These will be (i) construction/operation areas, (ii) adjoining areas and (iii) the remaining (i.e. control) areas of the bank. For the more numerous species at least, this should allow separation of any project impacts from natural variation – in conjunction with the plankton studies. Additional work will be considered during the pre-construction review in spring 2002. This may include additional boat surveys and observations from a dedicated platform on one or more turbine towers.

16.0 Continuation of POD monitoring as Year 2 – if feasible.

APPENDIX B:

ABBREVIATIONS AND DEFINITIONS OF TERMS USED IN THE TEXT

An Bord Pleanála	The Irish planning authority.
Annex I	See SPA (birds) and SAC (habitats).
Bank	The Arklow Bank. Where capitalised, refers specifically to the 40 km^2 area delimited by **waypoints** 4, 9, 14 and 19.
Biogeographic population	Well-defined subspecies or population, often the population of the NE Atlantic region. For most seabirds in this report, JNCC estimates are used (Pollock *et al.* 2000). Numbers for red-throated diver and little gull are from Wetlands International (via Colhoun 2000).
Bird Unit (BU)	1% of the biogeographic population of a species. See also **RBU** and **mBU**.
Birds Directive	See SPA
Birdwatch Ireland	One of the main Irish voluntary nature conservation organisations. Formerly called Irish Wildbird Conservancy.
Box	The 5 km zone surrounding the **Bank**. Its area is 366 km^2, so the combined area of Box and Bank is 406 km^2.
Cable (route)	In species accounts, refers to leg 5, along the proposed route of the cable link from the windfarm to the land.
cetacean	General term for whale, dolphin or porpoise.
DOMNR	Department of the Marine and Natural Resources.
Duchás	The Government's Heritage Service incorporating National Parks and Wildlife. Duchás is part of the Department of Arts, Heritage, Gaeltacht and the Islands.
EIA	Environmental Impact Assessment.
EIS	Environmental Impact Statement.
EU	European Union.
GPS	Global Positioning System.
ha	Hectare(s), a measure of area. One hectare equals 10,000 m^2 or 2.471 acres.
Habitats Directive	See SAC
Hz	Hertz, a measure of the frequency of sound. One hertz equals one cycle per second.
ICES cell	International Council for the Exploration of the Sea cell covering 15' of latitude and 30' of longitude.
IWDG	Irish Whale and Dolphin Group

JNCC	Joint Nature Conservation Committee A. UK statutory conservation body, which is responsible for surveys of seabirds and marine mammals in the NE Atlantic.
kHz	kilohertz, or one thousand hertz (see **Hz**).
km	Kilometre(s).
LANBY	Large Automatic Navigational BuoY, sometimes used by gulls and terns for roosting (see Figure 2.1).
Leg	Section of survey route taking in several **waypoints**. Legs 1-5 are shown in Figure 2.1.
m	Metre(s).
mBU	**milli-Bird Unit**, or 0.001% of the biogeographic population (see **BU**).
MW	Megawatt(s), or one million watts. One watt (a unit of power) is equal to one joule per second; the power dissipated by a current of one ampere flowing across a potential difference of one volt.
N, NE, NW, NNE, NNW	North, northeast, northwest, north-northeast, north-northwest.
NHA	Natural Heritage Area, to be protected under the Wildlife (Amendment) Act (2000).
Ramsar site	Internationally important wetland under the Ramsar Convention.
RBU	**Regional Bird Unit**, 1% of the Irish Sea population of a bird species.
SAC	Special Area of Conservation, designated for habitats listed on Annex I of the EU Habitats Directive (92/43/EEC) as transposed into Irish law via the European Communities (Natural Habitats) Regulations, 1997 (S.I. 94 of 1997).
S, SE, SW, SSE, SSW	South, southeast, southwest, south-southeast, south-southwest.
S.I.	Statutory Instrument (also known as "Regulations"), i.e. secondary legislation used to implement e.g. the Habitats and EIA Directives in Ireland.
SPA	Special Protection Area, designated for bird species listed on Annex I of the EU Wild Birds Directive (79/409/EEC) and for migratory species, as transposed into Irish law through the European Communities (Conservation of Wild Birds) Regulations (various dates) and the Natural Habitats Regulations.
SPEC	Bird Species of European Conservation Concern. SPEC 2 and 3 species have an unfavourable European conservation status and have their global populations concentrated and not concentrated in Europe, respectively.
Waypoint (WP)	Position marked using **GPS**, used for navigation during the sea surveys. Waypoints are shown in Figure 2.1.

APPENDIX C:

SCIENTIFIC NAMES OF SPECIES MENTIONED

Birds	
Arctic Skua	*Stercorarius parasiticus*
Arctic Tern	*Sterna paradisaea*
Bean Goose	*Anser fabilis*
Bewick's Swan	*Cygnus columbianus*
Black Guillemot	*Cepphus grylle*
Black-headed Gull	*Larus ridibundus*
Black-throated Diver	*Gavia arctica*
Brent Goose	*Branta bernicla*
Common Gull	*Larus canus*
Common Scoter	*Melanitta nigra*
Common Tern	*Sterna hirundo*
Cormorant	*Phalacrocorax carbo*
Eider	*Somateria mollissima*
Fulmar	*Fulmarus glacialis*
Gannet	*Morus bassanus*
Great Black-backed Gull	*Larus marinus*
Greenland White-fronted Goose	*Anser albifrons flavirostris*
Great Skua	*Stercorarius skua*
Guillemot	*Uria aalge*
Herring Gull	*Larus argentatus*
Kittiwake	*Rissa tridactyla*
Lesser Black-backed Gull	*Larus fuscus*
Little Gull	*Larus minutus*
Little Tern	*Sterna albifrons*
Manx Shearwater	*Puffinus puffinus*
Pomarine Skua	*Stercorarius pomarinus*
Puffin	*Fratercula arctica*
Razorbill	*Alca torda*
Red-breasted Merganser	*Mergus serrator*
Red-throated Diver	*Gavia stellata*
Roseate Tern	*Sterna dougallii*
Sandwich Tern	*Sterna sandvicensis*
Shag	*Phalacrocorax aristotelis*
Storm Petrel	*Hydrobates pelagicus*
Reptile	
Leathery (or Leatherback) Turtle	*Dermochelys coriacea*
Mammals	
Bottle-nosed Dolphin	*Tursiops truncatus*
Brown Rat	*Rattus norvegicus*
Common Seal	*Phoca vitulina*
Grey Seal	*Halichoerus grypus*
Harbour Porpoise	*Phocoena phocoena*
Killer Whale	*Orcinus orca*
Minke Whale	*Balaenoptera acutorostrata*
Long-finned Pilot Whale	*Globicephala melaena*
Risso's Dolphin	*Grampus griseus*
White-beaked Dolphin	*Lagenorhynchus albirostris*
(Atlantic) White-sided Dolphin	*Lagenorhynchus acutus*
Fish	
Cod	*Gadus morhua*
Herring	*Clupea harengus*
Plaice	*Pleuronectes platessa*
Sole	*Solea solea*
Whiting	*Merlangius merlangus*
Invertebrates	
Chaetognath	*Sagitta* sp.
Mayfly	Ephemoptera
Northern krill	*Meganyctiphanes norvegica*
Water bug	Hemiptera

11.1. Introduction

Three species of cetacean (i.e. whale, dolphin or porpoise) regularly occur in the Irish Sea. These are harbour porpoise, bottle-nosed dolphin and Risso's dolphin. Another six or so species occur irregularly. Two seal species occur in the Irish Sea, grey and common.

11.1.1. Harbour Porpoise

By far the commonest species is the harbour porpoise, the smallest cetacean in the North Atlantic. JNCC recorded abundances in most of the Irish Sea of up to 0.1 animals per km surveyed. They are thought to be present all year round but most records are in summer when calmer seas facilitate their recording. The Irish Sea population is unknown but higher concentrations are associated with the Irish Sea Front, which runs from Dublin Bay to the Isle of Man. An analysis of incidental sightings by the Irish Whale and Dolphin Group shows concentrations off Dublin and Wexford but the Dublin cluster is due to observer effort. They feed mainly on fish with a small proportion of squid. 74% of sightings relate to groups of 1 to 3 animals. While it is mainly considered an inshore species, it can also occur in deep Atlantic waters.

Harbour porpoise populations have been estimated off southwest Ireland at 19,200 and in the Celtic Sea at 36,300. These correspond to density estimates of 0.77 and 0.180 animals/km^2, respectively. While these density estimates are not comparable with the abundance estimates of JNCC, it is noteworthy that the high densities recorded off southwest Ireland correlate with the high abundances recorded there by JNCC. Off north and west Scotland, JNCC recorded lower porpoise abundances than in the Irish Sea, typically of 0.01 – 0.02 animals/km. (Baines 1997; Marine Institute 1999, Northridge 1990; Northridge et al. 1995, Pollock *et al.* 1997, Rogan & Berrow unpublished, Rogan & Penrose 2000, Weir & O'Brien unpublished).

11.1.2. Other Cetaceans

Perhaps the next most common species is bottle-nosed dolphin but these are mainly restricted to the Welsh coast. Risso's dolphins have been recorded mainly along the ferry route between south Wexford and west Pembrokeshire. There is also anecdotal evidence of sightings of Risso's dolphins off Co. Wicklow in recent years. They feed mainly on squid and groups may be faithful to particular areas.

Common dolphins are regular in the Celtic Sea and are associated with the Celtic Sea Front but they are virtually absent from the Irish Sea itself. Very small numbers of minke whale, northern bottle-nosed whale, white-beaked dolphin, white-sided dolphin, long-finned pilot whale and killer whales are occasionally recorded in the Irish Sea (Baines 1997; Hayden & Harrington 2000, Marine Institute 1999, Northridge 1990; Pollock *et al.* 1997, Rogan & Penrose 2000).

11.1.3. Conservation status of Irish Sea Cetaceans

The Whale and Dolphin Sanctuary, covering Ireland's 200-mile exclusive economic zone, protects all cetaceans. The Irish Government set it up in 1991 under the 1976 Wildlife Act and the 1937 and 1983 Whale Fisheries Acts. All European cetaceans are also listed on Annex IV of the EU Habitats Directive (92/43) as a species requiring strict protection from e.g. hunting. Furthermore the harbour porpoise and the bottle-nosed dolphin are listed in Annex II of the Habitats Directive. This states that "*A coherent European ecological network of special areas of conservation* [SACs] *shall be set up* [by member states]. *This network, composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II, shall enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range*" (Marine Institute 1999).

It is understood that Duchás does not currently intend to designate SACs for harbour porpoise because they are relatively common around Ireland and because there are no obvious concentrations. However, six sites have recently been proposed as harbour porpoise SACs by the voluntary nature conservation organisations. The only one on the east coast covers Dublin and Killiney Bays (Dwyer 2000).

11.1.4. Seals

The Irish Sea grey seal population is between 5,000 and 7,000 animals, of which at least 90% is in Wales. The most important sites in eastern Ireland are Lambay Island and Ireland's Eye in Co. Dublin with 170 to 220 animals. The Wexford population is between 450 and 580 animals (Kiely *et al.* 2000). The only concentration of common seals is at Strangford Lough in Co. Down (Baines 1997) but about a dozen also regularly haul out at the Sutton end of Bull Island in Dublin Bay (John Coveney, pers. obs.).

Both seal species are protected under the 1976 Wildlife Act and are listed on Annex II of the EU Habitats Directive. Duchás is designating SACs for grey seals at Lambay Island and the Saltee Islands. The voluntary nature conservation organisations have proposed others for both species in north Co. Dublin and south Co. Wexford.

Special Areas of Conservation (SAC's) arise from the EU Habitats Directive (92/43) and are designed to maintain or restore the favourable conservations status of the threatened habitats and species as listed in Annexes I & II of the Directive. Species listed in Annex II of the Directive that have been observed within the study box are the grey seal, bottle-nosed dolphin and the harbour porpoise.

11.2. Marine Mammals and Reptiles in the Existing Environment

FTC in association with Coveney Wildlife Consulting Ltd. conducted marine mammal surveys together with the bird surveys. A JNCC survey method for sea birds and marine mammals were used in this study (Komedeur *et al* 1992, Tasker *et al* 1984, and Webb and Durnick, 1992). The boat used, the MV Kilquade, was found by the JNCC to meet the requirements for sea bird and marine mammal surveys.

11.2.1. Harbour Porpoise (Figures 11.1 & 11.2)

Only one species, harbour porpoise occurred regularly with a total of 89 observations on 16 of the 18 survey days. This translates into an extrapolated peak of 173 animals in the 406 km^2 study area on 5 July 2000. Numbers dropped off as the season advanced with the exception of some 80 animals on 25 September 2000. However, JNCC caution against calculating area densities for cetaceans on the basis of poorer knowledge of this group. Instead they use comparisons of animals per km surveyed.

Using the same method, this study's results were comparable with JNCC figures (Pollock *et al.* 1997) except for the high figures on the bank in July. This may indicate that the bank is favoured by porpoises in July but this conclusion must be tentative on the basis of the limited data to date. The numbers of harbour porpoises observed during the study is given in Figure 11.1 and the harbour porpoise abundance is given in Figure 11.2.

11.2.2. Risso's Dolphins

The other cetaceans definitively recorded were a pod of eight or nine Risso's dolphins. What was considered to be same pod of Risso's was seen twice in the Box area in early and late July 2000. Another distant sighting of four unidentified dolphins in late July 2000 may also refer to these. Two individuals were seen in early June 2001 near the middle of the bank. At least one of these animals was different from the July pod in that it was a very big pale male. If Risso's dolphins are regularly using the area this may be significant but more sightings would be needed to determine the pattern of usage. It is understood that Risso's dolphins have been sighted off Wicklow Head and Kilcoole in recent summers. Up to 17 Risso's Dolphins were reported off the Saltees in May 2001 (Alyn Walsh, in litt.).

11.2.3. Seals and Turtles

Only three seals have been recorded on surveys to date. One, in February 2001, was positively identified as a grey seal, and it is likely that the other two, seen in July and November 2000, were also that species.

A single leathery (or leatherback) turtle was seen on 3 August 2000. It is the largest of the marine turtles with a global warm water distribution. However, they have been previously recorded in the Irish Sea (Chris Emblow, pers. comm.). They are regularly seen off Cape Clear in west Cork in late summer and early autumn and there were reports of up to 18 in 2000 (Steve Wing, in litt.).

The number of mammals and reptiles recorded are given in Table 11.1.

Figure 11.1: Harbour Porpoise Numbers

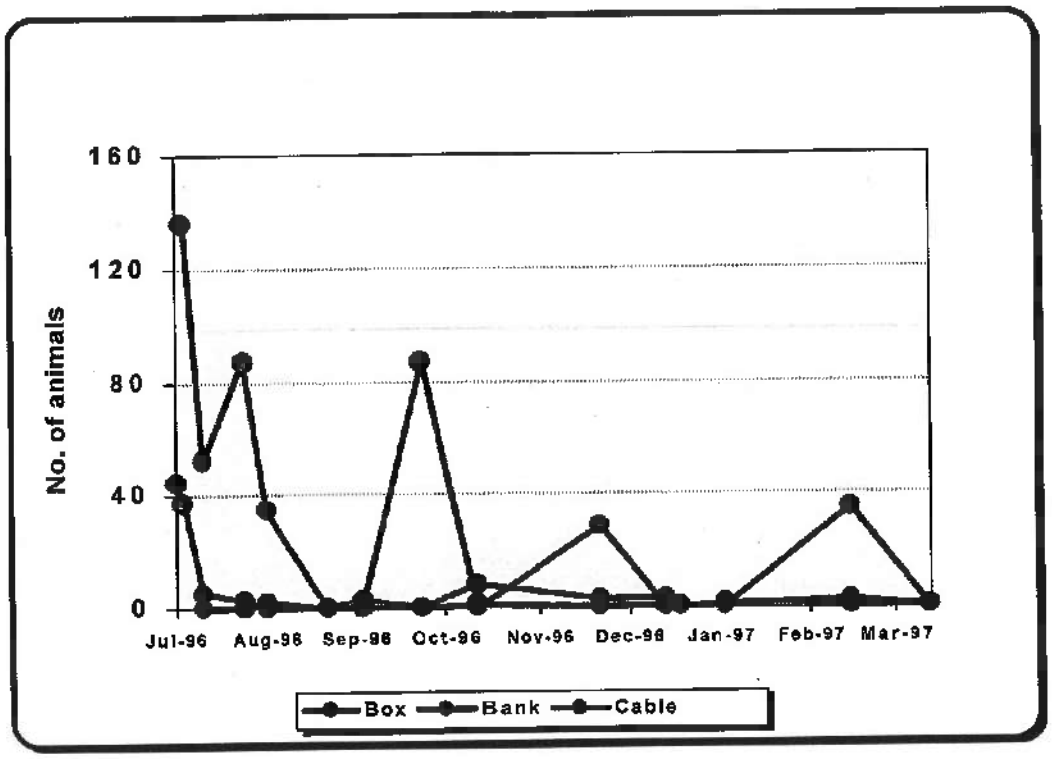

Figure 11.2: Harbour Porpoise Densities

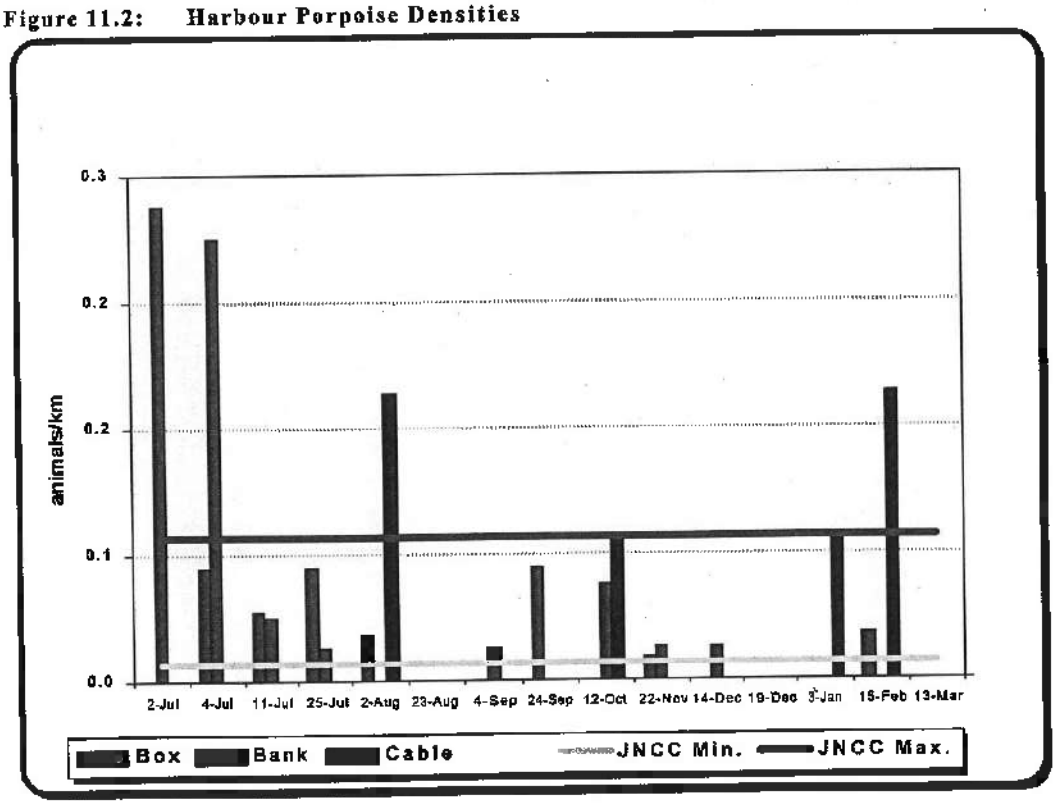

Table 11.1: Numbers of Mammals and Reptiles Recorded

Species	Numbers	Numbers of Days
Leathery Turtle	1	1
Grey Seal	1	1
Seal Species	2	2
Harbour Porpoise	69	13
Risso's Dolphin	17	2
Dolphin Species	4	1
Total	**94**	

11.3. Impacts of Offshore Wind Farms on Marine Mammals

11.3.1. Horns Rev in Denmark

In general, the likely impacts of offshore wind farms on marine mammals are poorly known. However, they were examined for the Horns Rev project (Anon 2000; Elsamprojekt A/S 2000). As with the birds, a survey of the wind farm site and the surrounding 1700 km^2 was done by boat four times between April 1999 and February 2000. Harbour porpoise densities of up 1/km^2 were observed which is high in a North and Baltic Sea context. The higher concentrations were observed between the wind farm site and Blavands Huk in association with an estuarine water mass that may be a breeding area.

The impacts of wind farms on porpoises have not been assessed anywhere nor have impacts from analogous structures such as bridge pillars. It was considered that the habitat loss to the wind farm would be insignificant but that fast service boats could cause significant disturbance. Helicopters could cause localised disturbance on take off and landing. During construction the animals may leave the areas so construction may need to be avoided during the breeding season of June to August.

Up to 400 common seals use haul-outs in the study area but are well away from the wind farm site. It was therefore considered that the impacts were minimal and that there was no need to monitor seals.

The impacts of the Horns Rev project on the marine environment were also examined (Hoffman *et al.* 2000). In general it was considered that the project would have insignificant or temporary effects on marine habitats. It was considered that most noise would be at frequencies of less than 1 kHz, which is well below the frequencies used by harbour porpoises for echolocation. However, noise during construction might cause temporary displacement of porpoises. Noise at infrasound levels of around 500 Hz would be well above ambient levels but it was not possible to predict the effects of this on porpoises.

11.3.2. Blyth Harbour Offshore Wind farm

There were very few marine mammals in the vicinity of this project and it was considered that the noise generated would not have any significant impact on any porpoises that might occur.

11.3.3. Scroby Sands Offshore Wind farm

Up to 60 common seals and 40 grey seals regularly used the Scroby Sands area as a haul out with "a small number" of common seals pupping there. The site is of regional importance but enhanced by more than 30 years of seal watching tourism. The seals have become accustomed to this, provided visitors stayed in the boats and the same boats visiting patterns were maintained. The main seal sites in the area were some 2km from the wind farm site. The main mitigation measure proposed was to keep boats and construction well away from the main seal sites and to implement a monitoring programme.

11.4. Impacts of the Development on Marine Mammals

Previous work conducted as part of the Horns Rev and the Rodsand wind farm developments have shown that the main potential impacts relate to habitat loss and avoidance for marine mammals. Usage of the study area by harbour porpoises may be significant especially if the bank is a nursery area. As the sample size increases, particularly of young animals, the level and nature of use may become clearer. The number of observations on Risso's dolphin is also too low to assess the importance of the bank area to them. It would be necessary to get a better idea of the total size of their home range, if thy are regular in the area. The number of seals in the area was very low and hence the impact on seals will not be significant.

Small cetaceans (dolphins and porpoises) use two types of vocalisations, clicks and whistles and echolocation for navigation and finding prey. Only the large baleen whales use very low frequency vocalisations for communications.

Harbour porpoises, the most common cetacean found within the study area, use the highest frequency range of any cetaceans at around 10-50 kHz and pulses of 1-2 kHz. The duration of both vocalisations is very short, typically up to 5 milli seconds. Risso's dolphins have been poorly studied and no data is available on frequency range.

The calving season for harbour porpoises in Irish waters is between May and August though some calf as early as March. The gestation period is approximately 11 months thus breeding occurs over the same period.

Sound travels 4.5 times faster underwater than it does in air. Fish hear by perceiving air waves and (especially at low frequencies) movements in the water. Work carried out by Westerberg (1994) found that the frequency distribution of wind blade rotation of a 220kW wind turbine was approximately 2.1 Hertz.

The spectral distribution showed a number of overtones, the most dominant corresponding to 16.7 Hertz. The EIS (DFU 2000) for the proposed off shore wind farm at Rodsand concluded that the sound field from a wind farm is so dispersed and constant that the fish can distinguish it from the patterns of movements of other creatures and that because of its constant nature they will probably become accustomed to it.

The impact of infrasound at frequencies of less than 20 Hertz is uncertain and it is not fully known whether fish can acclimatise to the noise.

Work carried out in the preparation of the EIS for the Blyth Harbour offshore wind farm found that most of the noise generated was in the range 8 to 12Hz with some up to 8kHz range. It was considered that the lower frequency noise was not significant in the context of background shipping and wave noise.

The likely impacts of the wind park on cetaceans is more difficult to assess. Data accumulated to date on the harbour porpoise has not established if the bank is a calving area. If ongoing works shows that the bank is a calving area then the impact of the development on harbour porpoises may be significant.

The numbers of Risso's dolphins sited is too low to assess the importance of the bank area to them.

The numbers of seals was low and therefore the impact on them will not be significant.

The expected temporary effects of the construction and erection of the wind farm on cetaceans include:

- The impact of suspended sediments on cetaceans; and
- Stress (due to construction work).

These impacts are expected to be temporary and will last for the duration of construction for the project.

An associated impact will be the reduction of available food to the cetaceans due to construction of the wind farm. In the long-term this will not mean a reduction in the number of cetaceans in the area but in the short-term it will mean that the cetaceans may have to cover a larger feeding area.

The noise of the construction work, particularly if monopiles are favoured as the optimum foundation, will also cause a degree of stress to the cetaceans.

The expected permanent effects of the wind farm on cetaceans will include:

- Direct occupation of the sea bed;
- Noise and electromagnetic fields; and
- The change, in the event that concrete or steel caissons are used for foundations, in the composition of the benthic species inhabiting the sea floor.

Whichever type of turbine foundation will be used either concrete caissons or monopile foundation some form of scour protection will surround the foundations. The scour protection will in turn act as an artificial reef and will lead to the colonisation of the foundations by a range of epibenthic organisms. This recruitment will take approximately 2-3 years to become fully established but when it does it will mean that a more diverse ecological benthos will be found on the Arklow Bank. This consequently will increase the food availability for other cetaceans.

The worst case summary of impacts from the Arklow Bank wind park is given in Table 11.2.

Table 11.2: Worst Case Summary of Effects on Marine Mammals

Species	Baseline Sensitivity	Possible Adverse Effect	Maximum Magnitude	Potential Significance
Harbour Porpoise	Moderate	Habitat Loss Disturbance	Negligible Unknown	Negligible *Moderate*
Risso's Dolphin	Low/Moderate	Habitat Loss Disturbance	Negligible Unknown	Negligible *Moderate*
Leathery Turtle	Low	Habitat Loss Disturbance	Negligible Unknown	Negligible Negligible
Seals	Low	Habitat Loss Disturbance	Negligible Unknown	Negligible Negligible

Notes to Table 11.2

1 The sensitivity ranking was based on a qualitative aggregation of the importance of three factors. These are the numbers in the study area (on an international, national, regional and local scale) their preference for the bank.

2 Major: Total of major alteration of baseline conditions. Moderate: partial alteration of baseline conditions. Minor: small changes in baseline conditions. Negligible: slight or no change in baseline conditions.

3 Given as potential significance because of lack of previous experience in the assessment of such developments. Effects of **major** or **major/moderate** significance are defined as potentially significant adverse effects. *Moderate* effects are italicised.

11.5. Monitoring of Likely Impacts on Marine Mammals

Extensive consultation on a monitoring programme has taken place with the Irish Whale and Dolphin Group. This programme includes provisions for regular reviews of this programme.

Acoustic monitoring of porpoise populations will be tested using the POD system (Porpoise Detector). This equipment is designed to automatically pick up their sonar pulses over a period of several days. The POD is then retrieved to download the data. It can also be towed behind a boat to make comparisons with visual observations. It has been successfully field tested in Newport Bay in Pembrokeshire. The POD is limited, however, in that it cannot measure the number of animals involved in each direction (Pierpoint *et al.* 1999).

11.6. References

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12. NON-LIVING RESOURCES

This section of the EIS considers the non-living resources along the south-east coast of Ireland. The resources included for consideration are sand/gravel deposits, coal resources, oil & gas resources and beach sand deposits. Wave/tidal power is also discussed in this section. Other non-living resources are considered in other sections, including navigation (maritime and aviation) in Chapter 4 and archaeology (wrecks and war time graves) in Chapter 7.

Information provided is obtained from available published literature and discussions with relevant government departments including the Geological Survey of Ireland, the Department of Marine and Natural Resources and the Irish Marine Institute.

12.1. Sand and Gravel

Sand and gravel is a highly valued but depleting resource. Currently much of the sand and gravel used in Ireland is sourced from land-based pits and quarries. To date, limited amounts have been dredged from offshore deposits. An example is sand/gravel won from the Codling Bank in 1998/99 for use in coastal protection works in Bray. The sand/gravel was extracted under licence from the Department of Marine and Natural Resources.

In the United Kingdom and Europe offshore extraction is well established and companies active in these countries have expressed interest in Ireland's offshore deposits. There are a dozen, or so, sand banks between Dublin and Wexford, including the Arklow Bank potentially suitable for aggregate extraction. The distribution of sand and gravel deposits in the Irish Sea, between Wicklow and Wexford is shown on Figure 12.1. Many of these sand banks are however mobile and form an integral part of the coastal system. The effects on the coastal dynamics would need to be thoroughly assessed prior to any extraction works.

The site for the wind park is dominated by sand deposits. The shallow water and proximity to the shore makes this an attractive site for exploitation. Site investigation carried out by Fugro Ltd. (November 2000) as part of the EIS indicates up to 25m of sand deposits. The wind park will cover an area of 39km^2 approximately which represents approximately 1 billion cubic meters of aggregate.

Figure 12.1: Distribution of Sea Bed Sediments

The presence of sand/gravel deposits on the Arklow Bank does not necessarily mean that it is a suitable site for extraction. Its proximity to the coast and shallow water depths are favourable. However, the removal of sand/gravel from the bank will alter the coastal dynamics which could result in accelerated coastal erosion. There are other environmental impacts associated with extraction processes which would also need to be assessed. With the present level of knowledge available, it is not possible to say definitely whether the Arklow Bank is suited for extraction. Banks further north, namely the Codling Bank has been identified as being suitable. This reserve has the added benefit of being closer to the Dublin market.

In any case, the extraction of sand/gravel from the Arklow Bank on a large scale would be incompatible with the siting of a wind park at this location. It is however not a simple case of choosing one activity over the other. Other resources of the Arklow Bank and emissions would have to be considered, namely the aquatic fauna and coastal amenities. Mineral extraction could have a severe long-term impact on both, while the wind park, once constructed, would have a low impact.

12.2. Coal

Coal resources have been identified to the north of the Arklow Bank, in the Kish Bank basin. Figure 12.2 shows the location of the coal resources relative to the proposed wind park. This coal resource was first identified from boreholes drilled for oil/gas exploration in the 1970s.

The coal field consists of 26 seams of bituminous coal, typically 1m in thickness, but ranging up to 2m in thickness. They occur at depths ranging from 100m to 1km below the sea floor. Although the amount of coal present is estimated to be 1.75 billion tonnes, the minable resource is estimated to be 215 million tonnes (GSI, 1986).

A second coal-bearing sequence was identified during oil/gas exploration carried out by Marathon off the coast of County Wexford. The coal-bearing sequence is 340m thick, but the uppermost workable seam is 1,130m deep making the deposit uneconomical at this time.

The presence of coal beneath the Kish Basin and off Wexford Head indicates the possibility that other coal-bearing sequences are present along the east coast, possibly extending beneath the Arklow Bank.

Undersea coal mining is carried out in other parts of the world, although undersea collieries tend to be extensions of land-based operations.

Two extraction methods for the Kish Bank coals are considered feasible. These are land-based conventional mechanised systems and gasification. Whichever extraction method is chosen, it is unlikely that mining will be undertaken in the short-term. The coal deposits identified off the coast of Wexford are too deep to be economically viable, using current extraction methods.

The location of a wind park on the Arklow Bank would not significantly curtail the extraction of coal, even if coal deposits were identified beneath the site. The nature of the extraction method would need to be known, however, to fully assess the impact of each activity on the other.

12.3. Oil/Gas

Oil/gas exploration has been carried out in the Irish Sea in the 1970s. No economical reserves were discovered. There are a number of licensed blocks in the Irish Sea, however these are in UK territorial waters.

12.4. Heavy Mineral Deposits

Heavy mineral beach sands have been known from a number of locations around the Irish coast (Geoghegan et al, 1989). Figure 12.2 shows the locations of deposits near the Arklow Bank. One such deposit has been identified south of Wicklow Head, in the Brittas Bay area. A wide range of economically viable minerals is present in these sands. The mining company involved with these deposits has estimated that 30,000 tonnes of concentrate are present. No extraction has taken place to date and difficulties have arisen with the local planning authorities as the area is designated high amenity value.

Possible conflicts with the wind park development is the potential impact of beach sand extraction on cable routes and possibly an increase in shifting sands from the bank to replace sands removed from the beaches.

Figure 12.2: Location of Mineral Resources

12.5. Wave/Tidal Power

Wave and tidal power are emerging as a new economically variable energy source. Generally coastlines with an ocean fetch of greater than 400km are suitable for exploiting wave power. The Arklow Bank is therefore unlikely to be a suitable site to harness this energy resource. However, tidal currents around the Arklow Bank are quite strong. Tidal currents of up to 2m/sec have been recorded across the bank and similar current velocities have been measured to the east of the bank in deeper waters (see report entitled 'On the Effect of Wind Farm Structures on the Arklow Bank Seabed' Murphy and Dollard May 2001). With these velocities, high power densities can be achieved. The distribution of tidal current velocities are shown on Figure 1.

The currents near the Arklow Bank generally run in a north-south direction, approximately parallel to the coastline and the sandbanks. If at a future time, energy from the tidal currents is exploited, then an array of turbines orientated in an east-west direction would be best suited to maximise the energy yield from the currents. This is perpendicular to the orientation of the wind park array so one would not interfere with the other.

12.6. Conclusions

There are a number of non-living resources identified in and around the Arklow Bank. It is unlikely however, that these resources will be exploited in the near-term. At the present time, it is considered that the wind resource of the area offers the greatest potential for exploitation. Sand/gravel extraction is possibly the next resource offering the greatest potential for exploitation along the south-east coast. The impacts from this activity have, as yet, not been fully explored and so the feasibility of extracting sand/gravel from the Arklow Bank area remains uncertain.

13. LANDSCAPE AND VISUAL IMPACTS

13.1. Scope and Objectives

MosArt were commissioned by Sure Partners Ltd. to produce a Landscape Impact Assessment concerning a proposed wind farm on the Arklow Bank in the Irish Sea. The overall objective of this section is to consider the wind farm as proposed by Sure Partners Ltd. and evaluate the likely impact on landscape.

13.2. Outline of Procedure

Production of this section entailed desk studies and fieldwork comprising professional evaluation by landscape consultants. The study focuses on the landscape context of the Study Area and is based on the following methodology:

- Description of proposed development;
- Definition of Study Area, informed by identification of the zone of visual influence (ZVI);
- General landscape description concerning essential landscape character and salient features of the Study Area, discussed with respect to landform, vegetation, land use and structures;
- Consideration of landscape sensitivity;
- Selection of viewshed reference points (VRPs) from where the proposal is examined in detail;
- Assessment of photomontages produced by Macro Works;
- Estimation of the likely degree of impact on landscape; and
- Recommendation of mitigation measures where appropriate and possible.

The Landscape Consultants took cognisance of the following references, among others (refer to Bibliography):

- Wicklow County Development Plan (1999);
- Wexford County Development Plan - Courtown Area (2000);
- Wexford County Development Plan (2001)
- Recommendations made by An Foras Forbatha as set out in the publication entitled Planning for Amenity, Recreation and Tourism (date unknown);
- Environmental Protection Agency, 1995. Draft Guidelines on the Information to be Contained in Environmental Impact Statements (Anon., 1995(a));
- Irish Government, 1995. Wind farm development: Consultation draft of guidelines for Planning Authority. Department of the Environment, Custom House, Dublin 1 (Anon, 1995(b));
- Irish Planning Institute, 1995. Planning guidelines for wind energy. The Irish Planning Institute, 8 Merrion Square, Dublin 2, Ireland (Anon, 1995(c));
- Countryside Commission, 1991. Wind Energy Development and the Landscape. Countryside Commission Publications CCP 357;
- Planning and Wind Energy: Creating a Secure Framework for Investment. Proceedings of a Workshop Examining European Practice held in Kiltiernan, Co. Dublin on 22nd to 23rd October 1998. Irish Planning Institute (Anon., 1999);
- Proceedings of the Wind Energy Planning for 2000 Conference; 25 - 26 November 1999; Galway. (Convened by the Renewable Energy Information Office of the Irish Energy Centre, in partnership with the Irish Planning Institute and the Royal Town Planning Institute.) (Anon., 2000(a)); and
- Irish Government, 2000. Landscape and Landscape Assessment Guidelines (issued for consultation by the Department of Environment and Local Government) (Anon., 2000(b)).

13.3. Description of Proposed Development and Site

Sure Partners Ltd. is proposing the development of a wind farm on the Arklow Banks, off the east coast of Ireland. For the purposes of orientation, the centre of the site is approximately 13 km from the Arklow town. The total area encompassed by the 20m underwater contour of the Arklow Bank is approximately 29.7 km^2, the outer limit of which stretches approximately 26.1 km both north and south. The development comprises the following main elements:-

- 200 turbines of up to 100m high tower from sea-level to nacelle and a rotor diameter of up to 120m (total height of 160m) and shown white in the photomontages. The turbines are generally arranged regularly in plan and evenly spaced in the order of between 350m and 500m m apart. A more detailed overview of the design and layout of the wind farm turbines is provided later;

- 3 site substations measuring approximately 30 m by 25 m comprising a control building as well as other components. The wave clearance of the modules is approximately 15 m to 17 m to (Figure 2 presented earlier depicts the turbine layout); and

- Approximately 15 km 110 kV line connecting to the national grid at Arklow town. Consideration of the 110 kV line does not fall within the remit of this Landscape Impact Assessment.

13.4. Use of Zone of Visual Influence to Define extent of Study Area

Macro Works prepared two zone of visual influence (ZVI) maps **(Figure 13.1 and Figure 13.2 – included separately from this bound report in a scroll)**. The objective of these maps is to identify the 'theoretical' extent and degree of visibility of each individual turbine ('40m – 160m' and '100m – 160m' respectively); theoretical as it is based only on topography and does not allow for intermittent screening provided by, for example, hedgerows, copses or buildings. Thus the ZVI map, assuming no screening, represents the 'worse-case-scenario' with respect to viewing exposure.

The Countryside Commission suggest that from 10 to 15km would be an appropriate outer limit for landscape impact assessment purposes, depending upon local circumstances. Given the scale of this project, however, a ZVI radius of 20km was used.

Figure 13.1: Zone of Visual Influence
Figure 13.2: Zone of Visual Influence

The following key points should be noted from the 'theoretical' ZVI study:

- To the north of the proposed development, substantial screening is provided by Wicklow Head;
- All 200 turbines will be visible from the entire coast south of Wicklow Head as far as the 20km threshold in Wexford and beyond, with the exception of a couple of small pockets, for example at Kilpatrick and Kilgorman (both in the vicinity of Castletown) where screening is provided by Kilmichael Point;
- Visibility of all turbines is typically limited to two to three kilometres inshore, with exceptions at Redcross, south of Castletown and east of Ballycanew where full visibility extends inland due to the lack of screening by landform;
- Full visibility of all turbines also exists on high ground away from the coast, at locations such as Carrick Mountain, Kilmacrea Upper, Johnstown, Croghan Mountain, Tomathone Upper and Laraheenhill; and
- The rolling hills and mountains provide reasonable screening east of the 20km threshold, with some exceptions west of Coolgreany.

Based on the findings of the ZVI study, the Landscape Consultants have defined the extent of the Study Area pertaining to the wind farm site by the following locations:

- Wicklow head, to the north;
- The Irish sea to the Arklow Bank, to the east;
- Courtown, to the south; and
- Rathpierce Upper (west of Ballyfad), to the west.

13.4.1. ZVI Methodology

The ZVIs were produced from digital elevation models derived from contour tiles. These tiles were purchased from the Ordnance Survey of Ireland. Each contour tile was checked to ensure topological integrity. These were subsequently imported into ArcView with a thematic layer depicting the correct positions of all turbines. Once this GIS was built, the routine to calculate viewshed was initiated.

Two ZVIs were produced to depict the visibility of the turbines at varying heights along the turbine tower. The first ZVI depicts the number of turbines where the full 360° arc of the rotating blades are visible (this is represented by a point 40m above sea level where the rotation begins) (Figure 13.3). The second ZVI depicts the number of turbines where the nacelle at the top of the tower is visible (this is represented by a point 100m above sea level) (Figure 13.4).

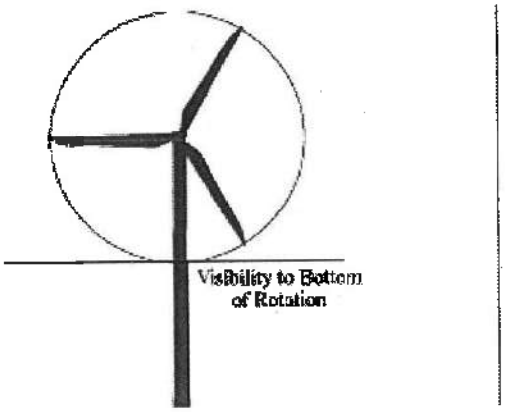


Figure 13.3: Visibility to Bottom of Rotation

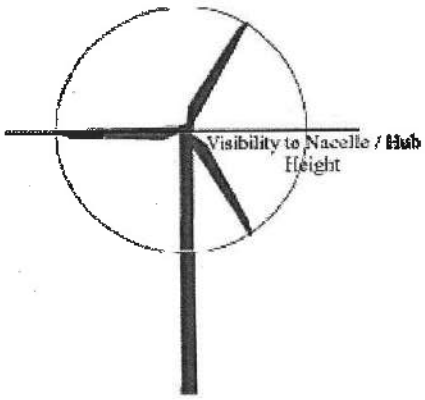


Figure 13.4: Visibility to Nacelle/Hub Height

Each ZVI has been made semi-transparent and superimposed onto the relevant sections of the 1:50,000 series raster maps (sheet 56 & 62).

Buffer zones (10km, 15km and 20km respectively) have been included on the map to demonstrate the distance from the wind farm. These have been calculated based on a line placed between the northernmost and southernmost turbines.

A legend on each of the ZVIs demonstrates the degree of visibility (number of turbines visible at the heights described above) (Figure 13.5). To avoid over-complication, this has been broken into 10 intervals of 20 turbines from 20 – 200.

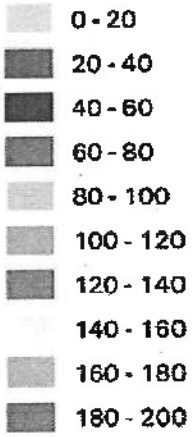


Figure 13.5: Degree of Visibility

Those areas on the map which remain uncoloured are areas where visibility is interrupted by topological features.

13.5. General Description of Landscape Context of the Proposed Wind Farm Site

A general description of the landscape encompassing the immediate context of the proposed wind farm site is provided below under the headings of landform, vegetation and structures. Additional descriptions of the landscape as viewed from each VRP are provided under the detailed assessments in section 13.12, using a similar structure.

13.5.1. Landform and Water

Landform in the region comprises mostly a low lying and gently undulating coastal zone with a number of isolated rounded hills and a backdrop of hills, mountains and valleys to the west.

The Irish Sea comprises a planar surface which reflects the colours of the sky. Unlike the Atlantic sea which often pounds the west coast of Ireland with high rolling waves, the sea in St. George's Channel is often calm, not unlike a vast lake. With exception of when strong easterly or northerly winds hit this region, the wave movement mostly comprises low waves and ripples along the shore. The Arklow Bank on which the proposed wind farm would be constructed comprises an elongated ridge approximately 10m under the surface.

At times, the bank can be discerned from surrounding hills and elevated views as a faint white line running parallel to the coast. When not visible, attention is often brought in the direction of the bank by wave and current movement due to the shallow waters. Another feature of the sea in this area is the prevalence of strong currents, particularly evident for example at Wicklow Head, where swift movement of water parallel to the coast can sometimes resemble more a river than the sea. Lastly, again in strong contrast to the Atlantic Sea, the sea in St. George's Channel is often murky and thus rarely provides crystal clear views of the seabed below.

The orientation of the coastline is mostly north-northeast to south-southwest and in plan consists of a series of shallow curving bays defined by a series of headlands. The coast proper comprises mostly sandy or pebble beaches with some rock outcrops particularly at headlands. Some of the largest beaches includes those at Magheramore, Magherabeg, Jack's Hole, Brittas Bay, Sand Hills, Ferrybank, Tinahask, Askintinny, Kilmurrary Lower, Kilpatrick, Kilbegnet, Ballymoney and Courtown. The elevation of these beaches predominantly rises very gradually westwards with few cliffs or steep ridges such as exists at Magheramore and Ballynacarrig. In other locations a ridge of steeply rolling sand dunes exist, such as those at Brittas Bay and at Sand Hills, visually separating the beach from land to the west. Headlands and most prominent rock outcrops include Wicklow Head, Long Rock, Ardmore Point, The Castle, Mizen Head, Arklow Head, Clogga, Kilmichael and Breanoge Head south of Courtown. From these locations are often provided elevated views of the adjacent countryside. The sea cliffs at Clogga are noted for their geological and geomorphological interest.

The low lying zone west of the coast generally ranges in elevation from sea level to less than 100m with undulations becoming less pronounced towards the south, for example between Arklow and Tara Hill. A series of distinct low rounded hills in this zone serves to add punctuation of landform and includes (from north to south) Ballyguile, Brides Hill, Ennisboyne, Bonagrew Little, Arklow Rock, Tara Hill and Ask Hill. Elevation of these hills is generally in the region of between 100 and 250m ASL.

Moving further west the land generally rises in elevation and comprises a series of rolling hills and ridges which sometimes serve to screen views westwards from the coast. Examples of these hills and ridges include Westaston Hill, Kilmacoo, Ballinvally Upper, Glenteige, Ballinabrannagh and Laraheen Hill northwest of Gorey. Elevation is generally less than 280m ASL. These hills and ridges comprises what might be regarded as the foothills of larger mountain ranges, including the Wicklow Mountains, and they define such valleys as the Vale of Avoca. The most western boundary of the study area is thus defined by higher ridges and mountain slopes including Croaghanmoira Mountain (664m ASL) and Croghan Mountain (606m ASL).

Included in this description of landform is a summary of the character of rivers and water bodies other than the sea. The largest river in the Study Area is the Avoca River which flows southeast through the Vale of Avoca to the coast at Arklow. The Avoca River is formed to the west by such rivers as the Aughrim River, Avonbeg River and Avonmore River extending west and north through rounded valleys into the Wicklow Mountains. Another relatively large river is the Owenavorragh River which flows out through the harbour at Courtown. Otherwise, rivers in the Study Area are minor in terms of overall landscape character and include, for example, Three Mile Water, Potters River, Redcross River and Kilgorman River. None of these rivers have carved notable valleys.

13.5.2. Vegetation and Land Use

Approximately four vegetation and landuse zones can be discerned in the Study Area comprises (a) a narrow coastal strip, (b) rolling and undulating lowlands, (c) hills, ridges and mountains and (d) wooded valleys. Each of these is discussed in outline below.

The narrow coastal strip comprises exposed sand, rock and, in places, seaweed, along the shore line. Where sand dunes exist, they are typically partially covered with marram grass and other maritime vegetation. The influence of off shore winds can be discerned in places by the presence of stunted and lopsided trees as well as tight hedgerows and grass. Gorse is common is this zone.

West of the coastal strip is a patchwork of pasture fields defined by a combination of mature broadleaf hedgerows and copses, low tight hedgerows and fences. Towards the south of the Study Area, the fertility of land appears to improve somewhat with an increase in the area of arable and tillage land. The predominance of intensively farmed land, along with commercial forests listed below and located on higher ground, gives the region a strong sense of human-made order.

The vegetation and landuse on hills, ridges and mountains typically comprises semi-marginal and marginal agricultural grazing land as well as commercial conifer forests and, on high ground, moorland vegetation. Some of the larger conifer exist at Ennisboyne, north of Brittas bay, Balinvally Lower and Glenteige, between Redcross and Arklow, Pollahoney and Croghan Mountain, west of Arklow, and at Tara Hill, north of Gorey.

Lastly concerning vegetation and landuse, a series of valleys including those of the Avonbeg, Avonmore and Aughrim rivers combine to produce the Avoca River which, in turn, flows out to sea through Arklow town. The valley sides of the above rivers tend to be clothed in broadleaf and conifer woodlands extending as finger-like projections westwards into the foothills of the Wicklow Mountains.

13.5.3. Structures

Structures throughout this area are discussed in outline under the following four headings:

- Urban Centres and Housing;
- Communication routes;
- Public amenities and facilities, including historical features and buildings; and
- Utilities.

13.5.3.1 Urban Centres and Housing

In the Study Area are towns, villages, clusters of houses, scattered private houses, isolated farmstead and, notably, several holiday home parks. Many of these provide open views eastwards of the Irish Sea.

The largest population centres include Wicklow town (edging the northern boundary of the Study Area), Arklow, Gorey and Courtown. Referring to the ZVI study, Arklow and Courtown are deemed to be the population centres most affected with respect to visual exposure of the proposed wind farm. Villages and other clusters of population include Brittas, Redcross, Coolgreany, Ballyfad, Inch, Castletown and Ballymoney. Otherwise, there are many private houses and isolated farmsteads scattered throughout the entire Study Area. Not surprisingly, there is great pressure for development of private houses in this locality given the relative proximity to Dublin as well as easy of access to the coast. Sea views are especially sought after by prospective developers.

Aside from the above urban centres and houses in which people permanently reside, there are also several locations in the Study Area which serve to accommodate significant numbers of people principally during the summer holiday season. Such locations include caravan, mobile home and holiday chalet parks. A non-exhaustive list of such parks includes those at Long Rock, Kilpoole, Blainroe, Ballynacarrig, Brittas, several south of Brittas, Clogga, Clones, Ballymoney, Seafield, Duffcarrick, Courtown, Riverchapel and Pollshone. The principal feature of attraction at these locations is the provision of sea views and the availability of coastal and other amenities.

13.5.3.2 Communication Routes

Communication routes in the Study area comprise roads, a railway, walking routes and shipping lanes.

The principle road communication route which exist in the Study Area is the busy N11 connecting Dublin to Rosslare Harbour in the south. Many people use this route to commute to Dublin daily from such places as Gorey, Arklow and Wicklow town. A limited number of elevated open views are provided of the sea from this route, the most relevant to this study being north of Arklow at Johnstown South.

The second most important road communication route relevant to this study is the R750 connecting Wicklow town to Arklow. This is locally known as the coast road to Brittas Bay and Arklow due to the close proximity with which is passes to the sea, at times skirting along the edge of beaches and sand dunes. Open panoramic views of the sea are provided at several locations and this route provides access to many coastal amenity areas and holiday resorts.

In addition to the above two busy routes, the Study Area is well served with a network of third class roads. Some of these roads, for example at Crone Upper (south of Redcross) and Rathpierce Upper (west of Coolgreany) provide elevated panoramic views of the Irish Sea. Other roads provide access to the many holiday home parks listed above.

The Dublin to Rosslare railway line passes through the Study Area heading southeast towards Arklow before heading southwest in the direction of Gorey.

A 'Preliminary Coastal Walking Route' is illustrated in Part 1 of the Wicklow County Development Plan 1999 which connects Bray to Arklow directly along the sea shore.

In addition to road, rail and walking routes, the Study Area also caters for sea faring traffic including large container ships, fishing boats and recreational boating, including sailing. Large container ships are regularly seen on the horizon passing north and south and serving both Dublin as well as the port of Wicklow town. These ships can also be discerned at night due to their navigation lights. Fishing boat traffic is mostly served by Wicklow, Arklow and Courtown as is pleasure boating. Each of the above three towns have active sailing clubs.

13.5.3.3 Public Amenities and Facilities, including Historical Features and Buildings

Those amenities, facilities and historical features which have been identified as being most relevant to this assessment include the following:

- Beach amenities, including those at White Strand, Maheramore, Maherabeg, Jack's Hole, Brittas Bay, Sand Hills, Johnstown South, Ferrybank, Arklow, Clogga, Kilmichael, Clones, Ballymoney and Courtown;
- Golf courses, including Blainroe, Ballynacarrig, The European Club, Arklow and Courtown;
- Areas of geological and geomorphological interest, including Arklow Rock and sea cliff glacial till deposits at Clogga;
- Proposed Natural Heritage Areas, including the Rocky headland at Wicklow Head, sand dunes and fen at Brittas, sand dunes at Arklow and Maherabeg, coastal heath at Arklow Rock – Askintinny and deciduous woodland along the Avoca valley;
- Historical features, including the old light house and old semaphore at Dunbur Head, Coastguard Station at Ballynacarrig, Brittas Bay, convent (formerly Sea Park House) at Magheramore, example of deserted Anglo-Norman Borough at Ennisboyne, Brittas; and
- Walking routes, including the Preliminary Coastal Walking Route' as illustrated in Part 1 of the Wicklow County Development Plan 1999 and the Wexford Coastal Path.

13.5.3.4 Utilities

Given the presence of such large towns as Wicklow, Arklow and Gorey, it is not surprising that many over ground services and utilities exist. Perhaps most noticeable of all is the high tension steel lattice towers which flank the N11 near Arklow, feeding the large scale fertiliser factory at Glenart. This 240kV line connects to the electricity sub-station at Killiniskyduff on the northern edge of Arklow. An additional 240kV line heads north from this sub-station, initially running west of Redcross before veering northeast where is passes in close proximity to the N11 at Ballinclare. Finally, a network of 120kV and 38kV electric lines as well telegraph lines traverse the Study Area, serving the scattered private houses and farmsteads.

In addition to the above land-based utilities, there a number of sea-based utilities within the environs of the proposed wind farm. These comprise navigational markers and are listed below (from south to north):

- No. 1 Glassgorman (red flashing light)
- No. 2 Glassgorman (red flashing light)
- Arklow LANBY (white flashing light)
- South Arklow (white flashing light)
- No. 1 (Arklow Bank) (red flashing light)
- No. 2 (Arklow Bank) (red flashing light)
- North Arklow (white flashing light)
- Horseshoe (red flashing light)
- Pipeline outfall at Wicklow (yellow flashing light)

As can be seen from the list above, there are currently 9 markers within the study area and its immediate environs which are lit at night. These markers, in combination with the shipping and other boat traffic mentioned under Section 13.5.3.2 above, are part of the character of the 'seascape' of this region and serve as a reminder that the Irish Sea is far from being an untouched wilderness but, rather, a busy working and recreational environment.

13.6. Designations

13.6.1. Wicklow County Development Plan

Part 1 of the Wicklow County Development 1999 outlines development policies, objectives and standards for the county. In summary it can be said that much of the area included in the ZVI is deemed to be 'sensitive' to development by Wicklow County Council. The most important aspects of this development plan with respect to this study are outlined below in bullet form:

- It is stated under "**Infrastructural Provision Objectives**" that the Council "will encourage the development of wind energy in suitable locations in an environmentally sustainable manner";

- The overriding **Coastal Zone Management** policy is "to retain and reinforce the existing undeveloped rural character of the area ... to restrict haphazard and unnecessary development ...". In this section of the County Development Plan the only mention of off-shore development pertains to prevention of "further proliferation of sea outfalls for effluent discharge";

- Aside from the urban centres of Wicklow and Arklow, the entire coast of the county between these towns is classified as an **Area of Outstanding Natural Beauty**. The width of this zone varies between approximately 1 to 2 kilometres. In this zone the Council will "reinforce and preserve the scenic quality by restricting development in it". Development on the seaward side of roads will be restricted where "it would be injurious to the amenities ... injurious to tourism, or where it would be visible between the road and the sea..";

- **Views of Special Amenity Value** or Interest will be preserved and protected where they are of "special interest of national or regional significance". Three such views are identified as of relevance to this study, namely C108, Castletimon, Brittas Bay, C160, Tonlagee, Brittas bay and N11, south of Scratanagh Cross. Each of these three locations have been chosen as viewshed reference points for this study;

- **Prospects of Amenity Value or Interest** are also to be preserved and protected where they are of "special interest of national or regional significance". Three such prospects are identified as of relevance to this study, namely R750 Wicklow to Arklow, N11 south of Scratanagh Cross and C170 and C173 at Crone Upper, Redcross. As with the views above, each of these three locations have been chosen as viewshed reference points for this study; and

- Other existing and / or proposed designations are noted in the Wicklow County Development Plan, including Natural Heritage Areas, Special Protection Areas, Special Areas of Conservation and Landmarks. These are dealt with elsewhere in this report.

13.6.2. Wexford County Development Plan

A revised Development Plan for Wexford County was adopted at the time of printing this EIS. Some of the most relevant information pertaining to landscape issues is summarised below:

- It is recognised that the county has "potential for offshore wind energy generation". The challenge, however, is in achieving a "balance between the wider environmental benefits occurring from wind energy and the potential for adverse impacts on the local environment and community".

- The plan will require wind farm developments to locate "outside vulnerable and sensitive landscapes and avoiding also areas located in proximity to scenic routes ...". Areas designated as "Vulnerable" include the entire coastline and comprises the county's "highest quality landscapes with limited potential to absorb intensive development". The plan strives to protect the character of this coastline and "large scale development shall be strongly resisted unless they are proven to be in the National interest ...". Areas designated as "Sensitive", on the other hand, include beaches, dunes and sands. Within or adjacent to such landscapes, "development which would adversely affect the special scenic quality of the landscape will be strongly resisted". As will be seen later, five of the VRPs used in this study are located within the such Vulnerable or Sensitive landscapes.

- The "Coastal Zone" is regarded as "a vital asset with limited capacity to absorb development". For this reason, there will be emphasis placed on the "scale and rate of development which can be accommodated without damaging or detracting from the basic qualities and attraction of the coast". In all, three different coastal types are noted, from high to low sensitivity. The same five VRPs referred to in the previous point are located within this Coastal Zone.

- Despite the above policies for protection and conservation, the plan also states that "special emphasis will be placed on the creation of new landscapes" as would be the case following the development of the Arklow Bank wind farm. Furthermore, the local authority seeks to "encourage the development of green tourism" which might be assisted by renewable energy projects such as wind farms.

Given that the southern most location selected in the study area for this report is the resort of Courtown, the specific development plan relating to that area is considered below.

Courtown Development Plan

The most critical points of relevance to this study are listed below:

- The development strategy is to provide for "structural open space and natural amenity areas particularly in the coastal zone";

- The entire coast included in the Courtown Development Plan is designated as either "natural amenity areas" or "harbour and marine amenities";

- Coastal areas and headlands shall be maintained "free from development having regard to the overall Coastal Development Strategy"; and

- Protection of "significant views in the area through the strict control of development along the coastline". This would involve prohibiting "the development or siting of structures so close to beaches or coastline as to intrude on the enjoyment of the beach by the public or which detract from views, prospects and the special amenity value of the coastline".

13.6.3. Blue Flag Beaches

The Blue Flag is an exclusive eco-label awarded to more than 2,500 beaches and marinas in 21 countries across Europe in 2000 (refer to the web site http://www.blueflag.org/frames/criteriadetail.htm). The campaign is owned and run by the independent non-profit organisation 'Foundation for Environmental Education in Europe' (FEEE) and the Blue Flag itself is a symbol of high environmental standards as well as good sanitary and safety facilities at the beach/marina. Of relevance to this study, it should be noted that there are three beaches within the Study Area which are classified as 'Blue Flag' beaches, namely Brittas Bay north, Brittas Bay south and Courtown north.

Criteria used in the designation of Blue Flag beaches are listed below:

- Water quality
- Environmental information and education
- Environmental management and facilities
- Safety, services and facilities

Of relevance to this section of the EIS, it is highlighted that the four key criteria listed above do not explicitly refer to the visual or aesthetic quality of any given location.

From a landscape perspective, therefore, it is suggested that the proposed development would not adversely impact upon the Blue Flag designation of local beaches. In fact, according to details provided in the above web site, the proposed development may actually contribute positively to the existing designation. In relation to the second criteria above, for example, environmental information and education, a number of activities are recommended including "nature reconstruction projects, recycling projects, green technology projects." The proposed wind farm would, without doubt, provide an excellent example of 'green technology'.

13.7. Identification of Viewshed Reference Points as a basis for Assessment

Viewshed reference points (VRP's) are selected as being representative of locations from which views of the proposed development, may, though not necessarily, be critical with respect to impact upon landscape. Typically they include centres of population, important communication routes (whether due to traffic volume or their scenic value) and amenity areas (eg. beaches, walking routes, parking areas, golf courses, etc.).

A combination of visits to the study area as well as desk studies based upon layout maps and the ZVI assessment were used to select nineteen VRP's as a basis for this study. In the final selection of VRP's due cognisance was taken of designations highlighted in both Wicklow and Wexford country development plans.

The VRPs are shown on Figure 13.6 and are as follows:

- VRP 1: Old Lighthouse at Wicklow Head, Co. Wicklow
- VRP 2: Blainroe Golf Club, Co. Wicklow
- VRP 3: Third Class Road at Ballynacarrig / Castletimon, Co. Wicklow
- VRP 4: Public House Car Park at Ballynacarrig, Co. Wicklow
- VRP 5: Beach at Brittas Bay, Co. Wicklow
- VRP 6: Third Class Road at Tonlegee, Co. Wicklow
- VRP 7: Third Class Road at Ballinvalley Upper, Co. Wicklow
- VRP 8: Third Class Road at Ballinaskea, Co. Wicklow
- VRP 9: N11 National Road at Johnstown South, Co. Wicklow
- VRP 10: Amenity Area at Ferry Bank, Arklow, Co. Wicklow
- VRP 11: Arklow Town, Co. Wicklow
- VRP 12: Third Class Road at Moneyribbin, Wicklow- Wexford Border
- VRP 13: Amenity Car Park at Clogga, Co. Wicklow
- VRP 14: Beach at Kilmichael, Co. Wexford
- VRP 15: Beach at Clones, Co. Wexford
- VRP 16: Third Class Road at Tara Hill, Co. Wexford
- VRP 17: Beach at Ballymoney Lower, Co. Wexford
- VRP 18: Beach at Courtown Harbour, Co. Wexford
- VRP 19: The Irish Sea – East of the Arklow Bank

Both Wicklow and Wexford County Councils were notified of the above list of VRP's, including their depiction on a colour map. The planning section of both local authorities have indicated that the viewpoints are considered to be suitably representative and appropriate.

A quantitative comparison of each VRP is provided in Table 13.1, highlighting national grid co-ordinates, direction of view, VRP type, distance to nearest turbine, approximate number of turbines visible and angle of view occupied by the wind farm. The impact of the proposed development upon landscape is estimated in section 13.12 from each of the nineteen selected VRPs.

Figure 13.6: VRPs Nos. 1-19

Table 13.1: Quantitative Comparison of Viewshed Reference Points

VRP No.	Location	National Grid co-ordinates	Direction of view	VRP type	Distance to nearest turbine (Km)	Approx. number of turbines visible	Angle of view occupied by wind farm
1	Old Lighthouse at Wicklow Head, Co. Wicklow	E: 334300 N: 192300	South-east	Heritage feature	8.40	200	40
2	Blainroe Golf Club, Co. Wicklow	E: 333328 N: 190077	South-east	Sports amenity	7.70	120	54
3	Third Class Road at Ballynacarrig / Castletimon, Co. Wicklow	E: 330421 N: 185426	East and south-east	Third class road and scenic view	8.90	200	82
4	Public House Car Park at Ballynacarrig, Co. Wicklow	E: 331450 N: 185450	East and south-east	Public meeting place	7.80	180	85
5	Beach at Brittas Bay, Co. Wicklow	E: 331025 N: 183625	East and south-east	Amenity and Blue Flag Beach	8.10	200	95
6	Third Class Road at Tonlegee, Co. Wicklow	E: 329683 N: 183485	East and south-east	Third class road and scenic view	9.30	115	90
7	Third class road at Ballinvally Upper, Co. Wicklow	E: 324822 N: 181608	East	Third class road with elevated panoramic views	13.90	130	63
8	Third class road at Ballinaskea, Co. Wicklow	E: 326689 N: 178468	East	Third class road with elevated panoramic views	11.80	200	93
9	N11 National Road at Johnstown South, Co. Wicklow	E: 325875 N: 176925	East	Busy national route	12.50	200	93
10	Amenity area at Ferry Bank, Arklow, Co. Wicklow	E: 325650 N: 174150	East and North-east	Amenity	12.10	200	94
11	Arklow town, Co. Wicklow	E: 324200 N: 172850	East and North-east	Urban centre	13.30	190	87
12	Third class road at Moneyribbin, Wicklow- Wexford border	E: 315600 N: 171700	East and North-east	Third class road with elevated panoramic views	21.60	200	59
13	Amenity car park at Clogga, Co. Wicklow	E: 325223 N: 169294	East and North-east	Amenity	11.70	200	88

Table 13.1 continued

14	Beach at Kilmichael, Co. Wexford	E: 325503 N: 166609	East and North-east	Amenity	11.10	200	83
15	Beach at Clones, Co. Wexford	E: 324475 N: 164500	East and North-east	Amenity	11.70	200	72
16	Third class road at Tara Hill, Co. Wexford	E: 321375 N: 162200	East and North-east	Third class road with elevated panoramic views	14.50	200	58
17	Beach at Ballymoney Lower, Co. Wexford	E: 321600 N: 160100	North-east	Amenity	14.20	170	52
18	Beach at Courtown Harbour, Co. Wexford	E: 320100 N: 156450	North-east	Amenity and urban centre	16.40	200	39
19	The Irish Sea - East of the Arklow Bank	E: 341693 N: 179238	West	Boating amenity	<0.01	200	

13.8. Sensitivity of VRPs

A five-point scale is used by MosArt to classify the degree of sensitivity of VRPs from very low, low, medium, high and very high. This classification is similar to that recently proposed by the Department of the Environment and Local Government in their Landscape Guidelines issued for consultation (Anon., 2000(b)). However, a critical point of distinction is that sensitivity in the context of this report is understood to pertain to specific VRP locations, rather than the broader landscape context.

Criteria used by MosArt to estimate the sensitivity of VRPs include those listed below (no relative magnitude is inferred by this arrangement):

- Sense of awe;
- Number of viewers;
- Likely mental disposition of viewers (eg. commuters hurriedly driving on busy national route versus golfers enjoying panoramic views in a leisure mode).
- Provision of elevated panoramic views;
- Presence of water (river, lake, sea);
- Degree of perceived naturalness and sense of remoteness;
- Ruggedness of landform / exposure of rock outcrops;
- Degree of enclosure by landform;
- Presence of striking or noteworthy features;
- Integrity of character;
- Historical, cultural and / or spiritual significance sensed; and
- Rarity or uniqueness.

Those locations which are deemed to satisfy many of the above criteria tend to be higher in terms of sensitivity than those which do not. MosArt considered each of the above criteria at every VRP and prepared a summary classification on the five-point scale mentioned above (Table 13.2). As can be seen from Table 13.2, many of the VRP's selected are deemed to be of high sensitivity.

Table 13.2: Analysis of Landscape Sensitivity at Viewshed Reference Points

Criteria	Viewshed Reference Point Number																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Sense of awe	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N
Number of viewers	N	Y	N	Y	Y	N	N	N	Y	Y	Y	N	Y	Y	Y	N	Y	Y	N
Likely mental disposition of viewers	Y	Y	N	Y	Y	N	N	N	N	Y	N	N	Y	Y	Y	N	Y	Y	Y
Provision of highly elevated panoramic views	N	N	N	N	N	Y	Y	Y	N	N	Y	Y	N	N	N	N	N	N	N
Presence of water (river, lake, sea)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Degree of perceived naturalness and sense of remoteness	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Ruggedness of landform / exposure of rock outcrops	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
Degree of enclosure by landform	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
Presence of striking or noteworthy features	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Integrity of character	Y	Y	Y	Y	Y	N	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Historical, cultural and / or spiritual significance sensed	Y	N	N	N	N	N	N	N	N	Y	Y	N	N	Y	N	N	N	Y	N
Rarity or uniqueness	Y	N	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
Summary sensitivity assessment	H	H	L	M	VH	M	H	M	L	H	H	M	H	H	H	L	H	H	M

Notes: N above implies VRP is generally not sensitive with respect to the assessment criteria, whereas Y implies yes (i.e. is sensitive)

VL = very low sensitivity, L = low sensitivity, M = medium sensitivity, H = high sensitivity and VH = very high sensitivity

13.9. Overview of Typical Landscape Impact of Wind farms

In order to achieve a balanced perspective on the acceptability of wind farms, their impact upon the landscape should be outlined, both positive and negative. Consideration of such impacts include perception and preconception. The two subsections below have been taken from a paper written by the authors of this report (McCormack and O'Leary, 1999).

Not withstanding the arguments for and against wind farm developments in the landscape MosArt have, in this study, adopted a precautionary stance in their assessment.

The main adverse landscape impacts of wind farms are as follows:

- They are typically located on the skyline of highly visible sites which may also be sensitive due to their perceived character as naturalistic wildland (in this case, a *seascape*) with a sense of remoteness, freedom and beauty.
- Wind farms comprise vertical elements (configured in lines or clusters and arranged regularly or irregularly) in stark contrast with their context. This is especially relevant where turbines are located off-shore. Turbines thus typically stand far higher than their surrounds.
- The entire complex comprising turbines, service buildings and compound as well as connection with the national grid may effectively result in a relatively large scale development, both point-located and linear.
- Blade movement may draw attention from considerable distance, increasing risk of exposure. Where blades break the skyline (depending upon angle of view) they can be visually irritating.
- Impact upon landscape quality away from the site may result due to structures required for connection with national electricity grid. In the case of this proposed development, it should be noted that connection to the national grid will not require additional towers or twin poles in the landscape.

A number of positive contributions towards landscape aesthetic quality may result from the introduction of wind farms, as listed below:

- They are associated with green-energy and a pollution free environment and are regarded as a sign of progress and also peace with Mother Nature. Perceived advantages of wind farms by members of the public in a study carried out in Altamont, US, for example, included "*lack of pollution*" and "*desirable alternative to other energy sources*" (Thayer and Hansen, 1988).
- The wind turbines possess an aesthetic quality associated with abstract sculpture due to their elementary structure and kinetic-like dynamic. Thayer and Hansen (1988) note that many subjects in their study regard wind farms as "*interesting visual stimuli .... looked upon as moving visual forms contrasting with a smooth landscape*".
- Wind farm developments may arouse a positive sense of curiosity due to their novelty and strangeness or even mystique due to their aloof, lonely and minimal

character. Once again, Thayer and Hansen provide support for this argument, highlighting that the interest of some of their survey respondents towards wind turbines was due to their "*novel, unfamiliar forms and animation*".

13.9.1. Research on public perceptions of wind farm developments

To the best knowledge of the authors of this report, no research has been carried out in Ireland on public perceptions of wind farms. A substantial number of studies have been completed in the UK and elsewhere, however, and the following key findings are noted below. These findings are drawn from an article by Paul Gipe titled "Tilting at Windmills: Public Opinion Toward Wind Energy" and documented on the web site http://rotor.fb12.tu-berlin.de/windnet/tilting.html.

BBC Public Survey (carried out by the University of Wales' environmental and countryside planning unit at three sites (Llandinam, Rhyd-y-Groes, Taff Ely).

- 67% of those surveyed favoured wind development in Wales
- 32% felt that principle drawback is adverse aesthetic impact
- Support increased once the wind projects were actually installed
- The majority of those who could see wind turbines from their homes still favoured wind energy

Department of Trade & Industry Poll - *residents living near a windfarm*

- 75% saw the turbines every day
- The majority concluded that the turbines did not "spoil" the scenery, while 22% believed that they did
- 54% held positive attitudes towards the appearance of the turbines, 27% were neutral, and 12% objected
- Survey by the Countryside Council for Wales
- 50% to 75% of those in areas with existing windfarms thought the wind turbines were in keeping with the landscape
- Only "small numbers regarded them as intrusive"
- Owners of second homes worried that the turbines would despoil their summertime destination
- After construction, 85% of the respondents in Cornwall and Exeter approved of wind energy.

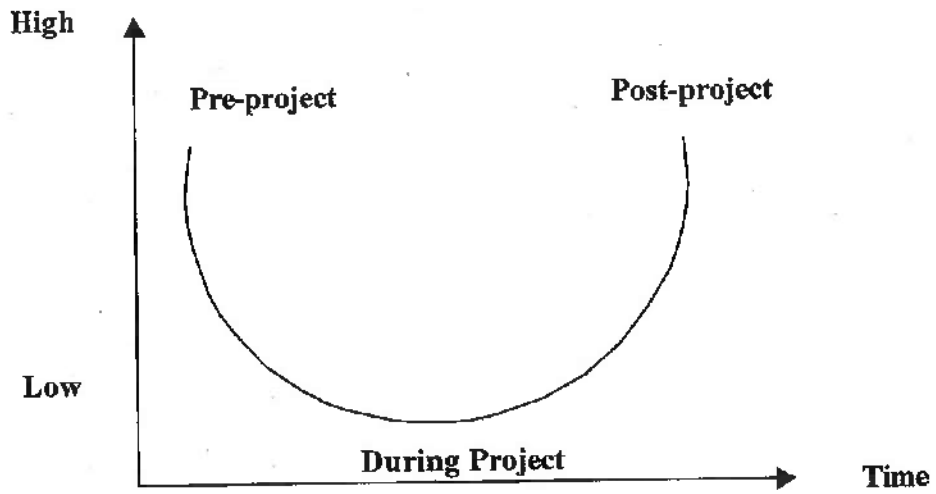
13.9.2. International observations regarding wind farm development

A number of quotations from international observers regarding wind energy projects are included below for the purposes of highlighting that while landscape impacts are generally the greatest concern with wind farm developments, they tend to result in lower adverse impacts than anticipated and, in come cases, can even enhance landscape quality:

- "The negative view of wind turbines on the landscape is 'the' factor determining opposition to wind energy" (Maarten Wolsink, 1989)
- "The reality of a wind farm is much better than the prospect of it" - Andrew Garrad, Energy Connection (quoted in the above referred to web site http://rotor.fb12.tu-berlin.de/windnet/tilting.htm.)
- "Wind turbines when located thoughtfully, can enrich the cultural landscape rather than detract from it" (Neilsen, 1996)

The graph depicted in Figure 13.7 (Gipe, 1995) below is proposed as encapsulating the overall experience regarding public acceptance of wind farm development. Three stages are noted, namely pre-project, during-project and post- project. The level of acceptance of wind farm development tends to be high at the pre-project stage. People generally agree that renewable energy projects are, as a matter of principle, positive and therefore welcome. During project construction, however, the level of acceptance tends to dip as local people come to grips with the reality of the development and have to deal with the change in landscape with which they are so familiar. In the third and final post-project development stage, acceptance tends to rise again as people become familiar with the turbines in their landscape. While it cannot be guaranteed that the response to the proposed project at Arklow Banks will change as described in the above three stages, it is reasonable to suggest that the experience may be broadly similar.

Figure 13.7: Public Acceptance of Wind Energy



13.9.3. Anecdotal Evidence regarding Perceptions of the Proposed Scheme

During the course of preparing this report, MosArt have had the opportunity to present the scheme to the public at seminars both in the Arklow Bay Hotel and in Courtown Bay Hotel. During these presentation, seminar attendees were requested to view a series of photomontages depicting the proposed development from a number of viewshed reference points. Of those who made comment regarding the photomontages to the authors of this report, the majority were in full support of the scheme. The overall sentiment was that renewable energy projects are needed in Ireland. When individuals were asked to comment about the visual impact of the scheme, most, except a few persons, had the impression that there 'is no problem with them'. One exception of this sentiment was expressed by a person living at the coast near Arklow who felt there are too many turbines in the scheme. Furthermore, some individuals at Courtown expressed concern regarding potential adverse impact upon landscape and the harm this might have on tourism. On hearing the distance to the scheme from Courtown, however, the majority of concerns of this group were allayed.

13.10. Classification of Landscape Impact

Estimation of impact upon landscape is reached using both quantitative and qualitative factors, including landscape character, sensitivity of viewshed reference points, distance to the nearest turbine and number of turbines visible. Impact can be either (a) positive or (b) adverse and a three-point scale is used to summarise the magnitude of such impact, whether minor, moderate or major. Six summary impact assessments are thus possible, as follows:

- Positive Major
- Positive Moderate
- Positive Minor
- Adverse Minor
- Adverse Moderate
- Adverse Major

Given that MosArt have adopted a precautionary approach, the majority of judgements made have erred on the adverse side. However, in two cases it will be seen that the classification of impact is positive.

As an example using the above six classes, the impact at a VRP that is of 'naturalistic' character, high or very high sensitivity and close and exposed to a high number of turbines might be, say, adverse major. On the other hand, the impact at a location of anthropogenic or 'human-made' character, low sensitivity which is a great distance from the turbines and where only a low number of turbines are visible could be, for example, adverse minor. Conversely, in a location where the arrangement of turbines is such that a sculptural rhythm results and which is in keeping with the surrounding character, then the impact might be positive moderate.

The above rationale is used for each of the VRP's below in order to present a summary statement regarding impact upon landscape. The landscape impact assessment is accompanied in each instance with a graphic depiction of the view after introduction of the turbines and quantitative descriptors **(Figures 13.8 through 13.27 inclusive – included separately from this bound report in a scroll).**

13.11. Impacts common to all Viewshed Reference Points

A number of key adverse landscape impacts of wind farms has been listed above and, subject to the qualifications mentioned below, it can be assumed that these are broadly relevant for each of the VRPs used in this study. In order to minimise unnecessary repetition throughout this report from each of the nineteen VRPs, therefore, no mention of these impacts will be made unless it is deemed necessary to do so.

An outline discussion of the impact of (a) turbine numbers, (b) turbine layout, (c) turbine height, (d) turbine colour and (e) service modules is provided below in advance of the assessment from each VRP.

13.11.1. Number of turbines

Practically all of the 200 turbines will be visible from most VRPs used in this study and the development, therefore, will appear as large in scale. Due to the need to space the turbines approximately 350m apart, the development will occupy approximately a 22km long swath of sea. While each VRP is at least approximately 8km away from the wind farm, this length of development will nevertheless appear as significant from most locations used in this study.

Intuitively, it may seem reasonable to suggest that a reduction in the number of turbines would also lessen the overall level of adverse impact. However, it must be remembered that most turbines are visible from most VRPs. Therefore, the development would still be visible and would still draw attention even if a substantial number of turbines were to be removed. In any event, if turbine numbers were significantly reduced they would still be spaced as far apart as possible on the Arklow Bank in order to maximise efficiency. A reduced scheme, therefore would occupy the same proportion of horizon as viewed from the VRPs. The benefit to be gained, therefore, is a reduction in the apparent scale and sense of visual clutter which might arise from some perspectives.

13.11.2. Layout of Turbines

MosArt has suggested elsewhere (McCormack and O'Leary, 1999 and O'Leary and McCormack 2000) that turbine layout should preferably respond to landscape character. In a rugged undulating and mountainous landscape, therefore, a random arrangement might be appropriate, with no apparent order in terms of spacing or alignment. In a planar moorland landscape, on the other hand, such as that at the existing wind farm at Bellacorrig in Mayo, a geometric rectilinear layout of equal spacing is preferred. In many respects the seascape in which the proposed development at the Arklow Bank is to be located is *visually* quite similar to the landscape at Bellacorrig, the primary difference being colour (grey / blue water and brown peat respectively). Arising from this argument, therefore, MosArt suggests that a geometric and rectilinear turbine layout of equal spacing is preferred at the Arklow Bank.

This suggestion agrees with available international literature which emphasises the general need for regularity, uniformity and order, irrespective of landscape type (Thayer and Hansen, 1988; Stanton, 1996; Patton, 1998).

Thayer and Hansen (1988), for instance, comment that most windfarm designers aim for turbines of similar sizes and types, arranged "*in orderly rows respective of land contours*" presumably intending lines of masts to be level. Stanton (1996) highlights that an informal arrangement will only succeed where it can be easily related to prominent features or characteristics such as field hedges. Without such visual clues, she argues, an informal arrangement appears "*confusing*". Patton (1998) concludes with similar design recommendations to those of Thayer and Hansen, including that "*a grid organises and gives regularity to pattern. A good windfarm layout is well organised as opposed to ad hoc*".

The proposed layout is depicted in plan in Figure 2, overlaid on the Arklow Bank. As can be seen from this plan, the layout comprises a series of straight lines of turbines aligned on the central axis of the Arklow bank. This axis is, in turn, approximately parallel to the coastline. The lines of turbines taper to the northern and southern ends of the Arklow Bank, in sympathy with the lozenge shape of the underlying ridge. Finally, additional regularity is assured through the regular spacing of turbines both within and between lines. It is fair to say that the layout as proposed will in effect 'mirror' the underwater landmass that is the Arklow Bank and bring expression to a landscape feature which is otherwise more or less invisible.

The geometric layout of turbines as described here will be perceived in part from many of VRPs chosen for this study. However, given the overall length of the wind farm, coupled with location of some VRPs either north or south of the Arklow Bank proper, it must be recognised there will also be locations from where the geometric layout will not be fully appreciated. Despite this, MosArt feels that the arrangement as proposed is most preferred and will result in the optimal visual expression of the 200 turbines.

13.11.3. Alternative Randomised Layout

In order to test the above hypothesis that a regular layout is most preferred, an alternative randomised layout was simulated as would be visible from Brittas Bay. Findings from this study can be read in more detail below under the heading 'Estimation of Impact Upon Landscape from VRP 5: Beach at Brittas Bay, Co. Wicklow'.

13.11.4. Turbine Height

The proposed dimensions of turbines and rotor blades have been highlighted above and have been used as a basis for simulation from all VRPs. While a turbine height of up to 100m could be regarded as tall, it can be reasonably suggested that tall towers look somewhat more elegant and slender compared to shorter counterparts. An additional aesthetic advantage of using up to 100m turbines is that they are less likely to appear to 'cut' the horizon as viewed in perspective from the shore line.

In summary, the assessors feel that the key impact of this development is the introduction of turbines per se, and not whether they are, for example, 80m tall or 100m tall.

13.11.5. Colour of Turbines

The colour chosen for turbines can have a strong influence upon visibility and the two most common colours used in the industry, including off-shore projects, are white and off-white/gray. As viewed from the majority of VRPs, the turbines will be located sitting on the horizon with a backdrop being provided by the sky. In overcast weather, which is common in Ireland, the colour of this backdrop is typically white, off-white or grey. For this reason two colours were chosen as options for the top 90m of the turbines as well as the blades, namely white and "battleship grey". Anon. (1996) suggests that light grey turbines are less distinct than those which are white. Nevertheless, white could be regarded as an unapologetic symbol of the purity and sculptural quality of the development. White, therefore, is the colour chosen for this assessment.

The colour yellow will be used on the lower 10m for navigation purposes. However, as investigated using the photomontages, this relatively short section will hardly be discerned from the remainder of the structure from the on-shore viewshed reference points.

13.11.6. Service Modules

In addition to the 200 turbines, there will be three service modules located out on the Arklow Bank. Their main function is to collect and distribute the power harnessed by the turbines. The top height of these structures above sea level is approximately 30m so their impact is unlikely to be significantly adverse within the context of 200 much taller turbines. Consideration of the structures has been taken into account as part of the assessment from each VRP.

13.11.7. Lighting

Lighting will be in accordance with the IALA specification as provided and interpreted by the Commissioners of Irish Lights. There will most likely be six red lights and six green lights arranged at the ends and along the sides of the bank. These will most likely be built onto the towers and may be visible from shore. There will also be low intensity, yellow lights for passing vessels which will not be visible from land.

At the time of preparing this report, aviation lights have yet to be agreed. However, they are likely to be red and low intensity with a reduced azimuth in order to reduce visibility from shore.

As discussed earlier, there are already a number of lights in the vicinity of the proposed development. The introduction of additional lights, therefore, will not bring about a major alteration to views seaward a night time. Nevertheless, the red and yellow lights may well be visible from shore and thus will draw attention in the direction of the development.

13.12. Landscape Assessment from VRP's

The landscape assessment is outlined from all VRPs in the following pages. Ahead of this, a short overview of how the photomontages were produced is provided below.

13.12.1. Methodology used to Produce the Photomontages

At each of the VRP's identified by the landscape consultant, Macro Works Visual Consultants took a series of partially overlapping photographs for the production of linear panoramas. Typically 8 to 14 photographs were taken at each viewpoint. This number of photographs was necessary to cover the full extent of the site as well as the greater view, and allow for approximately 40% overlap between images.

Prior to visiting the sites, a desktop study was carried out aided by a purpose built GIS for the area. Using the coordinates for both the viewpoints and the turbines, the angles to the northernmost and southernmost turbines were calculated. These were corrected to magnetic north for use of a compass in the field (all angles were later verified for each viewpoint using the coordinate location of the test mast). In the field, these angles were used to place rods in the ground at a set distance from the camera tripod. These were captured in the panoramas and used as reference guides within which to place the digital model of the wind farm. These rods were subsequently airbrushed out of each of the panoramas to an adjustment layer in Photoshop.

All images were captured using a professional digital SLR camera (Canon EOS D30). This allows for on-site quality control and verification of images as well as automatic storage of important information with each image file. These are stored as RAW data which are later converted to Tiff format images upon downloading.

The images were stitched together manually using Adobe Photoshop 6.0 using a variety of photo manipulating and enhancing techniques.

The turbines were constructed digitally in a CAD software package and imported into a 3-d GIS enabling the wind farm to be virtually viewed from and co-ordinate position. Using the camera settings recorded in the field the images captured can be digitally replicated.

The offshore images were taken at a high shutter speed to counter the movement of the boat and the water. These were subsequently digitally adjusted for tilt. Coordinates for these offshore viewpoints were captured using a handheld GPS and the on-board navigational equipment. The GPS enabled the viewpoints to be captured with respect to the Irish National Grid.

The extent of the wind farm and the low-lying nature of many of the viewpoints, necessitated adjustments to visibility created by earth curvature. Coastal navigation charts such as "distance of horizon for various heights of eye" were used to position the digital turbine models on, in front of, or behind the horizon line. Such calculations were carried out for the northernmost, southernmost, centre and nearest turbines at each viewpoint.

The colour selected for the turbine simulations was matt white. The first 10 metres above sea level, however, are coloured yellow to improve visibility to marine traffic. These colours were used on all simulations. The turbines however, appear darker and lighter on panoramas depending on the lighting conditions experienced at the time. The colour varies depending whether strong light, dim light, foreground light or background light. These lighting conditions can change across the face of a panorama. Such conditions were also backed up with close up shots of the test mast. These were captured by locating the mast using compass bearings and taking images using a 400mm focal length telephoto lens (640mm digital equivalent).

13.12.2. Photomontages Depicting the Proposed Development in Inclement Weather

Each of the photomontages used in the impact upon landscape report depict the proposed development in optimum viewing conditions. All the photographs were taken in bright clear weather to ensure maximum exposure of the turbines as viewed in perspective. In addition to these photomontages, however, a number of views of the development are included in the Appendix which depict the development in inclement weather. These latter views are representative of the kind of likely exposure which might be common place throughout the year.

Estimation of Impact Upon Landscape from VRP 1: Old Lighthouse at Wicklow Head, Co. Wicklow (Figure 13.8)

VRP type:	*Heritage feature*
VRP sensitivity:	*High*
Distance to nearest turbine:	*8.40 km*
Number of turbines visible:	*200*

Description of View

Elevated panoramic view southwards along east coast towards Blainroe Golf Club. The view comprises undulating farmland mosaic sweeping gradually down towards a rocky shoreline. Mature trees abound and are especially located along field boundaries. A few scattered houses exist, located mostly along roadsides. In the immediate foreground are located the hexagonal old lighthouse as well as other built structures to the east. Further east perched on low cliff-top is the lighthouse currently used to assist navigation. This specific location thus has a strong working relationship with the sea, guiding boats and ships for many generations. To this end, the introduction of wind turbines in the view from this location might be positively regarded as a contemporary off-shore development which draws attention to the navigational hazard that is the Arklow Bank.

Description of Landscape Impact

All turbines will be visible from this location, reducing in height with increasing distance from the viewpoint. Furthermore, the development occupies a limited proportion of the panorama. It will be difficult to perceive the grid like arrangement used as viewed from this location, given the direction and distance of view. The turbines may thus appear to be arranged haphazardly. On a more positive note, viewers' attention from this location is primarily drawn southwards along the rocky jagged coastline. Given the location of the development 8 kilometers out to sea, there is sufficient space between the turbines and land so as to ensure that the former do encroach significantly upon the latter.

Summary Impact

Given the relatively low number of people viewing the development from this location, the possible positive association with other structures including the lighthouses as well as the distance of viewing, the impact is deemed to be **Adverse Minor.**

Estimation of Impact Upon Landscape from VRP 2: Blainroe Golf Club, Co. Wicklow (Figure 13.9)

VRP type:	*Sports amenity*
VRP sensitivity:	*High*
Distance to nearest turbine:	*7.70 km*
Number of turbines visible:	*120*

Description of View

The view from this location comprises an elevated and carefully manicured amenity golf course and clubhouse overlooking the Irish sea to the east.

The coastline proper comprises low sloping cliffs and jagged rock outcrops framing a small pebble beach inlet below the golf clubhouse. Otherwise, the landform of the golf course is relatively flat, with minor undulations being provided by greens and tees as well as a low marshy area south of the clubhouse. Fairways and greens on this tightly mown golf course are defined by loose belts and copses of trees, many of which are coniferous.

Description of Landscape Impact

Local people and visitors alike gather at this location in considerable numbers throughout the year to spend time outdoors, relaxing and enjoying the amenity on offer. Viewers at this location would thus tend to be particularly appreciative of the landscape and the views afforded out to sea and along the coast. There can be little doubt that the proposed development will result in a significant change in the character of the view to which people have become accustomed.

Only 120 of the turbines will be visible on the horizon from much of the golf course, including the clubhouse as well as more elevated sections of the course to the west. To the south, the wind farm appears to connect to the land, creating a possible adverse sense of 'fencing off' the sea. From the perspective depicted in the photomontage, the rhythmic and geometric layout will be especially evident along the northern end of the development. Furthermore, given the distance and angle of view, the development does not occupy the majority of the horizon and therefore would not dominate the view. Lastly, the development does to impact adversely upon the view of the lighthouse structures on Wicklow Head to the north.

Summary Impact
Given the high number of viewers at this popular coastal amenity area as well as the open panoramic exposure of the development from this popular coastal amenity area, the impact from this VRP is deemed to be **Adverse Moderate**.

Estimation of Impact Upon Landscape from VRP 3: Third Class Road at Ballynacarrig / Castletimon, Co. Wicklow (Figure 13.10)

VRP type:	*Third class road and scenic view*
VRP sensitivity:	*Low*
Distance to nearest turbine:	*8.90 km*
Number of turbines visible:	*200*

Description of View

Elevated view east and south from third class road over rolling farmland mosaic towards Brittas Bay and the sea beyond.

A series of low and gently interlocking hills define the route of a shallow winding valley. Otherwise, the land falls gently in the direction of the sea, interrupted momentarily by a low undulating ridge defined by steep sand dunes. Vegetation comprises mostly pasture and some tillage, with fields being mostly defined by mature broadleaf hedgerows. The view is framed by a mature conifer woodland to the west and high broadleaf hedgerows to the north, both drawing the view in the direction of the proposed development. A few scattered houses as well as holiday chalets and caravans are visible, the latter being concentrated closer to the coast.

Aside from the above mentioned holiday homes, the character of this location is strongly rural.

Description of Landscape Impact

This VRP is highlighted in the Wicklow County Development Plan as a "View of Special Amenity Value or Interest". Even though this road is narrow, winding and serves low traffic volumes, therefore, it is deemed to be a sensitive location by the local authority. The development from this perspective will almost completely occupy the horizon, with a narrow gap at Mizen head towards the south. The turbines will thus create a strong sense of enclosure in a landscape which would otherwise be open. Furthermore, the turbines may compete for attention with the dunes at Brittas Bay.

Summary Impact
Given the official designation of this location as a "View of Special Amenity Value or Interest", coupled with the exposure of most of the turbines, the impact might be deemed to be Adverse Major. However, given the low number of viewers at this location, coupled with the relatively short duration of view afforded due to screening provided elsewhere by hedgerows, the impact is assessed as **Adverse Moderate**.

Estimation of Impact Upon Landscape from VRP 4: Public House Car Park at Ballynacarrig, Co. Wicklow (Figure 13.11)

VRP type:	*Public meeting place*
VRP sensitivity:	*Moderate*
Distance to nearest turbine:	*7.80 km*
Number of turbines visible:	*180*

Description of View

View southeast from car park at popular public house over rolling grassland towards the sea. The view is framed by the entrance to a holiday village to the north and mature hedgerow vegetation to the south. This location is especially busy during the summer holiday season and during the weekends at other times of the year.

Description of Landscape Impact

As with many of the other VRPs chosen in this study, this location is frequented by people who are on holidays and / or on a day trip. The attraction of this specific location is due to the nearby proximity of many coastal holiday resorts as well as the provision of sea views.

While most of the turbines will be 'theoretically' visible from this VRP, many will be screened by vegetation directly across the road from the public house car park. Some sense of the grid arrangement will be apparent, contributing towards a sense of regularity and order. As in the majority of cases, the turbines will be viewed as located on the horizon and thereby draw attention due to their vertical dynamic. The turbines do not occupy most of the horizon and thus do not dominate the view of the sea. Most importantly, the turbines do not encroach upon filtered views of the northern-most dunes at Brittas Bay.

Summary Impact
The impact at this location is deemed to be **Adverse Minor** given that the majority of users of this location spend their time indoors where views seaward may not always be possible coupled with the fact that the development does not visually compete with Brittas Bay to the south.

Estimation of Impact Upon Landscape from VRP 5: Beach at Brittas Bay, Co. Wicklow (Figures 13.12 and 13.13)

VRP type:	*Amenity and Blue Flag Beach*
VRP sensitivity:	*Very High*
Distance to nearest turbine:	*8.10 km*
Number of turbines visible:	*200*

Description of View

Panoramic sea shore view from very popular Blue Flag beach resort measuring approximately 3.5km in length. The view is dominated by the Irish sea to the east with a backdrop provided by a rolling bank of sand dunes with marram grass, restoration works and worn tracks. Views westwards are limited by the high steeply sloping sand dunes. The bay at this location is defined by The Castle headland to the north and the rocky Mizen Head to the south.

Brittas bay is renowned for the quality of its sandy beaches and amenity facilities and attracts very high numbers of visitors particularly during the summer holidays. Even outside this busiest period the resort is popularly frequented at weekends by local people and day-trippers from Dublin alike. A number of houses in the immediate vicinity of the beaches are afforded sea views.

Description of Landscape Impact

As highlighted in the table above detailing landscape sensitivity, Brittas bay is deemed to be the most critical location from where full open views of the proposed development will be provided. The most essential reasons for this is the quality of beach amenity on offer coupled with the large number of people who regularly visit there for leisure purposes. Due to the high sensitivity of this location, it was decided to use the VRP at Brittas Bay to experiment through photomontages with two alternative arrangements, as follows:

- 100m turbine with 120m rotor diameter – regular arrangement
- 100m turbine with 120m rotor diameter – irregular arrangement

The remainder of this sub-section will deal with the turbine and blade dimensions being assessed elsewhere, ie. 100m turbine with 120m rotor diameter. The other alternative being considered is dealt with later below.

No adverse impact upon the physical enjoyment of Brittas Bay will result from the proposed development. After all, people can continue to sun bathe, paddle, swim and engage in other activities during and after construction of the proposed wind farm.

The location of the wind turbines in full view from the beach during fine weather will, nevertheless, undoubtedly alter the landscape character as engraved in the minds of those who regularly visit there. While the wind farm will occupy a substantial portion of the sea horizon as viewed eastwards, there exists substantial space between land and turbines both to the north and south. The wind farm will not, therefore, completely dominate the view and a possible threat of claustrophobia due to full enclosure is averted.

An opposing and perhaps equally legitimate view to that expressed above is that the introduction of a wind farm off the coast of Brittas Bay might actually be favourably regarded by visitors due to the aesthetic and sculptural qualities of the tall and slender turbines arranged geometrically.

Summary Impact

Despite the possible positive reaction to the proposed development as mentioned above, the adverse impact at this location is deemed to be **Adverse Major** given the popularity of the beach resort and the full exposure of the turbines to viewing by people picnicing and / or walking.

Consideration of alternative turbine arrangement (random layout)

In addition to the regular geometric arrangement of turbines depicted in the photomontages from all VRPs, an irregular arrangement was also simulated from Brittas Bay (Figure 13.13) in order to test whether it influences the aesthetic quality of the development.

Referring to the photomontage, it can be clearly seen that there is no coherent underlying order or rhythm in the layout and arrangement of the turbines. The development thus appears as somewhat chaotic with no apparent logic. Such visual chaos might seem contradictory to the nature of the development, comprising high-tech elements which are, in themselves, a feat of engineering.

The authors thus suggest that the random layout as depicted is less favourable than the geometric layout from a landscape aesthetic perspective.

Estimation of Impact Upon Landscape from VRP 6: Third Class Road at Tonlegee, Co. Wicklow (Figure 13.14)

VRP type:	*Third class road and scenic view*
VRP sensitivity:	*Moderate*
Distance to nearest turbine:	*9.30 km*
Number of turbines visible:	*115*

Description of View

Fleeting view eastwards through a gap in a hedgerow which flanks a narrow winding third class road. An elevated view is provided of Brittas Bay with a long curving beach, rolling sand dunes and a plethora of scattered and clustered holiday homes. This location was chosen as a VRP due to its designation in the Wicklow County Development Plan as a View of Special Amenity Value. The apparently haphazard development of a multitude of holiday homes, however, significantly detracts from the aesthetic quality of this location in the opinion of the authors.

In the foreground, rolling farmland gently sweeps down towards the sandy bay. A multitude of high and steep sand dunes is located immediately in front of the sea. Some parts of the dunes consist of exposed light coloured sand that draws attention due the strong contrast with the marraham covered areas.

The farmland comprises a patchwork of mostly grazing fields defined by gorse hedgerows with some mature broadleaf and conifer trees. Scattered and clustered houses and some farms with outbuildings are located throughout, the houses mostly oriented in order to optimise sea views. The above referred to holiday homes are located on low lying land and in close proximity to the sand dunes. The only other discernible structures are those of the toilet block and car park serving visitors to the beach.

Description of Landscape Impact

As viewed from this perspective the wind farm overlaps with some of the sand dune ridges at Brittas Bay, competing for attention and drawing the view seaward. The wind farm will thus tend to co-dominate the view. However, there is a substantial area of dunes to the north 'outside' of which there are no turbines, thus mitigating somewhat the above impact. Only 115 of the turbines will be visible crossing the horizon and those towards the north will be visible in distinct rows, creating a sense of order and rhythm. As in other locations, some sense of partial enclosure results from the connection in perspective of the southern tip of the development.

Summary Impact
While this location is classified as an important view in the County Development Plan, the number of viewers along this route is likely to be low. Furthermore, almost half the turbines are screened from view at this location. Despite the visual competition with the dunes at Brittas Bay, therefore, the impact is classified as **Adverse Moderate**.

Estimation of Impact Upon Landscape from VRP 7: Third class road at Ballinvally Upper, Co. Wicklow (Figure 13.15)

VRP type:	*Third class road with elevated panoramic views*
VRP sensitivity:	*High*
Distance to nearest turbine:	*13.90 km*
Number of turbines visible:	*130*

Description of View

Elevated panoramic view eastwards from third class road south of the village of Redcross. At approximately 160m ASL, this VRP is one of the highest chosen in this study and affords the viewer an open panorama towards the Irish sea. A sense of drama is heightened by the landform which initially falls quite steeply before levelling out to relatively flat land between the busy N11 and the coast.

Views to the southeast are curtailed by the hill / mountain (280m ASL) at Glenteige as well as by semi-mature coniferous forests in the foreground at Ballinvally Lower. Other commercial forests are located on lower ground and contrast in terms of colour and texture with the otherwise patchwork mosaic of fertile agricultural fields.

Description of Landscape Impact

This location is designated in the County Wicklow Development Plan as a Prospect of Special Amenity Value or Special Interest and is somewhat different to the others used in the study insofar as it is one of the highest above and furthest from the proposed wind farm. While the wind farm from this location would occupy the majority of the sea horizon, a substantial gap exists to the north providing some sense of spatial release. The height of view provided would result in the visibility of the turbines partially below the horizon line. The impact of this would be the apparent 'cutting' of blades on the horizon, resulting in an adverse impact. Nevertheless, the height and distance of view would enable the linear grid-like arrangement to be more fully appreciated than would be possible at lower elevations. In fact, it is the opinion of the authors that the development as viewed from this location is of high aesthetic merit.

At a distance of almost 14km, strong and vivid exposure of turbines will likely be limited to the clearest of weather. In any event, the immediate on-shore context for the development is one of an intensively farmed and working landscape. The wind farm could therefore be considered as a logical extension of human activity seaward.

Summary Impact
This location is classified as a Prospect of Special Amenity Value or Special Interest in the County Wicklow Development Plan. Despite such classification, however, and considering especially the considerable viewing distance to the proposed development, the character of the working landscape and the high number of turbines screened from view, the impact at this VRP is deemed to be **Adverse Minor**.

Estimation of Impact Upon Landscape from VRP 8: Third class road at Ballinaskea, Co. Wicklow (Figure 13.16)

VRP type:	*Third class road with elevated panoramic views*
VRP sensitivity:	*Moderate*
Distance to nearest turbine:	*12.50 km*
Number of turbines visible:	*200*

Description of View

Elevated view from third class road eastwards towards Irish Sea.

Landform at this location comprises some low mountains and hills rolling down to gently undulating farmland and eastwards towards the coast. At the coast, a ridge of rolling sand dunes at Brittas Bay and beyond provides contrast with the otherwise flat landscape. Land cover consists mostly of fertile agricultural patchwork fields of pasture and tillage defined by mature hedgerows. Hedgerows are generally lower in height with increasing proximity to the coast. On higher ground there are extensive coniferous plantations. Houses and farmsteads are scattered throughout.

The view provided at this location is clearly of a working agricultural landscape with a low sense of the naturalistic.

Description of Landscape Impact

The turbines occupy a substantial proportion of the horizon from this perspective, connecting visually with land on the southern side of the development. Furthermore, the turbines compete considerably with the ridge of dunes at Brittas Bay and therefore dominate the sea view. On a more positive note, the deliberate tapering of turbines towards the north can be fully appreciate from this view, adding to the interpretation of the Arklow Bank.

Regarding the road and its use, it is unlikely to carry much traffic and is not designated in the County Development Plan.

Summary Impact
Despite the above mentioned adverse impacts, this location is deemed to be less sensitive than many of the other VRPs. For this reason, the impact is assessed to be **Adverse Minor.**

Estimation of Impact Upon Landscape from VRP 9: N11 National Road at Johnstown South, Co. Wicklow (Figure 13.17)

VRP type:	*Busy national route*
VRP sensitivity:	*Low*
Distance to nearest turbine:	*12.10 km*
Number of turbines visible:	*200*

Description of View

View eastwards from busy national route towards the Irish Sea.

To the west of this view is a low mountain and the partially jagged profile of Arklow Rock is visible in silhouette to the south. Further south of this is Tara Hill. Otherwise, the landform is gently undulating and sweeps gradually down towards the sea. Landuse at this location includes both grassland as well as tillage. Fields are mostly defined by low to medium hedgerows with some mature broadleaf trees. In addition to a few scatter houses, the outskirts of Arklow town is visible to the south. Lastly, a twin pole 110kV electric line passes between the viewer and the sea, in parallel to the direction of travel.

Description of Landscape Impact

Views afforded of the sea from the N11 are limited and this location provides one of a few opportunities for passing traffic to enjoy the visual amenities of the sea on offer. However, the view is fleeting due to the screening of the sea by landform as well as the high speed of traffic on this dual carriage way.

All turbines are visible from this location, located on the horizon and stretching over most of the visible sea profile. Fortunately, there exists considerable space between the wind farm and Arklow Rock to the south, thus reducing possible visual competition with latter feature. The grid-like arrangement and resulting regular rhythm and sense of order can be clearly appreciated from this position.

Summary Impact
While only a fleeting glimpse of the wind farm is provided, the sea nevertheless naturally draws views in the direction of the development. Given the substantial numbers of roads users at this location, therefore, the impact is classified as **Adverse Moderate**.

Estimation of Impact Upon Landscape from VRP 10: Amenity area at Ferry Bank, Arklow, Co. Wicklow (Figure 13.18)

VRP type:	*Amenity*
VRP sensitivity:	*High*
Distance to nearest turbine:	*13.30 km*
Number of turbines visible:	*190*

Description of View

Open panoramic view east and north from slightly elevated concrete viewing point and footpath near nature reserve. This location is backed by Arklow town and flanked to the south by Arklow Harbour.

To the north, a sandy beach rises gradually to a sloping coastal protection scheme comprising very large boulders which stretch for some considerable distance to the north. Behind (west) the stone revetment the land dips again to contain a shallow flat bottomed marsh before rising to a low and elongated ridge. To the north of this marsh is located a holiday home park, mostly screened from view. Steeply rolling dunes are located to the north, framing the gently curving bay. Vegetation cover comprises gorse, salt marsh plants and mature conifer and broadleaf trees on the higher ground away from the coast.

Looking to the south at this location, there is neither sandy beach nor dunes. Instead, the view comprises bulky harbour walls extending north as well as multi-story warehouses and stores. In addition, there is a continuation of the above mentioned stone revetment. To the south of these features in the middle distance is located Arklow Rock with a substantial quarry development.

On the one hand, the presence of the nature reserve as well as the rolling dunes to the north gives this location a sense of the natural. This contrasts strongly, however, with the human-made character of the harbour and associated structures as well as the quarry immediately to the south.

Description of Landscape Impact

All turbines will be visible sitting on the horizon and stretching over a considerable distance. The development will thus tend to dominate the view. Mitigating such adverse impact is the fact that the turbines do not form a continuity with the land either to the south or north. Any possible sense of claustrophobia is thus alleviated. Additional mitigating factors include is the possible positive association of the development with the nearby commercial port as well as the regular rhythm of turbines which can be easily discerned. Despite such factors, however, this location is popularly used as a local amenity and thus the impact will likely be adverse.

Summary Impact
Given the important amenity value of this location, coupled with the proportion of the horizon occupied by the proposed development, the impact is deemed to be **Adverse Moderate**.

Estimation of Impact Upon Landscape from VRP 11: Arklow town, Co. Wicklow (Figure 13.19)

VRP type:	*Urban centre*
VRP sensitivity:	*High*
Distance to nearest turbine:	*13.30 km*
Number of turbines visible:	*200*

Description of View

Elevated view east and north over Arklow town towards the Irish Sea. The location chosen for this VRP is one of the few road locations in Arklow town where a full and elevated view is provided out to sea.

The land falls gradually to the east before levelling out as it nears the sea. The foreground is dominated by roof tops and rows of terraced and other houses of mixed colours, including red brick and grey plaster. A number of small urban gardens as well as open spaces in large housing estates provide some relief from the otherwise dominating hard surfaces. The middle ground is occupied by the coastline, harbour and associated stores and other buildings. A number of cranes are located in the vicinity of the harbour, breaking the skyline and contrasting with the horizontality of the harbour walls and sea.

The character of landscape at this location, comprising the largest town in the Study Area, is of strong human-made order with very little sense of the naturalistic. This is a 'working' landscape, as is evident from the regular loading and unloading of large container ships in the harbour.

Description of Landscape Impact

The wind farm from this perspective occupies all of the horizon, thus dominating the sea view and creating a strong sense of enclosure. This sense of enclosure could be regarded as positive, however, due to the outer 'harbour-like' association created which is emphasised further by the crane-like structures that are the individual turbines. This association with what is a busy commercial port and harbour mitigates significantly any adverse impact. In any event, the landscape context in the immediate foreground is one of a human-made urban centre, so there is little impact on what might constitute a sense of the naturalistic. Lastly, very few views of the sea are provided from the roads and streets in Arklow town. Despite the high population living at this location, therefore, the number of people exposed to the development could be limited.

Summary Impact

Despite the domination of the development in the context of the sea as viewed from Arklow town, the impact is classified as **Adverse Minor** due to the association of structures with the busy port as well as the limited number of locations from where full open views will be provided.

Estimation of Impact Upon Landscape from VRP 12: Third class road at Moneyribbin, Wicklow- Wexford border (Figure 13.20)

VRP type:	*Third class road with elevated panoramic views*
VRP sensitivity:	*Moderate*
Distance to nearest turbine:	*21.60 km*
Number of turbines visible:	*200*

Description of View

Elevated view northeastwards from third class road towards the Irish Sea.
The view from this location is similar in character to that described from VRP 7, Ballinvalley Upper. At 280 meters above sea level, an open, panoramic and long distance view is provided. Land at this higher elevation is steeply rolling, gradually becoming less so with increasing proximity to the coast. Arklow Rock and the low mountain at Glenteige provide punctuation in what is otherwise perceived as a flat landscape along the coast. Landuse is predominantly pasture and tillage with fields defined by broadleaf hedgerows. Some large conifer plantations are located alongside these fertile fields, as well as being located on more marginal land on hilltops. Houses and farmsteads are scattered throughout.

Description of Landscape Impact

The view from and therefore impact at this location is very similar to that described from VRP 7: Third class road at Ballinvally Upper, Co. Wicklow. It is one of the highest above and furthest from the proposed wind farm. While the wind farm from this location would occupy a substantial proportion of the sea horizon, gaps exists to the south and north providing some sense of spatial release. The height of view provided would result in the visibility of the turbines partially below the horizon line. The impact of this would be the apparent 'cutting' of blades on the horizon, resulting in an adverse impact. Nevertheless, the height and distance of view would enable the linear grid-like arrangement to be more fully appreciated than would be possible at lower elevations. As commented upon earlier when considering VRP 7, it is the opinion of the authors that the development as viewed from this location is of high aesthetic merit.

At a distance of over 21km, strong and vivid exposure of turbines will likely be limited to the clearest of weather. In any event, the immediate on-shore context for the development is one of an intensively farmed working landscape. The wind farm could therefore be considered as a logical extension of human activity seaward.

Summary Impact
While an elevated and panoramic view from this location, the number of users of this road is likely to be relatively low. Taking this into account, as well as the viewing distance to the proposed development and the character of the working landscape in the foreground, the impact at this VRP is deemed to be **Adverse Minor**.

Estimation of Impact Upon Landscape from VRP 13: Amenity car park at Clogga, Co. Wicklow (Figure 13.21)

VRP type:	*Amenity*
VRP sensitivity:	*High*
Distance to nearest turbine:	*11.70 km*
Number of turbines visible:	*200*

Description of View

Elevated view east and north overlooking amenity beach and the Irish Sea.

The landform in the immediate foreground comprises low sea cliffs and rocky headlands backed by gently undulating land immediately to the west. A series of crescent bays is formed by three of these headlands, namely Mizen Head and Arklow Head, to the north, and an unnamed headland in close proximity to the south. From this perspective, Mizen Head and Arklow Head appear as slender thread-like projections extending out into the Irish Sea. A number of low mountains and hills are visible to the north at Glenteige and at Castletimon and provide spatial containment from this VRP.
Land cover in the immediate foreground is of marginal coastal vegetation and grassland fields defined by broadleaf hedgerows. In the distance, north of Arklow, sand dunes are clearly visible, framed by undulating agricultural mosaic and, lastly, mature coniferous forests on higher ground on the above mentioned hills and low mountains. Few houses are visible in the foreground from this location, with many visible, however, in the distance north of Arklow.

The overall view from this location is well composed with a reasonably strong sense of integrity.

Description of Landscape Impact

All turbines would be visible from this location, occupying a significant proportion of the horizon. To the south, the turbines appear to connect to land as viewed in perspective, visually 'fencing in' views seaward to the east and south. To the north, on the other hand, there exists a significant gap between the wind farm and land. Looking northwards, therefore, the wind farm does not detract from viewing the coastline and surrounding hills and low mountains.
The beach at Clogga is relatively small scaled and the length of horizon occupied could be dominating, especially as viewed from lower down at beach level.

Summary Impact
Given the popularity of this location as a beach amenity, coupled with the quality of view especially to the north and the large size of the development relative to the intimate scale of the beach, the impact is deemed to be **Adverse Major.**

Estimation of Impact Upon Landscape from VRP 14: Beach at Kilmichael, Co. Wexford (Figure 13.22)

VRP type:	*Amenity*
VRP sensitivity:	*High*
Distance to nearest turbine:	*11.10 km*
Number of turbines visible:	*200*

Description of View

View northwards close to sea shore.

The landform in the immediate foreground comprises low sea cliffs and rocky headlands backed by flat and gently undulating land immediately to the west. A series of sandy bays is formed by some of these headlands. A number of low mountains and hills are visible to the north at Arklow Rock, Glenteige and at Castletimon and provide loose spatial containment from this VRP. In the distance, the foothills of the Wicklow mountains are also visible.

Land cover in the immediate foreground is of marginal coastal vegetation and grassland fields defined by broadleaf hedgerows. In the distance, north of Arklow, sand dunes are clearly visible, framed by undulating agricultural mosaic and, lastly, mature coniferous forests on higher ground on the above mentioned hills and low mountains. While houses are generally scattered throughout, a cluster of holiday home buildings is visible to the north in close proximity to Clogga. Views to the south from the point at which the panoramic photograph was taken are blocked by a large two storey cut stone house.

Description of Landscape Impact

The impact at this location is expected to be very similar to that at the above VRP 13. All turbines would be visible from this location, occupying a significant proportion of the horizon. To the south, the turbines appear to connect to land as viewed in perspective, visually 'fencing in' views seaward to the east and south. A cut stone two storey house is located at the point where the wind farm and land appear to connect, resulting in an adverse impact. To the north, on the other hand, there exists a significant gap between the wind farm and land. Looking northwards, therefore, the wind farm does not detract from viewing the coastline and surrounding hills and low mountains.
The beaches at Kilmichael are relatively small scaled and the length of horizon occupied could be dominating.

Summary Impact
Given the popularity of this location as a beach amenity, coupled with the quality of view especially to the north and the large size of the development relative to the intimate scale of the beach, the impact is deemed to be **Adverse Major.**

Estimation of Impact Upon Landscape from VRP 15: Beach at Clones, Co. Wexford (Figure 13.23)

VRP type:	*Amenity*
VRP sensitivity:	*High*
Distance to nearest turbine:	*11.70 km*
Number of turbines visible:	*200*

Description of View

View east and north close to shore level at popular beach amenity.
Landform in the immediate foreground comprises a steeply sloping bank of sand dunes falling to a sandy beach and the Irish Sea. Immediately behind this dune bank, the land is predominantly flat or gently undulating before rising gently to a number of rounded hills. Due to erosion, sand is visible along much of this dune bank. Otherwise, the dunes are covered with marraham grass.

Description of Landscape Impact

The impact at this location is expected to be very similar to that at the above VRP 14 and VRP 15.

All turbines would be visible from this location, occupying a significant proportion of the horizon, albeit less than that for the two previous VRPs. In contrast to those VRPs, there exists a significant gap between the wind farm and land both to the north as well as south. The result of this is that the wind farm does not dominate sea views completely. As is relevant for all other VRPs, the wind farm appears to be coherently ordered in the zone where the turbines are aligned and visible as distinct lines (in this case towards the southern tip of the development). The rest of the development, however, appears to be haphazardly organised with little sense of rhythm.
As with the VRP at Wicklow Head, the turbines appear to decrease in height with increasing distance. The impact thus dissipates somewhat towards the north.

Summary Impact
While this location is an important amenity area providing full open views of the whole development, the impact is likely to be than at VRPs 13 and 14 due to the increased distance of viewing as well as the lower proportion of horizon occupied. For this reason, the impact is deemed to be **Adverse Moderate**.

Estimation of Impact Upon Landscape from VRP 16: Third class road at Tara Hill, Co. Wexford (Figure 13.24)

VRP type:	*Third class road with elevated panoramic views*
VRP sensitivity:	*Low*
Distance to nearest turbine:	*14.50 km*
Number of turbines visible:	*200*

Description of View

Elevated view eastwards from third class road towards Irish Sea. This road is designated as a scenic rout in the 2001 County Wexford Development Plan.

Tara Hill is a rounded hill approximately 250 metres above sea level and rises well above the surrounding countryside. While the southern side of Arklow Rock is visible in the distance to the north, landform is otherwise gently undulating. Due to the obliqueness of viewing, the coastline proper is mostly screened from view. Landuse consists mostly of fertile grazing fields defined by hedgerows. Due to the proximity to the shore at this location, many of the hedgerows are windswept and thus low. Houses and farmsteads are scattered throughout and the village of Castletown is visible to the northeast, close to the coastline.

Description of Landscape Impact

All turbines will be visible on the horizon. The wind farm appears to be coherently ordered in the zone where the turbines are aligned and visible as distinct lines (in this case towards the very southern tip of the development). The rest of the development, however, appears as a continuous line of closely yet irregularly spaced turbines and gives the impression of a dense development.

A substantial proportion of the horizon is occupied by the development. Nevertheless, the development does not totally dominate the sea given the broad expanse of horizon visible both to the north and south. Lastly, the immediate foreground context of the wind farm is one of an intensively farmed working landscape.

Summary Impact
While this route is designated as a scenic road in the County Development Plan, the immediate context is, nevertheless, of an intensively farmed landscape. The impact at this location, therefore, is deemed to be **Adverse Moderate.**

Estimation of Impact Upon Landscape from VRP 17: Beach at Ballymoney Lower, Co. Wexford (Figure 13.25)

VRP type:	*Amenity*
VRP sensitivity:	*High*
Distance to nearest turbine:	*14.20 km*
Number of turbines visible:	*170*

Description of View

Shore level view northeastwards from small contained beach inlet.
Views at this location are framed by rocky projections such that visibility to the north and south is prevented. The beach is contained by low rocky cliffs and a few seaside cottages and other buildings. A small stream flows through the beach to where it meets the sea.

Description of Landscape Impact

Approximately 170 of the turbines will be visible on the horizon. Due to the obliqueness of view from this VRP, it is not possible to discern any rectilinear arrangement. The entire development, therefore, appears as a continuous line of closely yet irregularly spaced turbines and gives the impression of a dense development. As with some of the most northern viewpoints, the perceived height of the turbines decreases with increasing distance mitigating the impact somewhat.

A substantial proportion of the horizon is occupied by the development and the turbines appear in perspective to connect to the rocky foreshore to the north. A generous area of open sea exists to the south, however, minimising any potential sense of adverse enclosure. The development does not totally dominate the sea given the broad expanse of horizon and coast visible to the south.

Summary Impact
Given the high sensitivity of this location, coupled with the framing of the development by the rocky headland, the impact might be classified as Adverse Major. However, given that the northern tip of the development is over 31km away, the impact is classified instead as being **Adverse Moderate**.

Estimation of Impact Upon Landscape from VRP 18: Beach at Courtown Harbour, Co. Wexford (Figure 13.26)

VRP type:	*Amenity and urban centre*
VRP sensitivity:	*High*
Distance to nearest turbine:	*16.40 km*
Number of turbines visible:	*200*

Description of View

View northeastwards from beach promenade at seaside resort.

The view at this location is dominated by the long sandy beach and high dunes running northwards. The dunes slope steeply down to the beach, the juncture of which is highlighted by a coastal protection scheme comprising large boulders. Aside from the top of Tara Hill, the landscape is screened from view to the east by the dunes. While the vegetation at this location comprises that typical to coastal areas, there is also a large coniferous forest running down to the beach in the middleground. The viewpoint is on the edge of Courtown Harbour and village, with its many brightly painted buildings and tourist amenities. The harbour walls extend seaward from a number of buildings including a lifeboat house.

Description of Landscape Impact

All turbines will be visible on the horizon. As with VRP 17 above, it is not possible to discern any rectilinear arrangement, due to the obliqueness of view. The entire development, therefore, appears as a continuous line of closely yet irregularly spaced turbines and gives the impression of a dense development. As with some of the most northern viewpoints, the perceived height of the turbines decreases with increasing distance mitigating the impact somewhat. It is worth noting that this VRP is the furthest shoreline VRP used in the study. The turbines will look smaller here from any other coastal location used in this assessment.

A substantial proportion of the horizon is occupied by the development and the turbines appear in perspective to almost connect to the rocky foreshore to the north. A substantial area of open sea exists to the south, however, minimising any potential sense of adverse enclosure.

It is important to highlight the immediate context from where this development will be seen. Courtown has been a very popular seaside resort for decades, associated with fun fairs, gaming machines, bright flashing lights, shops selling coloured souvenirs and so on. Furthermore, Courtown has a harbour and marina with pleasure boats for hire. Given this context, the authors suggest that the proposed development will serve to add interest, fun and a kind of 'giddyness' to the experience of this holiday resort.

Summary Impact
Given the potential positive contribution of the development towards the holiday experience at Courtown, the authors deem the impact at this location to be **Positive Minor**. This classification is unique among the 17 other on-shore VRPs used in this assessment.

Estimation of Impact Upon Landscape from VRP 19: The Irish Sea (Figure 13.27)

VRP type:	*Boating amenity*
VRP sensitivity:	*Moderate*
Distance to nearest turbine:	*<0.01 km*
Number of turbines visible:	*200*

Description of View

Sea level panoramic view westwards of much of the south Wicklow and north Wexford coastline. All the elements described from each of the previous viewpoints are openly visible. Landform rises from sea level through a combination of sandy beaches, rocky shores and low cliffs to gently undulating land to the west. Further west of this are located hills, low mountains as well as some of the Wicklow Mountains. Regarding land cover, a mosaic of mixed farmland and mature broadleaf hedgerows lies west of the immediate coastal fringe. As might be expected, fertility of land decreases with elevation and agricultural land gives way in many cases to coniferous forests. Arklow is the largest urban centre visible. Otherwise, houses and farmsteads are scattered throughout. A number of marker buoys are visible in close proximity to and over the Arklow Bank.

Description of Landscape Impact

All turbines will be visible in immediate proximity. As boats pass by the development, the individual lines of turbines will appear and disappear, creating a fascinating sculptural effect. The rotating blades will also generate a kinetic effect which may be especially appreciated by those on sailing boats who, like the turbines, rely upon the wind for their energy and momentum. Lastly, the turbines will serve to highlight and indeed celebrate the extent and shape of the Arklow Bank giving expression to a well known maritime feature which currently lies mysteriously beneath the surface.

Summary Impact
Given the above assessment overview, the authors feel that the development will result in a **Positive Major** impact from this location.

13.13. Summary Landscape Impact

A description of the likely impact from each of the nineteen VRP's has been provided in Section 13.12. The nineteen VRP's are now arranged in approximate order of decreasing impact in Table 13.3 serving to highlight what are likely to be the most critical locations. It should be noted that the estimated order of impact is not intended to imply any order of magnitude.

Table 13.3: Estimated order of impact upon landscape from VRP's

VRP No.	Location	Summary Impact
5	Beach at Brittas Bay, Co. Wicklow	Adverse Major
13	Amenity car park at Clogga, Co. Wicklow	Adverse Major
14	Beach at Kilmichael, Co. Wexford	Adverse Major
2	Blainroe Golf Club, Co. Wicklow	Adverse Moderate
3	Third Class Road at Ballynacarrig / Castletimon, Co. Wicklow	Adverse Moderate
6	Third Class Road at Tonlegee, Co. Wicklow	Adverse Moderate
9	N11 National Road at Johnstown South, Co. Wicklow	Adverse Moderate
10	Amenity area at Ferry Bank, Arklow, Co. Wicklow	Adverse Moderate
15	Beach at Clones, Co. Wexford	Adverse Moderate
16	Third class road at Tara Hill, Co. Wexford	Adverse Moderate
17	Beach at Ballymoney Lower, Co. Wexford	Adverse Moderate
1	Old Lighthouse at Wicklow Head, Co. Wicklow	Adverse Minor
4	Public House Car Park at Ballynacarrig, Co. Wicklow	Adverse Minor
7	Third class road at Ballinvally Upper, Co. Wicklow	Adverse Minor
8	Third class road at Ballinaskea, Co. Wicklow	Adverse Minor
11	Arklow town, Co. Wicklow	Adverse Minor
12	Third class road at Moneyribbin, Wicklow- Wexford border	Adverse Minor
18	Beach at Courtown Harbour, Co. Wexford	Positive Minor
19	The Irish Sea	Positive Major

In making a summary conclusion regarding the likely overall impact of the proposed wind farm, cognisance must be taken of the urgent need to develop renewable sources of energy in Ireland. In addition to small developments comprising perhaps a few turbines, it will be necessary to develop larger projects that can make a significant and rapid contribution to the national objective. In this light, development of large wind farms, in principle, is desirable. The key question, however, is where such larger projects be developed.

No matter where turbines are sited, they will almost certainly be visible from some location. There is no escaping the fact, therefore, that landscape impacts will arise independent of the number of turbines involved. Adopting a precautionary approach to assessment, as has been done in this case, the impact at the majority VRPs will be adverse.

Referring to Table 13.3 above, it can be seen that of the nineteen VRPs used in this study, the impact is deemed to be Adverse Major at 3 locations, Adverse Moderate at 8 locations, Adverse Minor at 6 locations, Positive Minor at 1 location and Positive Major at 1 location. At almost 85% of the VRPs, therefore, the impact is deemed to be either Adverse Moderate or less. Furthermore, at almost 50% of the VRPs the impact is deemed to be Adverse minor or less. Lastly, the impact at two locations has been assessed as Positive. Given the scale of the proposed development, comprising 200 turbines, the above summary overview of the assessment would suggest that the impact is likely to be especially critical at just a few locations. These locations are each beach amenities (Brittas bay, Clogga and Kilmichael).

13.14. Proposed Mitigation Measures

A number of general mitigation measures are included below.

- A significant reduction in the number of turbines would reduce any potential sense of visual clutter as well as the apparent scale of the development.
- Matt non-reflective finishes should be used on all turbine components.
- Counter rotation of blades should be avoided.
- The proposed development should, in so far as possible, not detract from the physical enjoyment of amenities.
- A high standard of design should be applied to all structures associated with the service modules considering not only their function but also the aesthetic quality, in order to minimise any sense of intrusion.

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14. ELECTROMAGNETIC EFFECTS

14.1. Introduction

Wind turbines can cause interference with electromagnetic communications such as radio, television and radar transmission.

14.2. Potential Impacts of the Proposed Wind Park Development

Interference, which is caused to a communication system that is based on the propagation of electromagnetic waves, can be of three forms:

- Electro Magnetic Interference (EMI) emanating from the turbines, where interference frequencies are generated internally in the turbine and conflicted with those which are legitimately propagating outside;
- Signals scatter as a result of the obstruction presented by the blades, the effect that mimics the presence of a lower power source operating from the location of the wind turbine and;
- Signal obstruction as it passes through the area sweep by the rotating blade, and as a consequence on desired modulation.

Any electric generator or motor will generate electromagnetic energy. Wind turbines, like all electrical equipment require assurance that they meet the required European Standard with regard to the level of emissions (EN 55011) and immunity to interfere (EN 61000). As such Electro Magnetic Interference (EMI) from these turbines will not pose a problem.

Two types of interference to television reception is produced by horizontal access wind turbines. These are forward scatter and backward scatter. In the case of forward the wind turbine obstructs the path of the signal before it reaches the receiving antennae. This in turn produces an amplitude modulation component in combination with a scatter component. This results in a distortion on the television screen. However, most television sets contain standard AGC circuits and this will compensate for the distorted signal. The other type of scatter (backward scatter) is produced when the receiving antennae is between the wind turbines and the transmit antennae.

When this occurs the receiving antennae receives a signal directly from the transmitter, but also receives a backward scatter signal that will have some time delay.

RTE were contacted in relation to the interference to television signals. RTE have indicated that the television reception along the East Coast will not be impact by the wind park although, television signals from Wales may have a possibility of interference. BBC Wales, HTV and S4C broadcast from Aberystwyth in Wales and this is the main broadcasting unit for the Arklow area. There is also another broadcasting area near Fishguard.

RTE has stated that in future most services will be on satellite and RTE have plans to have a digital terrestrial television in the future. This service will carry most of the UK programmes and therefore any impacts that the proposed wind park development may have on the television transmission will be mitigated fully.

The British Wind Energy Association has reported that the large spacings between wind turbines, along with the reduced amount of electromagnetic communication in most areas, will mean that electromagnetic radiation is less of an issue off-shore than it is with on-shore. Interference with mobile phone transmission has not been a problem with on-shore wind energy, indeed on occasion mobile phone transmission operators sometimes use wind turbines to monitor transmission or signal reinforcement apparatus. A study conducted by Metoc, 1999 concluded that with the exception of low level air defence radar no problems were anticipated with AM, radio, navigation systems or other radar transmissions. There is also evidence from independent sources (Swedish Defence Material Administration, 1997) adjusting wind farms to not have the significant adverse affect on military radar operations.

14.3. Electromagnetic Fields and Fish

Research has been carried out on how fish can sense sound and movement in water. However, there is less knowledge of their ability to perceive electrical and magnetic fields. Notwithstanding that it is known that cartilaginous fish (sharks and rays) possess electroreceptors. It is therefore possible that these fish will be able to sense fields originating from the generation of current and transmission from off-shore wind farms. The ability of bony fish to perceive electromagnetic effects and magnetoreceptors has not been adequately described in the literature.

In the EIS prepared for the wind farm at Rodsand it stated that fields comparable to geomagnetism (30-50) will only be expected to occur at distances of less than 1m from current-bearing structures in the farm. It is concluded that size of the magnetic field at a distance of 100m from a 150kV line is considered to be in the order of 2-4 times weaker than geomagnetism, depending on the type of cable. It concludes overall that such weak magnetic fields cannot be expected to create significant problems for fish.

14.4. Proposed Mitigation Measures

At this stage it is very difficult to quantify the exact degree of interference which will be caused by electromagnetic signals as a results of the proposed development. It is probable that persons receiving Welsh television channels along the east coast of Ireland may experience some interference although as yet it is difficult to quantify this. In future most services will be on satellite and RTE are also installing a digital terrestrial service and any interference associated with the proposed wind farm will be mitigated.

A socio-economic appraisal of the proposed wind park was undertaken by KHSK Economic Consultants. The full socio-economic appraisal report is given in Appendix 8, Volume 4 of this EIS. The conclusions of the appraisal are presented below:

- The completed Arklow Bank project of 520MW will be the largest offshore wind energy development in the world.
- The electricity produced will meet the needs of over 200 medium sized technology companies.
- 60MW will be installed in Phase 1 during 2002.
- Use of indigenous wind energy resources in the first phase will replace £261 million of imported fossil fuels.
- Over 69,000 tonnes of carbon dioxide (CO_2) and other fossil fuels will be displaced each year by Phase 1 alone – equivalent to the amount removed by 12,000 acres of trees.
- This is a major contribution towards meeting Ireland's commitments under the Kyoto treaty.
- First phase of 60MW will create 360 full-time equivalent jobs (FTEs) during construction and 23 permanent FTEs in direct employment from 2002.
- The full economic effect of Phase 1 will create a further 144 jobs during construction and 45 permanent jobs in sub-supply.
- The full development will provide employment many times this number in an area with little indigenous growth.
- The initial phase will create an important knowledge asset that can be leveraged by subsequent phases.
- Arklow will have potential to become the focus of a rapidly growing industry providing high value added employment.
- The extra cost of offshore development and high risk factors mean that the project may not be commercially viable in its early stages.
- Total net benefits of 60MW phase are estimated at £46.5 million in 2001 prices.
- Social benefit of avoided pollution is in the region of £20 million.
- Benefits of the completed 520MW project will be a multiple of this.
- Scale economies mean that opportunities will exist for the development of a world class competitive industry in a rapidly grow high value added sector.
- Extension of the national transmission system would help to offset the additional costs of offshore development.
- The project provides an important opportunity for the development of a public private partnership.

16. INTERACTION OF THE FOREGOING

Wind energy is a clean, renewable, and sustainable means of electricity generation. It is one of the most cost-effective energy options for Irish conditions. Further, it is one of the most practicable options for reducing climate change, and it does not result in the creation of any waste products.

The development of this wind park on the Arklow Bank will have positive and negative impacts on the receiving environment. The interactions and interdependencies between the environmental impacts as discussed in the preceding chapters are summarised in this section.

Besides avoiding the production of harmful pollutants, wind energy is an indigenous, secure, and sustainable resource, unlike energy derived from fossil fuels, which provide 98% of Ireland's energy needs. While new sources of fossil fuels are continually discovered, these resources are inevitably finite, and will deplete over time. The development of wind energy offers an alternative power source.

Given the significant resource available in Ireland, wind energy has a major potential contribution to make to the security and diversity of the national energy supply. Further, it makes a positive economic contribution, being cheaper than most of our current typical power generation methods, and not being subject to the price fluctuations that continually affect fossil fuels.

The completed Arklow Bank project of 520MW will be the largest offshore wind energy development in the world and it will allow Arklow to become the focus of this rapidly growing industry. As a consequence, the development of the wind park will create employment in Arklow both during construction and operation.

Additional positive interactive impacts include the creation of unique ecosystems around the turbine foundations. The placement of the foundations will result in the availability of substantial areas of hard substrata which will provide a new habitat for marine organisms in the area.

At a time when the ESB is experiencing difficulties in supplying peak electricity demand, this wind park will make a useful contribution towards easing this problem. As discussed, the ESB has identified approximately 1000 MW additional generating capacity as being necessary by 2006. It should come from Ireland's own clean, relatively cheap, indigenous, stable resources, and not from polluting, relatively expensive, imported, fossil fuels with unstable prices. This wind park will assist in meeting such a goal, and it is estimated that the electricity produced will meet the needs of over 200 medium-sized technology companies.

Wind turbines may be perceived as an unwelcome intrusion into the landscape. Inevitably, some locations will be subject to visual impact. However, there is no evidence to suggest that tourism in the area may be negatively affected by the presence of the wind park, indeed it may become an attraction in the future.

While there have been concerns expressed about the negative impacts of the wind park on birds, studies undertaken at existing offshore wind farms has found that no negative impact has occurred.

Based on the positive impacts of the development, it is considered that the Arklow Bank is a very suitable site for the development proposed. This development expresses an explicit commitment to the process of developing sustainable energy sources in Ireland. It thereby furthers national and international policy on both climate change and on the development of renewable energy sources.

17. MONITORING PROGRAMMES

17.1. Introduction

This section of the Environmental Impact Statement assesses proposals to monitor and audit the construction works both on-shore and off-shore to ensure that the mitigation measures contained in this environmental statement are carried out and that the impacts on the environment are accurately recorded.

The designer and the contractor will ensure that all measures will be undertaken to protect the environment and control pollution in accordance with any relevant statutory requirement. Part of the tendering process will require the contractors to put in place measures to avoid, reduce and mitigate any of the identified significant environmental impacts as far as is reasonably practical.

Notwithstanding any other requirements of the contract, the contractor will be required to install an environmental management system. This will clearly identify the organisational structure, responsibilities, and procedures put in place to reduce or minimise, wherever possible, any environmental accidents or pollution. In their tender the contractor will be required to illustrate how the proposed method of construction will reduce impacts and how contingency plans and emergency procedures will be put in place in the event of an accident or spillage. Notification procedures to the various statutory bodies will also be required.

The contractor will also be required to develop and maintain a waste management plan both on-shore and offshore during the construction and maintenance of the works.

The contractors will be audited by qualified environmental auditors on a regular basis. Environmental issues will be reported during the project meetings. The contractor will be required to co-operate with the auditors, statutory bodies, marine and shipping agents to correct any actions which are causing or likely to cause a negative impact on the environment or on shipping in the area. Other reports will be provided by the contractor to the developer who will review same prior to any project meetings.

The environmental monitoring and reporting requirements are detailed in Table 17.1.

Table 17.1: Environmental Monitoring and Reporting

Table 17.1 Continued

Environmental Management

Sure Partners Ltd. will ensure that environmental management of the development will be undertaken throughout its construction. At the tendering stage, tenderers will be given suggested mitigation procedures to be put in place to reduce environmental impact. These mitigation measures may include, but will not be necessarily limited to the following:

- construction methodology design;
- procedures for the selection and management of contractors;
- construction during different periods throughout the year; and
- the preparation of method statements by the contractor to reduce or minimise the environmental impacts from its activities.

The selected options will be provided by the contractor after submission of the tender.

17.2. Monitoring Programme for Birds

The aim of any monitoring programme is to document and if possible to quantify the calculated expected impact on birds and marine mammals unforeseen during the construction and/or the operational phases. One years baseline data has been gathered for birds and marine mammals within the study area and on the Arklow Bank.

The developer proposes to continue the bird survey monitoring programme after June 2001 during the period when permission is being considered. The extra information gathered here will supplement the years data that has been gathered for this EIS, the JNCC Survey data and any other additional information that is available. The pre-construction period will be the only opportunity to add to the pre-project baseline and get a better idea if the data to date is typical of the area.

The developer proposes that the bird surveying be carried out once per month using the MV Kilquade. Additional monthly trips during the winter period will also be taken to catch likely food samples for birds using the bank. Monitoring of breeding seabird colonies off Wicklow Head will also be undertaken.

During construction, the developer proposes to carry out bird surveys at the construction area, the adjoining areas and other areas along the bank.

Marine mammals will be monitored using a porpoise detector.

17.3. Marine Benthos

When the preliminary engineering design has been completed and cable routes chosen it is proposed to carry out additional monitoring along the routes.

Special programmes for monitoring the impact during the construction phase are not deemed to be necessary. The composition of the bank, and the currents and hydrology at the bank will ensure that the impact due to the suspension of sediment will be limited and temporary. In the event of monopile type foundations being used there will be little or no sediment generated during the installation process.

Monitoring for prey species for birds will be undertaken in association with the ongoing bird surveys, particularly during the winter months.

The developer proposes to monitor the establishment and succession of the benthic communities around the wind turbine foundations. Monitoring will be conducted on a representative sample of the wind turbine foundations and it is envisaged that a number of turbines on the northern portion of the bank, the centre and the southern portion of the bank will be examined.

17.4. Noise

In accordance with the environmental monitoring and reporting programme to be carried out by the contractor, noise will be monitored on a bi-weekly basis at the nearest noise sensitive locations for on-shore activities and off-shore activities during the construction period.

Ambient on-shore noise levels at the nearest noise sensitive locations to the wind park will be carried out on a annual basis to determine if the operation of the wind turbines is increasing the ambient noise levels at these locations.

17.5. Water Quality

Detailed water quality monitoring programmes are not deemed necessary for this project during either the construction phase or the operation phase. However, as detailed in the environmental monitoring and reporting programme, in the event of spillages of oil or lubricants water samples will be taken around the area of spillage for analysis by an accredited laboratory.

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Appendix 2 - RFI Observation

DIRECT PLANNING APPLICATION TO AN BORD PLEANÁLA

in respect of

Arklow Bank Wind Park Phase 2 - RFI

Bord Pleanála Case Reference: OA27.319864

Submissions on Behalf of Blue Ireland Coalition CLG

Blue Ireland Coalition CLG, Garadice House, 3-4 Fairview, Dublin 3, Ireland.

Briefing Note.

Applications for Offshore Renewable Energy under the 1933 Foreshore Act.

1. Purpose and background.

The purpose of this note is to set out the position on the processing of applications for Offshore Renewable Energy (ORE) projects under the 1933 Foreshore Act. The note also details the position of the seven ORE applications (see Table A below) on hands and sets out how this Department intends to deal with them.

The State has been processing applications under the 1933 Foreshore Act for Offshore Renewable Energy (ORE) projects since approximately 1999. The ORE applications received have encompassed wave, tidal, and wind projects as well as national test sites for their testing of smaller scale ORE devices. Since the late 1990's, the responsibility for the foreshore consent process transferred between three different Government Departments, initially it was D/CMNR, then D/AFM and since 2010, this Department has this responsibility.

2. ORE Applications under the Foreshore Act.

During the period from 1999 onwards, the activity by the companies in the offshore wind energy sector was fuelled by the initial development of this sector and the belief that the Refit Scheme (State support scheme for renewable energy) would provide subsidy support and allow these projects move to a level of commercial viability. Also, as the Foreshore Act was demand led, it meant that potential developers were free to identify suitable areas from a technical perspective within the Foreshore area to develop their projects without a national planning framework for the development of ORE being in place.

However, financial support for offshore wind was not provided for under any of the three iterations of the Refit scheme, the final iteration of this scheme was announced in 2012, and activity by such companies in the foreshore consent process stalled almost completely. At that time, this Department took a decision not to reject the existing applications that were on hands in order to prevent damaging a sector which was in the infancy of its development at that time. This meant that these applications were effectively in abeyance, and with the exception of an occasional meeting, these applications were not progressed further.

Also, certain applicants were awaiting developments in relation to a possible intergovernmental agreement on power transfer but these discussions concluded without agreement. These developments led to a situation whereby different offshore renewable wind energy companies who are engaged in the foreshore application process are at different points in this process. In the period from 1999 onwards, only two leases were issued under the Foreshore Act, to Codling Wind Farm in 2005 and to Sure Partners (now SSE) for a site at the Arklow Banks in 2002. Only one other applicant, Oriel Wind Farm, reached the stage of completing the Marine Licence Vetting Committee (MLVC) assessment process and they were sent a draft lease in 2010. None of these leases were issued by this Department.

3. Offshore Renewal Energy Development Plan.

In 2014, the Minister for Communications, Energy and Natural Resources published the Offshore Renewal Energy Development Plan (OREDP). This plan sets out the policy and direction for the sustainable development of Ireland's offshore renewable energy resources. The OREDP also sets out key principles, policy actions and enablers for delivery of Ireland's significant potential in this area.

Since the adoption of this plan, this Department has not accepted foreshore lease applications for offshore energy developments, other than for site investigation works or demonstration projects. The rationale for this position is the conflict between the plan led approach of the OREDP and the demand led approach of the Foreshore Act and the ongoing implementation of the OREDP.

4. Developments since 2016.

Since the beginning of 2016, this Department has re-engaged with all of the companies whose applications had been in abeyance since the decision not to include subsidy support for ORE projects under the REFIT scheme. The re-emergence of activity from these companies is fuelled by three main catalysts;

- The lower cost of the turbine technology involved,
- An industry view that the next iteration of the State support scheme for renewables (RESS) will offer a subsidy for offshore wind,
- Potential opportunities for the direct supply of electricity, through power purchase agreements, to large users in the domestic market, such as data centres.

We have seven of these historic applications on hands and all of the five companies involved, two companies have two applications, are in contact with this Unit regarding these projects. While these applications were all at different stages of the process, they can broadly be categorised in three ways. Those where a lease had been granted and those that were either pre or post the assessment by the MLVC.

5. Issues arising.

The hiatus in activity resulting from the 2012 Refit decision not to offer subsidy support to the ORE sector and the subsequent re-emergence of activity on these applications has caused difficulties in a number of areas.

In the two cases where a lease issued, the lessee has been unable to hold to the development timescale originally set out for the development of the project. This has meant that they have applied to the Department for extensions of the dates involved. Even where extensions to the longstop dates have been granted, the lessee has still not been able to begin the development process.

Also, fees due under the terms of the lease have not been paid leading to a very unsatisfactory situation whereby the State is receiving no income while large areas of the foreshore are effectively sterilised.

All of the existing applicants now wish to change the specification and number of the turbines from that which they submitted to this Department in their original application. This allows them to take advantage of the latest and most cost effective technology which means utilising fewer turbines but those are of a higher individual capacity, e.g. 10 – 12 mw. In the original applications the capacity of most turbines was 5mw.

Since the hiatus in activity with these cases, there has been a constant development in the regulatory and policy landscape. DCCAE have published and are currently implementing the OREDP and they have also announced the RESS (Renewable Energy Support Scheme). DCCAE have also contributed to the development of the MPDM Bill with a new, more appropriate, licensing regime for ORE which will give far more flexibility than the Foreshore Act.

There have also been changes to the EIA Directive and various case law judgements, e.g. the judgement in the O'Grianna case means that environmental assessment of such projects must now be considered more holistically.

Where our Minister wishes to issues a lease under the Foreshore Act, the consent of the Minister for Finance is also required. In a recent case of a longstop extension in 2013, that consent was not forthcoming. In our discussions to date with D/PER, it is unlikely that consent will be forthcoming unless there is an updating of the financial terms and conditions contained in these leases. Accordingly a project is underway with DCCAE to research a financial framework which would support both the existing leases under the Foreshore Act and those under the future ORE regime.

6. Current Position.

This Department decides to deal with these applications as follows;

We will only process those ORE applications which (i) have an existing lease,(ii) have had a technical/environmental assessment completed by the MLVC.

This would encompass the applications of SSE Airtricity, Codling Windpark and Oriel Windfarm; this does not guarantee that any of these applications will result in the issue of a lease, or acceptance of an amended proposal, it is just that we will continue to process these cases.

All other ORE applicants would then be informed that we will not be continuing with their application and they would have to reapply and be assessed under the new ORE regime which emerges either through the MPMD Bill. This would encompass the applications of Codling II Bank Wind Park Farm, Dublin Array Wind Farm (Kish and Bray Bank) and Sceirde Wind Farm (Fuinneamh Sceirde Teo) (FST).

The process of informing these companies of the status of their applications is ongoing and will be concluded quickly once the Climate Action Plan is published shortly.

Roger Harrington
Foreshore Unit
6th June, 2019.

Table A: ORE applications under the 1933 Foreshore Act.

Position		Applications	Current Position
Lease Granted	1.	Codling 1 (Codling Wind Park) (Wicklow)	Codling was granted a lease to develop a windfarm in 2005. The applied to extend the dates to build their project. Initially, they were to build it by 2013, then 2023 and now they are proposing to finalise the project by 2030. Their latest proposal, which this Department has rejected, sought to utilise fewer and more up-to-date turbines. As part of an agreement reached in 2013, there were a number of conditions which Codling had to achieve, including the payment (in instalments) of €5m by November 2019. To date, the majority of these conditions have not been met and no payments have been received. Accordingly, this Department is now in a process which might conclude that Codling is in development default and, if this is confirmed, we will terminate their lease.
	2.	Arklow Bank Wind Farm (SSE) (Wicklow)	SSE were granted a lease to develop a windfarm in 2002 in a number of phases. To date, only one phase of seven 3.6 mw turbines has been completed. SSE have re-engaged in discussions with this Department as they wish to alter the number, layout and size of the turbines which they wish to use. DHPLG awaits further details from SSE in respect of these issues. Once received, we can then assess the compliance of this request with the terms of their existing lease.

Post MLVC Assessment	1.	Oriel Wind Farm (Louth)	Oriel Wind Farm have completed two strategic transactions. The first in 2017 saw the participation of Parkwind BV, a Belgian wind farm developer take a majority stake in Oriel. Earlier this year, ESB also took an initial equity position which will rise depending on the completion of certain milestones. They have also secured grid connection and are about to commence discussions with An Bord Pleanala. This project does not have a lease but they were issued with a draft lease and conditions precedent letter in 2010. Given that this project has a grid connect, and has the level or organisational, technical and financial capacity available, if they are successful through the ABP and the foreshore process, then the indications are that it is likely that this project will proceed through to construction.
Pre MLVC Assessment	1.	Codling II (Wicklow)	Codling II was a further application in 2009 Codling Wind Park. This application will not be assessed under the Foreshore Act and can be resubmitted under the future ORE regime under the MPDM Bill.
	2.	Dublin Array Wind Farm (Kish and Bray Bank) (Dublin coast)	This project is two applications which is a joint venture between Saorgas and Innogy Renewables. They now wish to make major changes to this project. This application will not be assessed under the Foreshore Act and can be resubmitted under the future ORE regime under the MPDM Bill.
	3.	Sceirde Wind Farm (Fuinneamh Sceirde Teo) (FST). (Galway)	This application was for a small development of 100mw. It will not be assessed under the Foreshore Act and can be resubmitted under the future ORE regime under the MPDM Bill. However, with the development being situated off the Galway coast, it is not consistent with the objectives of national ORE development, which is to concentrate development on the East Coast in the period until 2030.

Appendix 3 - RFI Observation

DIRECT PLANNING APPLICATION TO AN BORD PLEANÁLA

in respect of

Arklow Bank Wind Park Phase 2 - RFI

Bord Pleanála Case Reference: OA27.319864

Submissions on Behalf of Blue Ireland Coalition CLG

Blue Ireland Coalition CLG, Garadice House, 3-4 Fairview, Dublin 3, Ireland.

Echelon Launches Ireland's First Green Energy Park at DUB20

Echelon Data Centres has announced a major milestone for Ireland's energy and digital infrastructure landscape: the development of the country's first Green Energy Park (GEP) at its DUB20 campus in Arklow, Co Wicklow.

This landmark project aligns directly with the Irish Government's Large Energy Users Action Plan (LEAP) – a framework designed to ensure energy-intensive industries can grow sustainably while supporting national climate targets.

Green Energy Parks are a new model of infrastructure development defined by the Department of Enterprise, Trade and Employment. They bring together high-energy-demand facilities – such as data centres – with renewable energy generation and storage. Green Energy Parks are required to:

- Be primarily powered by renewables
- Have battery storage or dispatchable backup from energy centres
- Reduce reliance on the grid
- Promote innovation and wider benefits such as using waste heat for district heating schemes

The DUB20 campus is the first real-world example of this model being delivered in Ireland.

Darragh O'Brien TD, Minister for Climate, Energy and the Environment expects Green Energy Parks to play a key role in achieving Ireland's climate targets while sustaining investment, employment and digital infrastructure growth.

He said: "The Large Energy Users Action Plan sets out a clear pathway for how energy-intensive industries can develop in a way that strengthens Ireland's grid, accelerates renewable deployment and supports our climate ambitions.

"The Green Energy Park being developed at DUB20 is an important example of that model in action – co-locating data infrastructure with offshore wind, onsite solar, battery storage, and grid-supporting capacity. This is exactly the kind of forward-planned, sustainable development we want to see delivered under LEAP."

Delivering on the LEAP Vision

Echelon's DUB20 campus is being designed in direct alignment with the LEAP framework. Key features include:

Co-location with Offshore Wind Renewables – The DUB20 campus includes a joint 220kV substation developed with SSE Renewables, enabling access for up to 800MW of offshore wind energy from Arklow Bank Wind Park Phase 2.

Onsite renewable generation – Solar PV systems are planned as part of the campus, with the potential to generate more than 6,000MWh per annum.

Grid-support – Two onsite energy centres will allow DUB20 to manage its own energy needs and also export power back to the national grid when required – creating Ireland's largest grid-supporting asset that is not a traditional power station

Energy storage and low-carbon fuels – Echelon will co-locate battery energy storage systems and use hydrotreated vegetable oil (HVO) to reduce onsite generation emissions by up to 90%.

Together, these elements demonstrate how large-scale digital infrastructure can operate in harmony with renewable energy systems.

A Model for Responsible Data Centre Development

The DUB20 campus, which forms part of Echelon's €4.2bn investment in the DUB20 and DUB30 facilities in Wicklow, Is located at the former Irish Fertilisers Industries site at the Avoca River Business Park in Arklow.

Construction is underway and due to be completed by 2028. It represents a major regeneration project for the region and positions Arklow as the first live example of a Government-aligned Green Energy Park under development in Ireland.

An independent Economic Impact Assessment by KPMG found that the DUB20 and DUB30 campuses could generate up to €7.5bn in economic output during construction and €801m annually once operational. The assessment also found that every €1 invested could yield €1.60 in wider economic activity, with thousands of jobs supported during both construction and operation.

Echelon Co- Founder Graeme McWilliams said: "The establishment of Ireland's first Green Energy Park at DUB20 demonstrates how large-scale digital infrastructure can be developed responsibly and in lockstep with national climate and energy policy.

"By co-locating data centre capacity with offshore wind, onsite solar and grid-supporting infrastructure, we are delivering the exact model envisioned under the Government's LEAP framework – cutting emissions, reinforcing energy security and supporting regional economic growth."

ECHELON
DATA CENTRES

Appendix 4 - RFI Observation

DIRECT PLANNING APPLICATION TO AN BORD PLEANÁLA

in respect of

Arklow Bank Wind Park Phase 2 - RFI

Bord Pleanála Case Reference: OA27.319864

Submissions on Behalf of Blue Ireland Coalition CLG

Blue Ireland Coalition CLG, Garadice House, 3-4 Fairview, Dublin 3, Ireland.

EPMG
ENERGY POLICY & MODELLING GROUP

Data centres in the context of Ireland's carbon budgets

Prof. Hannah Daly

December 2024

MaREI
Energy · Climate · Marine

Environmental Research Institute

UCC
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

Contents

Navigation

- Executive summary
- Context & background
- Energy demand growth
- Impact on GHG emissions & carbon budgets
- Is biomethane a plausible mitigation strategy for data centres?
- The role of corporate power purchase agreements (CPPAs) in meeting the growth in data center power demand
- Commission for the Regulation of Utilities (CRU) demand policy
- An Electrification Action Plan
- Conclusions

About this study

This study was commissioned by Friends of the Earth Ireland and undertaken by Prof. Hannah Daly. It seeks to explore and analyse the evidence surrounding the impact that growing data centre energy demand is having on Ireland's electricity and natural gas usage, greenhouse gas emissions and legally-binding carbon budgets.

Executive summary

This report explores the implications of rapidly increasing data centre electricity demand on Ireland's carbon budgets and broader decarbonisation commitments. As of 2023, data centres accounted for 21% of Ireland's electricity consumption, a figure projected to rise significantly by 2030. This unprecedented growth is matching the deployment of renewable energy, contributing to a stagnation in Ireland's progress toward reducing greenhouse gas (GHG) emissions and meeting legally-binding carbon budgets.

Key findings include:

- Electricity demand from data centres has grown at an annual rate of 22.6% since 2015, compared to 0.4% for other sectors. Without data centres, Ireland's electricity demand would have seen minimal growth over the past decade. Instead, demand between 2012 and 2022 grew by 24.7%, the second-fastest rate in the EU, while electricity demand in the EU fell by 3.1%. By 2027, data centres are projected to use more electricity than all households use today, and under high-demand scenarios are projected to exceed the demand of all sectors by 2025.
- Between 2017 and 2023, all additional wind energy generation in Ireland was absorbed by data centres. As data centre demand has expanded at the same rate as renewables generation, renewables are not delivering net reductions in fossil fuel use in power generation. Electricity demand from data centres far outstripped the additional renewable energy being procured through CPPAs between 2020 and 2023, and the proportion of CPPAs undertaken by data centres is itself unknown.
- Dozens of data centres have secure or are seeking connections to the natural gas network to overcome local power network constraints. On-site generation of electricity with natural gas less efficient than grid-scale generation, further increasing emissions intensity, and will sustain fossil fuel demand. Current national energy demand and GHG projections underestimate the impact of gas demand, as emissions from on-site generation are not fully accounted for, creating a significant blind spot in Ireland's climate action planning. The potential scale of demand from data centres who have made formal enquiries to connect to the gas network is large, but highly uncertain: if gas connections were temporary, data centres used them for a very small percentage of time, and switched to 100% renewables supply as quickly as possible, the risk would be minimal. However, it is not clear whether this outcome is realistic given the current extraordinary pace of growth.
- Data centres are driving additional GHG emissions from both electricity and natural gas consumption, threatening carbon budgets.
- Biomethane has been proposed as a mitigation strategy but the scale of demand for data centres would exceed sustainable production capacities and is unlikely to meet demand without diverting resources from critical sectors like heating and heavy industry, undermining its decarbonisation potential.
- Ireland lacks real-time emissions data for data centres, hindering accurate assessments of their climate impact. Moreover, the shift to on-site gas generation transfers energy security risks to the gas network, creating vulnerabilities in an already constrained system and creating the risk of fossil fuel lock-in.

This report **concludes** that unchecked data centre growth poses a significant threat to Ireland's climate commitments. Without decisive action, data centres will continue to divert renewable energy to serving demand growth rather than displacing fossil fuels, deepen reliance on fossil fuels, and exacerbate Ireland's carbon budget overshoot and energy security threats. A comprehensive policy framework is urgently needed to ensure Ireland's economic development and enterprise strategy are aligned with legally-binding climate commitments.

Policy recommendations include:

- Enforce stricter power and gas grid connection policies for data centres, requiring alignment with carbon budgets
- Enhance transparency and research, by mandating real-time GHG emissions reporting for data centres and improve data collection on gas usage and renewable energy procurement, to allow a full assessment of the current and potential future GHG impact of data centres.
- Develop a national electrification strategy to accelerate the electrification of transport, industry and heating, ensuring that renewables primarily displace fossil fuels. Create a plan for the use of surplus renewable energy production that best serves climate and societal goals, that is not limited to serving data centre needs, if and when this surplus arises. For example, this could entail delivering deeper climate mitigation, such as in aviation fuels, green fertiliser, Direct Air Capture and synthetic proteins.

Context & background

Back to Contents

Background: Global context

Data centres are shaping global energy markets

- The rapid growth in data centre operations across the world is raising concerns that rising power demand will set back progress in cutting greenhouse gas emissions. In the United States, for example, 133 new gas-fired power plants, four oil-fired plants and two coal-fired power plants are being developed because, after a period of stable power demand, power consumption is suddenly and rapidly growing due to a surge in data centre energy use[1]. This surge in demand is also leading to investments in additional fossil fuel infrastructure, and therefore dependence on natural gas supply, including pipelines and liquefied natural gas (LNG) infrastructure.
- Increasing investment in natural gas generation capacity and infrastructure is threatening to lock in fossil fuel use. For example, across Europe, 80.1 GW of new gas-fired power generation capacity is under construction or planning[2], without concrete commitments and actions to remove fossil fuels from power generation by 2035, which is a necessary milestone under the International Energy Agency's (IEA) Net-Zero by 2050 study. Meanwhile, gas, mainly LNG, is powering the booming growth of data centre demand across Asian countries.[3]
- Until recently, increasing energy demand arising from data centres was largely replacing the processing power of smaller-scale processing on servers and personal computers: efficiency improvements associated with large-scale data centres had been offsetting the majority of additional demand due to demand growth, leading to only moderate overall growth in electricity demand. The IEA estimated that global data centre electricity consumption in 2022 was around 1-1.3% of total global electricity demand (excluding electricity for cryptocurrency mining) [4].
- However, despite continued efficiency gains, the rapid growth in data centre investments and workloads has resulted in substantial annual increase in energy use, growing by 20-40% annually globally. This has mainly been driven by a boom in artificial intelligence (AI), and is likely to continue over the coming years, with the IEA projecting that overall electricity demand from data centres could double between 2022 and 2026, depending on efficiency improvements and the outlook for AI[5] . This increase is equivalent to the entire power consumption of Germany.
- This emerging trend has led to concerns on the upward pressure data centres are placing on decarbonisation. Global electricity demand is forecast to grow by around 4% in 2024, which is the highest annual rate since 2007, and grow by 4% again in 2025[6]. While renewable electricity generation is also growing strongly, its growth is not yet strong enough to overtake growth in electricity demand and cause an absolute reduction in fossil fuel use, and greenhouse gas emissions, in global electricity generation – much less to make emissions fall in line with the very rapid trajectory necessary.
- While the IEA projects that greater electricity demand is to arise from other sectors including EVs, industry and buildings, in many of these cases electricity demand is replacing fossil fuel usage, and therefore improves overall efficiency and cuts greenhouse gas emissions. Moreover, the IEA acknowledges deep uncertainty on the future speed and scale of AI growth, with generative AI applications being adopted faster than other innovations such as the personal computer. [7]
- The rise of AI suggests a new era of electricity demand growth, which may only be limited by the ability of physical networks and new power generation capacity to accommodate them. This – and evidence showing that the growing capacity of renewables is insufficient to meet rising demand (at least in the short- to medium-term) suggests that binding climate policies will be necessary to keep growth in line with decarbonisation commitments.

[1] https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/us-has-133-new-gas-fired-plants-in-the-works-putting-climate-goals-at-risk-81469493
https://www.reuters.com/technology/artificial-intelligence/how-ai-cloud-computing-may-delay-transition-clean-energy-2024-11-21/
[2] https://drive.google.com/file/d/1xVFAZoGefPhfuilcLiiTrcwQ7lCOcOEH/view
[3] https://www.woodmac.com/news/opinion/will-gas-fuel-asias-data-centre-boom/
[4] https://www.iea.org/commentaries/data-centres-and-energy-from-global-headlines-to-local-headaches
[5] https://iea.blob.core.windows.net/assets/6b2fd954-2017-408e-bf08-952fdd62118a/Electricity2024-Analysisandforecastto2026.pdf
[6] https://www.iea.org/news/global-electricity-demand-set-to-rise-strongly-this-year-and-next-reflecting-its-expanding-role-in-energy-systems-around-the-world
https://www.iea.org/commentaries/what-the-data-centre-and-ai-boom-could-mean-for-the-energy-sector

Data centres in Ireland

- Ireland's position as a European data center hub has attracted significant investment but is now facing major challenges in meeting the growth in demand while decarbonising energy supply rapidly, in line with legislated carbon budgets. Electricity consumption from data centres grew by 20% between 2022 and 2023, and represented 21% of total electricity demand in 2023[1]. According to the Sustainable Energy Authority of Ireland, "*the scale of energy consumption growth from datacentres is likely to significantly eclipse the electricity consumption growth of any other sector*".
- Around €15 billion has been invested in data centres in Ireland, according to Bitpower[1], with two thirds of this invested by "hyperscale" operators Amazon Web Services, Microsoft, Meta, and Google. Another nine companies account for the remaining €5 billion, including Echelon, Keppel DC Reit, and Vantage
- In 2021, Ireland's Commission for Regulation of Utilities (CRU) noted that "*there is an evolving, significant risk to electricity security supply in Ireland. A significant contributory factor to this risk is a large increase in electricity demand presented by the growth of the data centre industry*"[2].
- Moreover, according to the Sustainable Energy Authority of Ireland,
  - *In the context of our legally binding national and international climate and energy obligations, the negative consequences versus the benefits of allowing new large electricity users, such as datacentres, to establish in Ireland needs to be considered. If the scale and pace of renewable energy growth cannot exceed that of electricity demand, as was the case in 2023, then renewables are just abating further increases in emissions rather than delivering the absolute reductions in greenhouse gas emissions required.*[3]
- Proponents of data centres in Ireland argue that data centres are supporting Ireland's climate goals, because they are sparking greater demand for renewable energy[4]. Central to this narrative is that not only is the expansion of data centres essential for Ireland's economic prosperity, but this is also compatible with – or even necessary for - Ireland's decarbonisation, as "*data centre owners have been to the forefront of commissioning and paying for clean energy*". However, there is a significant absence of evidence-based analysis to establish the extent to which the concentration of data centres in Ireland are working for, or against, Ireland's legally-binding carbon budgets.
- **The purpose of this report** is to examine and analyse the evidence in relation to this question.
- This issue is arising in Ireland now given the concentration of data centres in a relatively small power system, but this issue is likely to become prominent in other countries which face bottlenecks in renewables and strong growth in demand. Therefore this subject should have broader interest outside of Ireland.

[1] https://www.cso.ie/en/releasesandpublications/ep/p-dcmec/datacentresmeteredelectricityconsumption2023/keyfindings/
https://www.businesspost.ie/news/92-data-centres-using-21-per-cent-of-irelands-electricity/
[2] https://cruie-live-96ca64acab2247eca8a850a7e54b-5b34f62.divio-media.com/documents/CRU21124-CRU-Direction-to-the-System-Operators-related-to-Data-Centre-grid-connection-.pdf
[3] https://www.seai.ie/sites/default/files/publications/National-Energy-Projections-Report-2024.pdf
[4] https://www.irishtimes.com/business/2024/10/14/instead-of-curbing-data-centres-we-should-build-more-to-spark-greater-demand-for-renewable-energy/
https://www.businesspost.ie/analysis-opinion/matt-cooper-data-centre-limits-and-airport-passenger-cap-are-acts-of-self-sabotage/

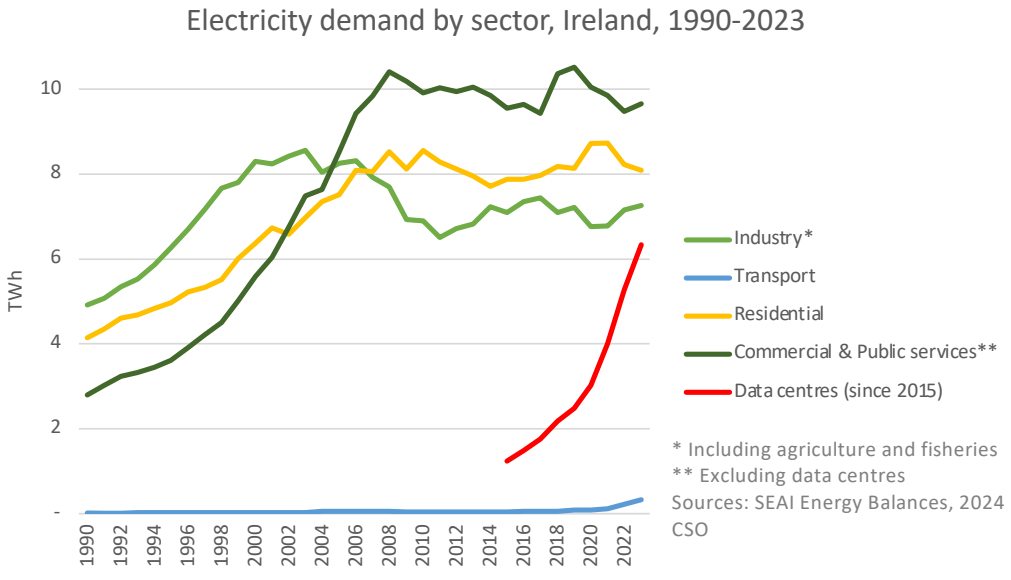
Energy demand growth

To what extent have data centres been driving energy demand growth, and how will this change in the future?

Back to Contents

Past energy demand growth from data centers

- Since 2015, data centres have accounted for the largest share of energy demand growth in Ireland.
  - Between 2015 and 2023, total electricity demand grew by 2.6% annually. Of this, data centre demand grew by 22.6% annually, while demand in all other sectors (industry, transport, residential and commercial and public services), grew by 0.4% annually.
  - Without data centres, Ireland's electricity demand would have been relatively stable. Instead, demand between 2012 and 2022 grew by 24.7%, the second-fastest rate in the EU, while electricity demand in the EU fell by 3.1%[1]. Data from the EU demonstrate that this difference is not explained by greater consumption – electricity consumption by households in Ireland was stable over this period.

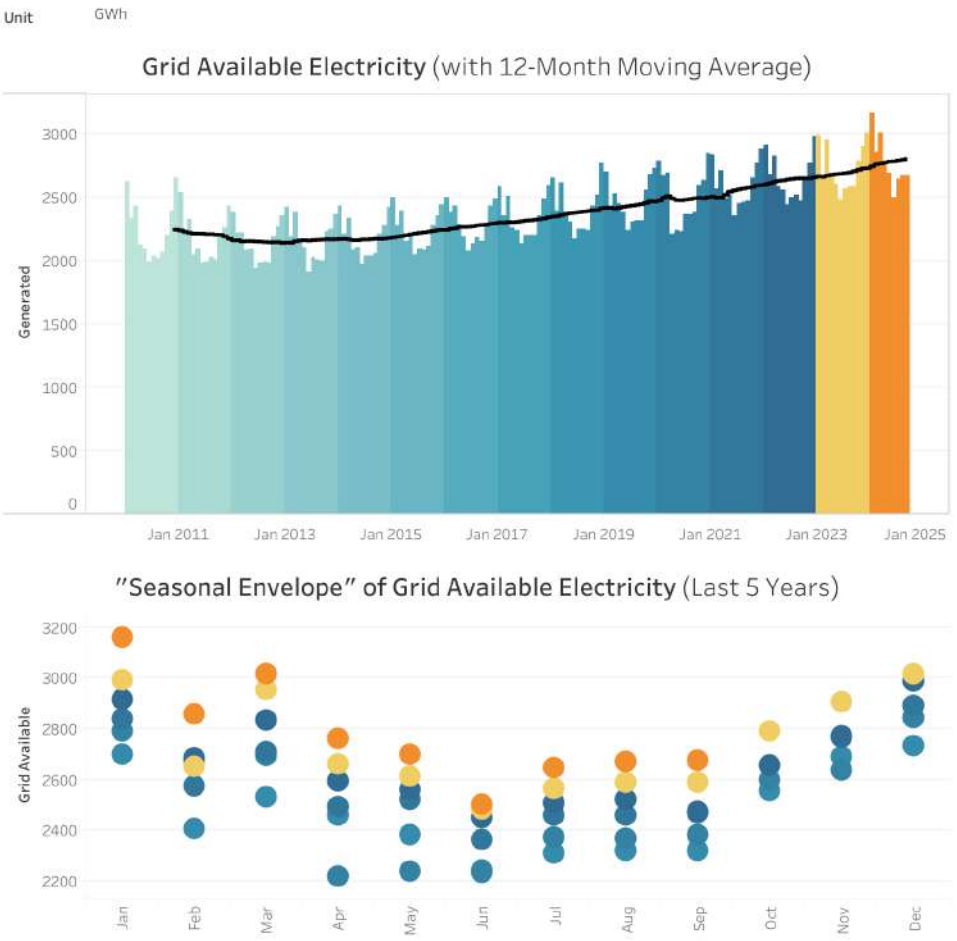


[1] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Electricity_production,_consumption_and_market_overview

Electricity demand in 2024

- Electricity demand in 2024 continues to grow strongly.
  - In the year to September, the electricity available to the grid* grew by 3.6% relative to the same period in 2023. Increases are being met by increased net imports from Great Britain, which are at historically high levels, while indigenous production has decreased relative to 2023.
  - Peak demand also continues to grow on the Irish electricity grid. Peak demand exceeded 7 GW for the third time in November 2024, with demand this year well ahead of previous years.

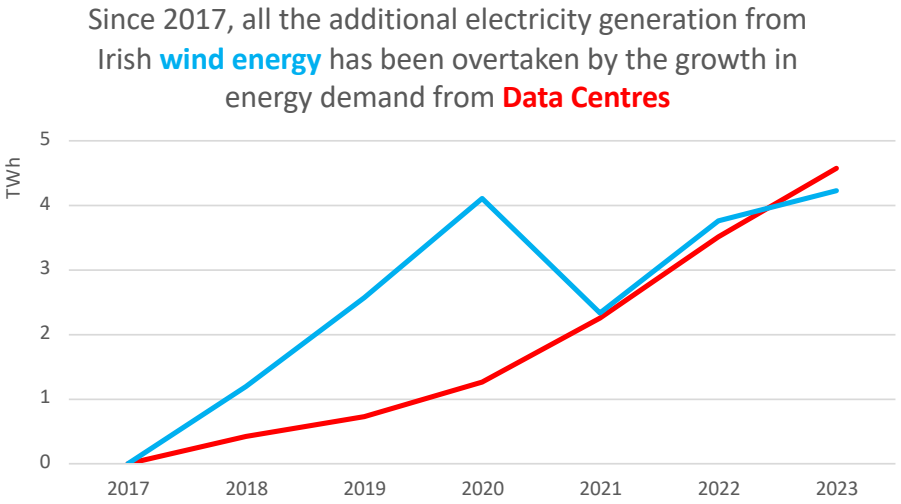
*This is an indication of consumption, which comprises indigenous electricity generation, net imports through interconnection and net pumped storage



Source: EirGrid, SEAI Monthly electricity demand

Data centres and wind energy demand growth

- To analyse the claim that that greater electricity demand from data centres is accelerating decarbonisation, there would have to be evidence that renewable energy deployment is growing faster (or can grow faster) than energy demand growth from data centres, and net renewables growth is greater than what it would be without data centres. This is because it is cumulative emissions that matter for the climate and the legal carbon budget basis for Ireland's Climate Act – building renewables is only a means to achieve the goal of cutting cumulative fossil fuel use, and therefore carbon dioxide emissions, to meet carbon budgets. If growing renewables generation is simply met by growing demand, then fossil fuel use won't fall – it will be like walking up a downwards-moving escalator.
- When we look at the historical data and projections, there is no evidence to suggest that data centres are supporting net renewables growth in this way. In the figure to the right, additional wind energy generated in Ireland is charted against demand growth from data centres since 2017. Data centres have more than matched all the growth from wind energy.
- For this reason, the share of renewables in Ireland's power generation mix has remained stable over this time period, and the generation from fossil fuels has not fallen.

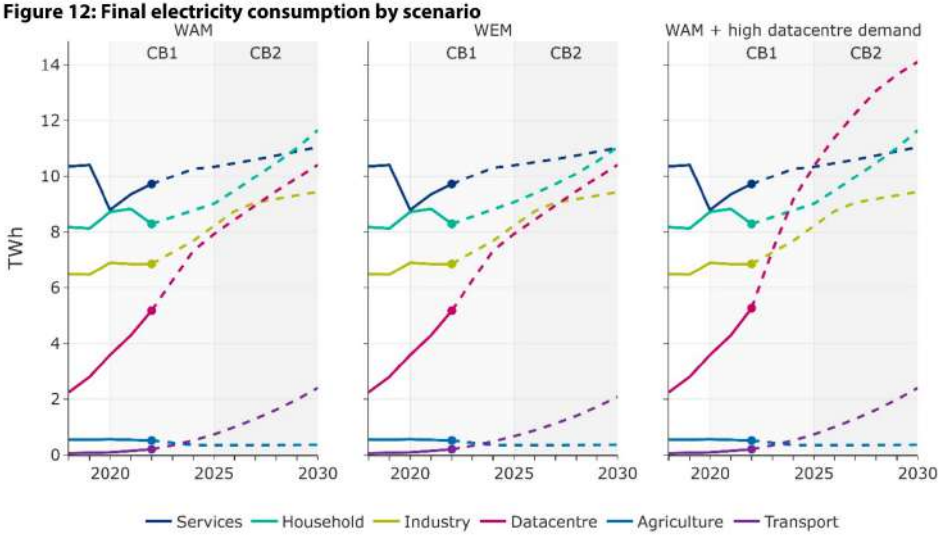


Data Sources:
- Additional data centre demand: CSO Table MEC02
- Growth in wind energy: SEAI Energy Balances, 2023

Projected data centre growth

- The Sustainable Energy Authority of Ireland (SEAI) has projected future electricity demand growth in each sector, under scenarios with existing and more ambitious climate policies (WEM and WAM respectively), and a sensitivity case with higher data centre demand (right). By 2027, data centres are projected to use more electricity than all households use today, and under high-demand scenarios, are projected to exceed the demand of all sectors by 2025.
- According to the SEAI[1],
  - *"From a national greenhouse gas emissions perspective, increased electricity demand from replacing fossil fuel heating systems with heat pumps or fossil fuelled cars with EVs results in an overall net reduction in emissions. This is because the emissions from the increased electricity demand are more than compensated for by a reduction in emissions in the heat and transport sectors, leading to lower overall emissions. In contrast, increased electricity demand from datacentres and continued growth in the industry, services and residential sectors does not displace fossil fuel use elsewhere in the economy. If total electricity demand increases ahead of the roll-out of renewable generation capacity it will lead to higher emissions. This will make it extremely challenging for the electricity sector to meet its national greenhouse gas emissions reduction obligations. The same principle applies with the requirement to reduce total final energy use in line with the EU Energy Efficiency Directive target35, and the requirement to increase renewable energy share in line with the EU Renewable Energy Directive (RED) target. For these reasons, the negative consequences compared to the benefits of allowing large new electricity users to establish in Ireland between now and 2030 need to be considered"*
- It is important to note data centre demand growth within SEAI projections, and the EirGrid data these are based on, are based on contracted data centre projects only, as their operation grows to meet their contracted connection level. Almost all of this extra load is contracted in the greater Dublin area and was contracted prior to a direction by the Commission for the Regulation of Utilities in 2021, which makes new connection agreements to be contingent on the ability of data centres to bring onsite dispatchable generation (and/or storage) with a capacity equivalent to or greater than their demand. This implies that these projections may under-estimate future demand growth, depending on new connections agreements and the rate that data centres ramp up operations to meet the contracted connection
- Moreover, these demand projections relate to electricity only: future natural gas demand is explored in the next section.

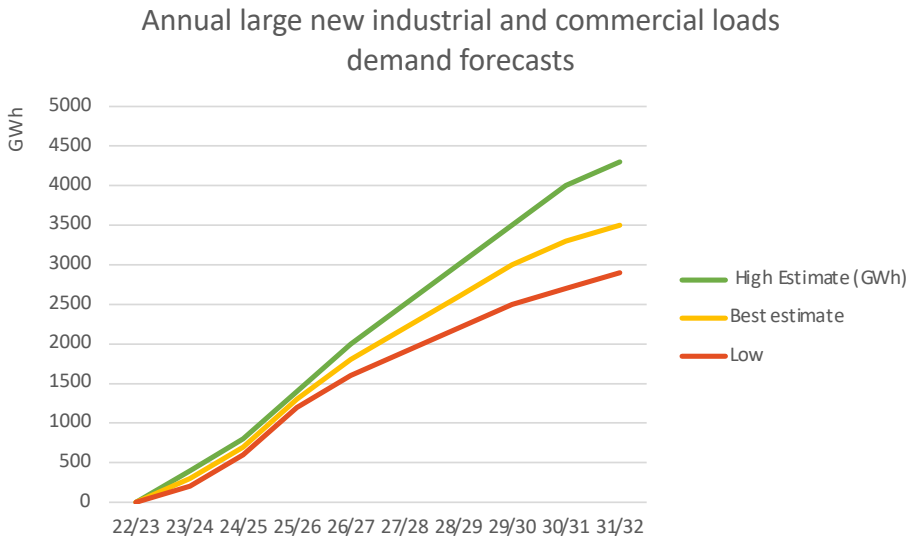
Figure 12: Final electricity consumption by scenario



[1]SEAI National Energy Projections, 2024
EirGrid and SONI, 'Generation Capacity Statement 2023-2032'. Jan 2024

Gas demand from data centres

- As per the 2021 CRU directive, offers of new data centre connections are contingent upon the ability of the data centre applicant to bring onsite dispatchable generation (and/or storage) with a capacity equivalent to or greater than their demand. This can be met with on-site renewables with battery storage, or gas or oil-based backup generators. Only the latter option is realistic for scaled power generation As a result, data centres in the Dublin area are connecting to the gas network, to enable on-site power generation. In 2024, 11 data centres have been approved to connect to the gas network, and an additional 22 have made connection requests, which Gas Networks Ireland are not progressing, pending publication of the CRU Connection Policy for Large Energy User[1]
- SEAI energy demand projections for data centres only cover electricity demand, and do not include direct demand for natural gas as a result of these gas connections. This is a blind spot in energy projections, and the EPA's projections of greenhouse gases, which rely on SEAI modelling. This also creates a blind spot in Ireland's Climate Action Plan, which is an annual report by Government to set out the policies and measures necessary to meet legislated carbon budgets and Sectoral Emissions Ceilings: additional natural gas demand will increase GHG emissions and increase the gap between projected emissions and legislated emissions ceilings. The scale of this gap is quantified in the next section.
- The figure to the right is developed using data from Gas Networks Ireland's Network Development Plan. It shows the demand for natural gas projected by GNI from data centre customers with connection agreements already in place (the "Low" scenario), and the Best and High estimates include new customers. According to GNI, the "Best" and "High" estimates for demand which implies a risk of increased growth, should additional connections be granted.

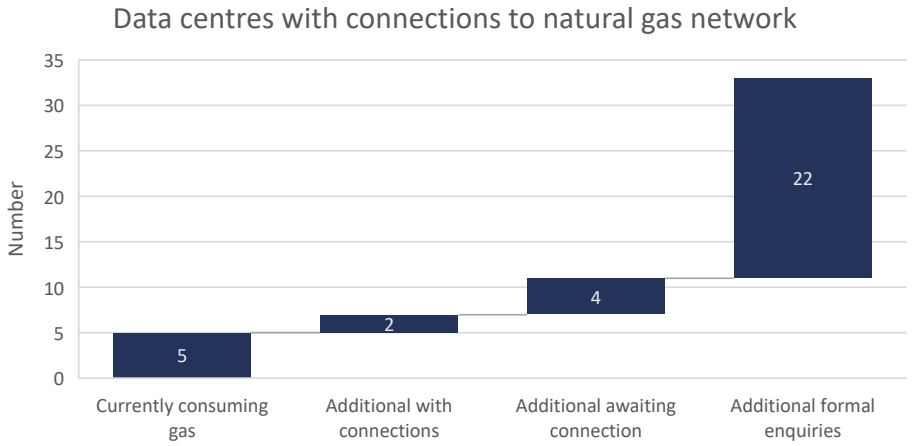


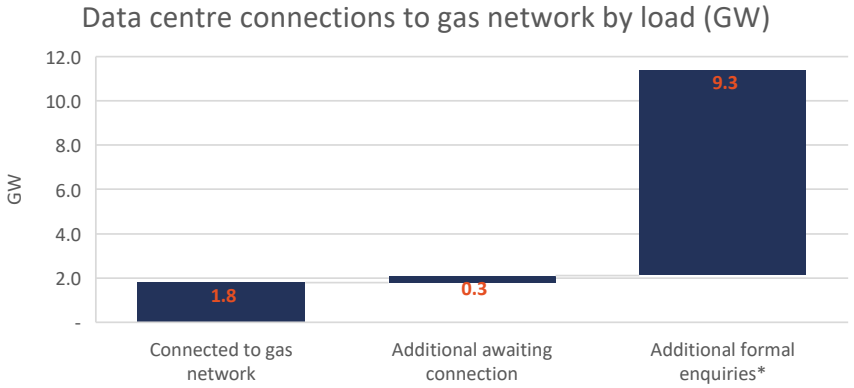
Source: Gas Networks Ireland Network Development Plan 2023: https://www.gasnetworks.ie/docs/corporate/gas-regulation/Network-Development-Plan-2023.pdf

[1] https://www.oireachtas.ie/en/debates/question/2024-11-06/33/#spk_284

Potential additional gas demand

- As of November 2024, GNI has advised DECC that 11 data centres have contracts to connect to the gas network[1] (representing 2.1 GW of aggregated maximum hourly load), of which 7 were in operation (1.8 GW), of which less than 5 are currently consuming gas. Of those with connection contracts to the gas network, 4 are awaiting connections, and an additional 22 additional data centres, representing 9.3 GW, made formal enquires, but have not yet secured contracts. The cumulative maximum capacity of data centres awaiting connections and who have made a formal enquiry represents a 540% increase on the capacity of those currently connected to the gas network. Gas Networks Ireland projects that natural gas demand from these enquiries ranges up to 1.3 GW, but is subject to considerable uncertainty.
- GNI is engaging with the Commission for Regulation of Utilities in relation to the impact of the July 2022 Government Statement on gas connection policy. GNI is not currently contracting more data centres pending the conclusion of this process.
- The above capacity figures relate to total maximum energy capacity, including gas and electricity. Actual gas consumption will depend on many factors, including the status of the electricity connection, timing of connection, the utilisation rate of data servers, the availability or constraints on the electricity grid (i.e., the rate that the TSO or DSO requires the development to switch to on-site power generation), and the potential for the data centre to switch fully to an electricity supply over time. GNI does not gather information on the anticipated duration of the gas connection from a potential data centre, and GNI does not classify data centres as "islanded" (those without an electricity connection) or not.
- No data is available to indicate actual gas use from the five data centres currently consuming gas. The SEAI's Energy Balances includes an estimate of energy use, including natural gas, for the "information and communication" sub-sector, however this is based on the 2022 Business Energy Usage Survey. In 2023, natural gas demand in this sub-sector was estimated to be 24 ktoe (280 GWh), around 0.6% of total primary energy requirement for natural gas in that year, according to the SEAI Energy Balance, but it is not clear if this includes natural gas from on-site power generation.





*Projected demand from these enquiries' ranges from 3.1MW up to 1,300MW; the aggregated demand represents the total developer's strategic long-term ambition which would be dependent on multiple factors including: ability to gain planning permission for multiple phases, availability of electricity grid capacity, permitting, data centre storage demand and route to market to fund these projects. Capacity figures relate to thermal input.

[1] https://www.oireachtas.ie/en/debates/question/2024-11-06/33/speech/284/

Potential impact of on-site gas demand

What is the maximum possible gas demand from data centres who have made formal enquiries to GNI?

- Data centres representing 2.1 GW of demand load currently have connection agreements to the natural gas network[1]. If these were running at full capacity and being powered entirely from natural gas (i.e., in fully "islanded" mode), the have the potential to consume 18,400 GWh of natural gas annually, which is around 38% of the total natural gas consumed in Ireland (across all sectors) annually. However, this is an implausible and extreme upper bound. But it does raise a critical question : what level of gas demand in the future is plausible?
- A number of factors influence the scale of this projected growth:
  - Firstly, more data centres are likely to connect to the network because they already received connection agreements. Currently, only 5 of the 11 data centres with connection agreement are consuming gas; 2 have connection agreements but are not consuming gas, and 4 are awaiting connections. In total, these represent 2.1 GW of maximum load.
  - Secondly, data centres typically take some time to power up to meet their maximum agreed load, though are not likely to use their full maximum agreed load.
  - Thirdly, some of these data centres will use gas for back up on-site power supply when supply on the power system is limited: this may be for a very limited period of the year. Moreover, some gas connections may be temporary However, GNI does not gather or publish data on the nature of the gas connections, and to our best knowledge, no stipulation in the connection agreement limits the the scale of gas usage.
  - And fourthly, an additional 22 data centres representing 9.3 GW of load have made formal enquiries to GNI, which has paused granting connections pending the finalisation of CRU's Large Energy User Connection Policy. There is uncertainty regarding the outcome of this connection policy, and also regarding the proportion of these enquiries that will materialise into formal developments.
- GNI projects that gas demand from the 11 data centres with existing grid connection agreements will grow from 200 GWh in 2023/24 to 2,700 GWh in 2030/31. GNI's "Best Estimate" scenario for gas consumption in 2030/31, which assumes some data centres will be granted new grid connection agreements, is 3,300 GWh, 600 GWh above the "Low" estimate, which only includes demand from the 11 data centres with existing connection agreements. However, the maximum load capacity of the 22 data centres who have made formal enquiries (9.3 GW) is around 5.5 times greater than that of data centres with existing agreements (2.1 GW).
- Therefore there is a risk that gas demand could be far greater than the level projected by GNI, depending on the four factors described above, even in the absence of new connection agreements. Should new connections be granted, the potential demand is very significantly greater. The theoretical annual maximum demand from all data centres who either have a gas network connection agreement, or who have made a formal enquiry, (representing 11.4 GW) is 100 TWh, which is around double Ireland's annual total primary natural gas demand. Again, this is not a plausible projection, but indicates the level of uncertainty and risk into the future.
- A more plausible estimate would take GNI's upper bound for projected demand from these enquiries – 1,300 MW (1.3 GW), and assume these are operational for 20% of the time (with the electricity grid used for the remaining 80% of the time). This would cause 2.3 TWh of additional natural gas demand annually.
- These calculations are not intended to act as projections or forecasts, but to demonstrate the significant risk that this trend for on-site natural gas connections creates for fossil fuel dependence, which is not being sufficiently explored. This risk is particularly strong for data centres which intend to fully bypass the electricity network and power all operations using on-site natural gas, but is also material for data centres which plan on a hybrid connections. On the other hand, if gas connections were temporary, data centres used them for a very small percentage of time, and switched to 100% renewables supply as quickly as possible, the risk would be minimal. However, it is not clear whether this outcome is realistic given the current extraordinary pace of demand growth.

[1] https://www.oireachtas.ie/en/debates/question/2024-11-06/33/speech/284/

Impact on greenhouse gas emissions & carbon budgets

What are the greenhouse gas implications of data centres, and how will they impact on the achievement of carbon budgets?

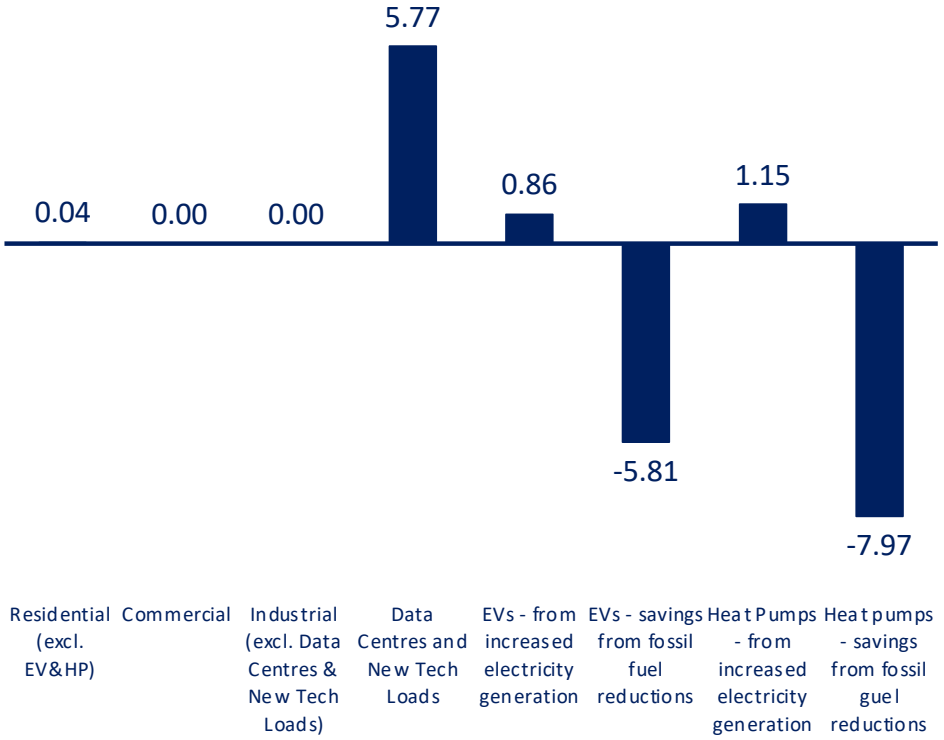
Back to Contents

Greenhouse gas emissions from data centre electricity demand

- We estimate potential additional GHG emissions from both the additional electricity demand, and additional natural gas demand. Bitpower[1] used this approach to estimate that data centres' electricity demand emitted 1.53 million tonnes of CO2 in 2023, 2.5% of Ireland's total GHG emissions, or 4.5% of total CO_2 emissions. This applied the gird average CO_2 intensity of power generated in 2023, 255 gCO_2/kWh
- This approach is also used in the graph to the right, which calculates the GHG emissions from new electricity loads, and also GHG savings from shifting demand from fossil fuels to electricity in transport and heating. This estimate uses the average carbon intensity of the electricity grid now and in the future, according to the EPA's With Additional Measures scenario. This uses EirGrid's Median demand scenario for data centre growth, and assumes the average GHG intensity of CO_2 generation falls in line with government policy. It finds that the GHG savings from EVs and Heat Pumps significant outweigh the additional emissions from their operations, and that new data centre loads cause nearly 6 million tonnes of emissions in the period 2021-2030.
- This approach allocates the "credit" for new renewables equally to all sources of demand. This approach has advantages and disadvantages. On the one hand, it treats all existing and new loads equally, based on total annual electricity demand. On the other hand, if a substantial new source of demand, like data centres, is causing greater fossil fuel usage directly, or indirectly by diverting renewables capacity away from powering existing energy demand, then it could be argued that this approach is favorable to new loads.
- An alternative approach to estimating the GHG impact of new data centre loads is to apply the GHG intensity of electricity using the share of renewables capacity directly procured by data centre developments, and assume that the remaining share is delivered with natural gas. Using this approach, if we assume that 16% of new data centre loads are realised with renewables through CPPA, and the remainder through grid-scale gas generation, then the cumulative emissions from power demand from data centres over 2021-30 rises to 14.6 million tonnes.

[1] https://bitpower.ie/images/Reports/2024_Q4_Market_Update_Ireland_v1-2.pdf

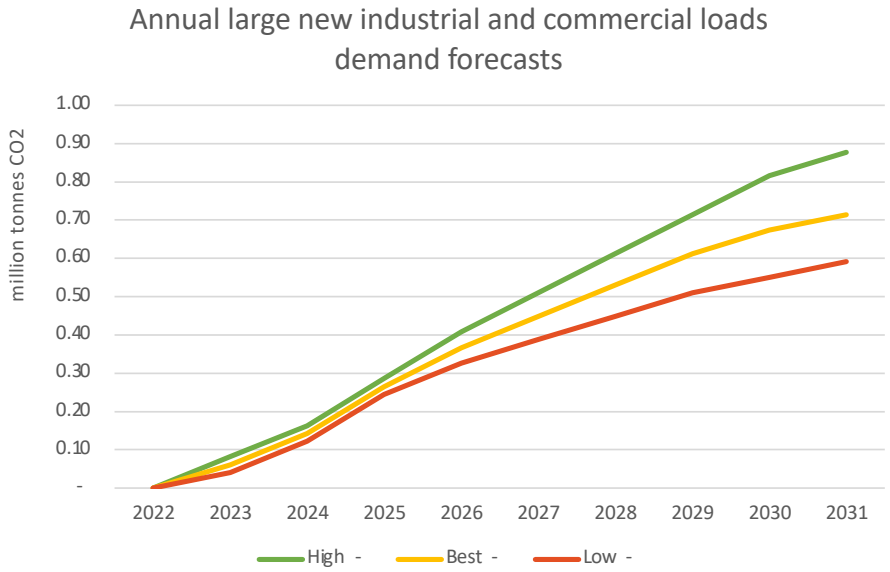
Cumulative Greenhouse Gas emissions of new electricity loads to 2030 (million tonnes CO_2)



Source: Own calculations based on Dr. Paul Deane https://www.esri.ie/sites/default/files/media/file-uploads/2024-06/7.%20Paul%20Deane_ESRI%20Presentation_PDeane%20June2024.pdf

GHG emissions arising from on-site gas generation

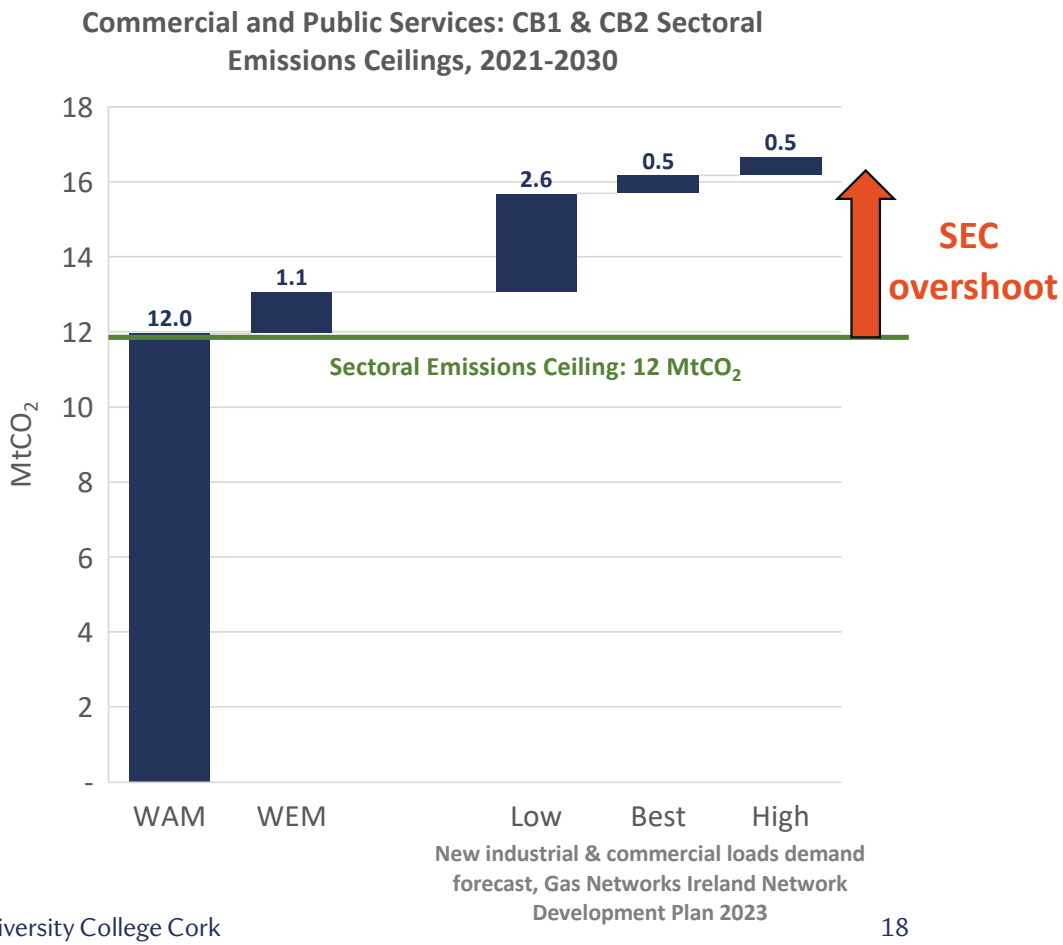
- Additional GHG emissions from natural gas demand arising from new industrial and commercial loads, according to GNI's Network Development Plan, is up to 900,000 tCO_2 in 2031. (See Gas Demand from Data Centres).
- To our best knowledge, these emissions arising from additional demand for natural gas from new industrial and commercial loads arising from data centres are not factored into SEAI's energy projections, and therefore not included in EPA GHG projections under "With Existing Measures" and "With Additional Measures" scenarios. Therefore, Ireland's Climate Action Plan is not taking account of an even greater gap between sectoral emissions ceilings and GHG emissions based on current projections.
- The cumulative impact of this additional natural gas demand on carbon budgets is explored in the next page.



Source: Own calculations based on Gas Networks Ireland Network Development Plan 2023: https://www.gasnetworks.ie/docs/corporate/gas-regulation/Network-Development-Plan-2023.pdf

Impact of new natural gas demand on SECs

- GHG emissions arising from this additional natural gas demand is calculated in the figure presented here. It is counted within the Commercial and Public Services sector within the greenhouse gas inventory, and therefore in the Services sector Sectoral Emissions Ceiling (SEC). EPA's GHG projections show that under the "With Additional Measures" (WAM) scenario, emissions for this sector are projected to be in line with its SEC. Apart from the "other" category, this is the only sector that is currently the case. Under the "With Existing Measures" Scenario (WEM), cumulative emissions are projected to be an additional 1.1 $MtCO_2$ over 2021-30.
- However, this new analysis shows that counting the additional emissions arising from natural gas from new industrial and commercial loads - data centres with connections to the gas network – the sector will exceed its SEC by a minimum of 2.6 $MtCO_2$ (Gas Networks Ireland's "Low" scenario), and up to 3.6 $MtCO_2$ (the "High" scenario). According to GNI, the Low scenario has been limited to Data Centre customers with connection agreements already in place.
- This calculation reflects GNI's projections. However, as shown in the previous section, the maximum potential gas demand from data centres seeking gas connection agreements is significantly higher than projected by GNI. The maximum annual gas demand from data centres who have secured a connection agreement is 18.4 TWh, which would emit 3.8 $MtCO_2$, and the maximum demand from those seeking a connection agreement is 81.5 TWh, which would cause emissions of 16.6 $MtCO_2$. In total, the maximum potential annual GHG emissions from data centres' gas connections is 20 $MtCO_2$ – which is equivalent to 68% of all CO_2 emissions arising from fossil fuel combustion in Ireland in 2023.
- We stress again that this is not a plausible scenario, but a theoretical maximum: It would require that all 33 data centres with connection agreements, or who have made formal enquiries, are granted agreements, are built, are operated continuously at their full maximum load and are fully powered using on-site natural gas generators. Consultation with the industry and GNI would be required to establish a plausible level of demand, in order to make a more credible projection of GHG emissions. However, it indicates an enormous risk to Ireland's carbon budgets, and energy security, beyond the threat that is already apparent from gas projections in GNI's Network Development Plan. This risk is clear when considering that a single planned data centre in Kildare, owned by Herbata, would cause 28.6 million tonnes of CO_2 over its lifetime, which is 4% of Ireland's total carbon budget [1].



[1] https://www.irishtimes.com/business/2024/10/08/kildare-county-council-says-planned-data-centre-runs-counter-to-national-policy/

Biomethane

What are the greenhouse gas implications of data centres, and how will they impact on the achievement of carbon budgets?

Back to Contents

Can biomethane mitigate GHG emissions from data centres?

- Biomethane has been proposed as a mitigation strategy to address the gas demand from data centres. For example, according to Gas Networks Ireland's Network Development Plan: "*There is a clear preference for Data Centre developments that can demonstrate the additionality of their renewable energy use in Ireland and can demonstrate a clear pathway to decarbonise and ultimately provide net zero data services.... Gas Networks Ireland believes that Data Centres connecting to the gas network could meet these principles through the increased use of biomethane and hydrogen while also assisting in establishing indigenous renewable gas markets in Ireland.*"
- However, this reasoning is misleading, using logic is the same that is used to justify expanded data centre power demand to create a market for renewables developments. It confuses targets for clean energy deployment – which in this case is biomethane – with their ultimate objective, which is to replace existing fossil fuels in order to meet legally-binding carbon budgets. Diverting any biomethane that is produced to serve additional demand will divert it from displacing fossil fuels in the electricity mix or for heating.
- The Irish Climate Action Plan (CAP) includes a target to develop 5.7 TWh of biomethane by 2030, which is required to contribute to decarbonising heating and industry by displacing fossil fuels.
- Moreover, the scale of natural gas demand from data centres cannot feasibly be reached by biomethane. The gas demand from GNI projections is equivalent to more than 60% of the biomethane target in the CAP, and this does not include significant demand from data centres who have made formal enquiries, including those which propose to run in "islanded" mode, without relying on the electricity network. One such proposed development, developed by Herbata, would consume the equivalent of half the total national biomethane target in 2030[1].
- According to the Sustainable Energy Authority of Ireland, "*It is possible that significant quantities of biomethane could be purchased by datacentres for use in off-grid electricity generation. Because grid electricity will be 80% renewable by 2030 and because of the losses incurred in electricity generation, any use of biomethane for off-grid electricity generation would be a highly sub-optimal use of this limited and valuable resource.*"[2]
- Short-term increases in fossil fuel use, relying on future biomethane injections, will undermine Ireland's ability to meet carbon budgets—the legal foundation of climate commitments
- Moreover, there are no detailed plans or guarantee that biomethane will be supplied in a timely manner.
- Finally, there are significant trade-offs and costs associated with biomethane production. Biomethane production at scale in Ireland would require significant volumes of sileage, because waste is a finite resource. Increased sileage volumes require greater land area, and threatens indirect GHG emissions through land use intensification and indirect land use change. SEAI classifies biogas produced with sileage using current cultivation practices as "high risk"[2]

[1] https://webgeo.kildarecoco.ie/planningenquiry# File 2460787
[2] https://www.seai.ie/renewable-energy/bioenergy/biomass-in-ireland
https://www.seai.ie/renewable-energy/bioenergy/sustainability-criteria-o
https://www.seai.ie/sites/default/files/publications/Assessment-of-Cost-and-Benefits-of-Biogas-and-Biomethane-in-Ireland.pdf

Power purchase agreements

To what extent are corporate power purchase agreements (CPPAs) meeting the growth in data center power demand?

Back to Contents

Are PPAs meeting data centre demands?

- A corporate power purchase agreement (CPPA) is a long-term contract between an energy producer (typically a renewable energy provider) and a buyer (such as a data centre) to purchase electricity at a pre-agreed price. PPAs help energy producers secure funding for projects by guaranteeing revenue, which offers finance for renewable energy projects and an alternative route to market from renewable energy auctions, while buyers benefit from stable energy pricing and potentially lower carbon footprints.
- Globally, CPPAs for renewable energy were pioneered by big tech companies, but evaluating the impact of this renewable procurement is not straightforward. Typically, the contracts are purely financial: the data centre is physically supplied with electricity by the central power grid, while the renewable electricity generated from the project is sold from where it is placed. This is a beneficial arrangement for a renewable developer, who can finance a project through a CPPA, and a data centre developer, who can secure a guaranteed electricity price and meet corporate emissions goals, but it does give rise to three important questions.
    1. Firstly, what is the additionality of this renewable capacity: would it have been built in the absence of the financial agreement, or is this investment "crowding out" other renewables projects by causing congestion, for example in planning or supply chains?
    2. Secondly, what is the coverage: how much of the electricity demand growth from data centres was matched by power generation from CPPAs?
    3. And thirdly, what is the time-matching of energy consumption from data centres with the generation from procured renewables generation?

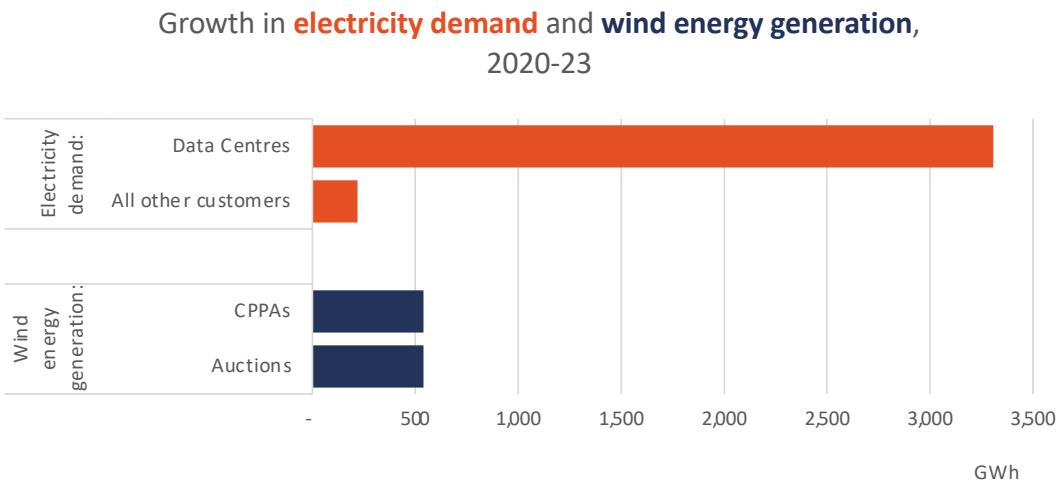
Irish policy on CPPAs and data centres

- The Government's Climate Action Plan 2019 included a target that 15% of electricity demand in 2030 is met by renewable sources contracted under CPPAs. However, subsequent Climate Action Plans which have been published under the Climate Act framework have not included a specific reference to CPPAs
- The Renewable Electricity Corporate Power Purchase Agreement Roadmap was published by the Government in March 2022. The roadmap sets out that CPPAs have an important role to play in helping Ireland to reach renewable electricity targets and includes the Principles of Good Practice for Renewable Electricity CPPAs, which state that "such agreements should clearly deliver additional GHG emissions reductions and contribute to Ireland's 2030 renewable electricity and climate targets,
    - Lower the net costs of the energy transition to Irish consumers and the State;
    - Be measured and reported in a way that accurately reflects actual emissions
- A strategy of procuring renewables through CPPAs have formed a significant part of the strategy of some tech companies with a significant presence of data centres in Ireland. For example, Meta has signed PPAs to buy the output of two of Ireland's largest solar farms in 2023[1]

[1] https://www.businesspost.ie/news/meta-buys-total-output-of-two-of-Irelands-largest-solar-farms/#:~:text=Both%20solar%20farms%2C%20which%20have,centre%20in%20Clonee%2C%20Co%20Meath.

Are corporate power purchase agreements (CPPAs) meeting the growth in data center power demand?

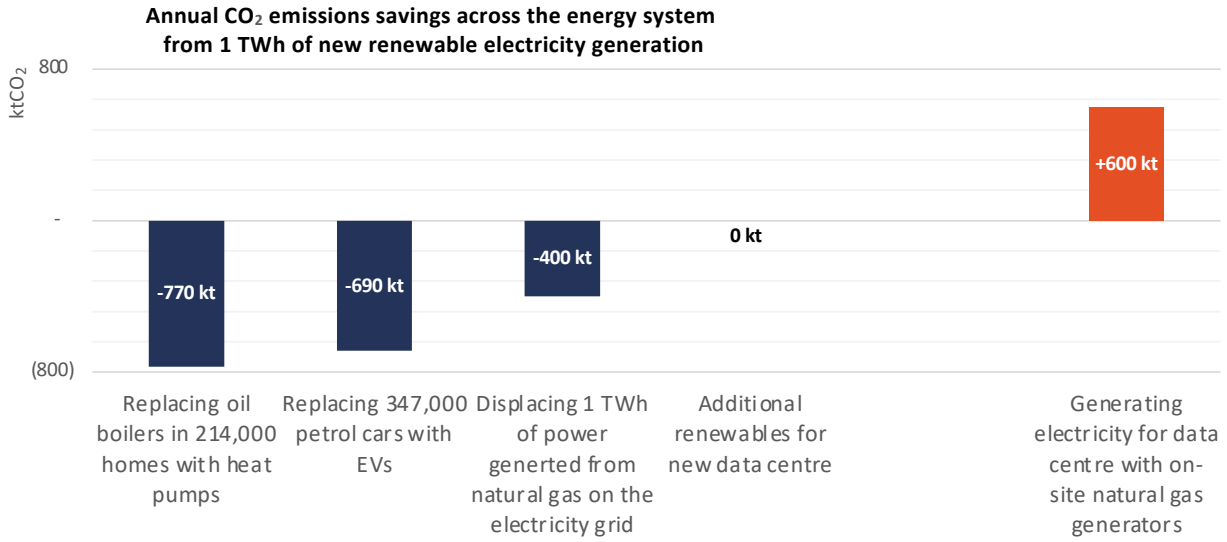
- According to industry estimates, half of the new wind energy capacity developed between 2020 and 2023 was financed though CPPAs.
- The chart to the right estimates that this led to just over 500 GWh of renewable energy generation over this period. However, this only met 16% of the new electricity demand from data centres between 2020 and 2023, which was over 3,000 GWh. In other words, data centre demand grew 6 times faster than new projects financed by CPPAs, and more than 15 times faster than electricity from all other sources – homes, vehicles, industry.
- From this analysis, it is clear that electricity demand from data centres is far outstripping the additional renewable energy being procured through CPPAs over the past three years, and the proportion of CPPAs undertaken by data centres is itself unknown.
- The narrative that procuring additional renewables capacity through CPPAs helps meet the targets under Ireland's climate act is not valid, because total energy demand is rising much faster than additional renewables, and that energy has to be met through additional fossil fuels. As before, it is cumulative greenhouse gas emissions, not gigawatts of renewables capacity, that is the legal basis for Ireland's decarbonisation commitments (and what matters for the climate).



Sources:
- Electricity demand growth: CSO
- Wind energy generation: Estimated from capacity growth (SEAI) and industry estimates for CPPA share

GHG emissions from diverting renewables generation

- This analysis shows that in the Irish context, the **coverage** of additional power demand from data centres is very limited. Only an estimated 16% of the growth in DC demand between 2020 and 2023 was met with CPPAs.
- The graph to the right shows the impact of diverting 1 TWh of renewable electricity to new loads, like a data centre, from displacing either electricity generated from a gas-fired power plant on the electricity grid, or to produce electricity to replace oil in home heating or transport.
- The graph below illustrates why it is so important, from a climate perspective, to focus new renewables on replacing fossil fuels than on serving additional demand from new data centres. It also illustrates why serving new data centre demand through on-site natural gas generators, which are less efficient than grid-scale generators, offsets large emissions savings efforts from other sectors.



Assumptions:
- Heat pump with COP of 3 replacing oil boiler emitting 257 gCO_2/kWh - would be higher with retrofit measures
- EVs with efficiency 0.16 kWh/km replacing ICE emitting 110 gCO_2/km
- Assumed GHG intensity of 400 gCO_2/kWh of large-scale CCGT natural gas, and 600 gCO_2/kWh for on-site generation

Commission for the Regulation of Utilities (CRU) demand policy

How can new policy developments described in the Commission for Regulation of Utilities review of Large Energy User connection policy contribute to the decarbonisation of data centres?

Back to Contents

CRU National Energy Demand Strategy

A National Energy Demand Strategy (NEDS) Decision Paper, published by CRU in July 2024, comprises three areas: 1. Smart Services, 2. Demand Flexibility and Response, and 3. New Demand Connections. The third area describes the process for developing a Large Energy User (LEU) Connection Policy. A central focus of the policy is to develop initiatives that can contribute towards demand flexibility in the short term, in addition to defining the longer-term strategic plan. CAP23 set a target for electricity system demand flexibility of 15-20% by 2025 and 20-30% by 2030. Shifting electricity demand to times of high renewables generation through flexibility mechanisms can enable greater emissions reductions and lower costs.

A second focus of the NEDS is to set out the parameters of a strategy to balance growing energy demand with Ireland's carbon budgets. One of the objectives, pertinent to this report, is to "*set out measures to ensure that overall electricity and gas demand is consistent with Ireland's carbon SECs*". According to the paper, in the long term additional demand will be decoupled from emissions growth, but *"at present, and in the short to medium term, electricity generation still produces significant emissions due to the role of fossil fuels in the generation mix. There are limitations, therefore, on the amount of electricity that can be consumed while simultaneously meeting the legal requirements set out in the Climate Act 2021".*

The focus on the third area in this paper, New Demand Connections, is initially focused on building flexibility contributions from LEUs seeking to connect. This will include reform of the pathway for new LEU connections to the electricity and gas systems so as to support security of supply, flexibility and minimise the impact on national carbon emissions.

The paper builds from the *Review of Large Energy Users Connection Policy* consultation paper, published in January 2024, which aims to set out a pathway for LEUs to connect to gas and electricity networks while addressing concerns around security of supply, network constraints and emissions.

The NEDS notes that *"the connection criteria that will be introduced as part of the new LEU connection policy currently in development and the extent of new LEU demand customers that connect under this policy. There is an expectation that LEUs will provide significant demand flexibility, noting the statement in CAP23 that 'Large Energy Users (LEUs) will be expected to make a higher proportional contribution to the target'".*

Chapter 6 of the Annex of the NEDS Decision Paper sets out the role of new demand connections, particularly LEUs, in building out demand flexibility in Ireland. It discusses the importance of incentivising new LEUs to provide flexibility as well as the interaction between the decarbonisation of energy demand, the gas network, and options for incentivising flexibility for non-LEU connections. This Annex also sets out the national and European legislative and policy contexts, and describes current emissions trends with regard to legislated SECs. Noting that emissions from the electricity sector are projected to overshoot the SEC, "it is important to recognise that these [scenarios] are based on assumptions that may not reflect the appetite for additional demand to accommodate economic growth, particularly with respect to the technology sector and data centres."

It should be noted that for new demand connections, the provision of flexibility and the impact on carbon budgets are two distinct topics. For example, demand from an LEU such as a data centre could be considered flexible if its operation is aligned with renewables generation on the grid, and powers down at times of low renewable generation, or if it switches to on-site fossil fuel-powered generation. However, in both of these cases, the source of new energy demand may be misaligned with carbon budgets. This is clearly the case for on-site power generation with fossil fuels, but is also the case if the renewable electricity consumed by the data centre could otherwise be used by existing energy customers, or be stored for times of low renewable generation.

NEDS Recommendations and Actions

Recommendations

The key recommendations for Government Departments, particularly DECC and DETE, to support the implementation of the NEDS are summarised below.

1. Policy measures regarding carbon emissions & SECs
    - Monitor the relative share of carbon emissions across the range of energy systems users. Consider whether further policy measures are required, including whether the legislative remit of the system operators remains appropriate with regards to adopting measures that prioritise decarbonisation. [Annex chapter reference: 3.3]
2. Enhanced emissions reporting framework - Part 2 (*Area 2D: Demand Flexibility & Response – Information, Certification and Reporting*)
    - Provide clarity and define the implementation and supporting actions required to complete delivery of the emissions reporting framework (CAP23 action: EL/23/27). [Annex chapter reference: 5.1.1]
3. Consider a national strategic approach for the facilitation of new LEU connections (*Area 3: New Demand Connections*)
    - Consideration to be given to a national strategic approach for the planning of large demand customers and associated infrastructure requirements (e.g. energy water, broadband, transport etc.), the associated costs and benefits, and any potential risks arising from high volumes of similar demand customer types. [Annex chapter reference: 6]

Actions

The NEDS describes 50 actions covering the three areas over 2024-2026, including responsible bodies, target completion dates and interdependencies. Actions relevant to the role of data centres in meeting Ireland's carbon budgets include the following:

- 0.1: Governance arrangements for NEDS implementation
- 0.2: Review the impact of NEDS on carbon emissions
- 2.19 & 2.20: Electricity & gas system emissions information
- 2.21: Enhanced emissions reporting framework: Deliver the design report for an enhanced emissions reporting framework for electricity emissions for LEUs
- 2.23: Certification of additionality for (a) power and (b) renewable gas:
- 2.24: Development of scenarios to define the future role of the gas network.
- 2.26: Support planning for the future role of the gas network and pathway for implementation:
- 3.1: Publication of new LEU connection policy

CRU Large Energy Users Connection Policy

The Climate Action Plan 2023 tasked the Commission for Regulation of Utilities, (CRU), with the delivery of a National Energy Demand Strategy, with the aim of 20% to 30% of electricity to be flexible by 2030. Large Energy Users will be expected to make up a higher proportional contribution to the flexibility target, as they are making up a high proportion of the increase in electricity demand. As part of this strategy, the CRU is also undertaking a review of the connection policy for Large Energy Users to the gas and electricity systems. The aim of this review is to provide a new pathway for Large Energy Users to connect to the electricity and gas systems, that minimises the impact on national carbon emissions while also taking account of the capacity of energy and grid infrastructure.

A Consultation Paper on the Review of Large Energy Users Connection Policy, published by CRU in January 2024, includes questions the following elements:

- **Reporting real-time emissions data:** Transparency around real-time GHG emissions is essential to inform the public debate and policy decisions on the relative costs and benefits of data centres
- **Data centres to be subject to flexible power connection contracts** in constrained locations of the grid – i.e., data centres may not secure a firm connection agreement to the power grid connection, could be asked to reduce power demand at constrained times. This policy could lead to a decrease in GHG emissions if reduced power demand was realised through lowering operation at the data centre. However, it would lead to increased GHG emissions if it caused a switch to on-site power generation, likely fuelled by gas and diesel, unless this was explicitly ruled out
- **Prove the "additionality" of any renewable power purchase agreements,** through regulator-certified system, to ensure they are not claiming renewable projects that are already in development. It is not clear how this policy will seek to establish the additionality of data centres' renewables procurement, for example including the possibility that the procured renewables project would not have been financed through other means, or that the project didn't diverted resources or create bottlenecks in the planning and development stages.
- **Islanded data centres,** which are not connected to the electricity grid at all and run off their own power generation, are expected to only be allowed a gas grid connection if they can demonstrate an ability to align with carbon budgets in the power sector. This report has demonstrated that new gas connections will increase greenhouse gas emissions and threaten the sectoral emissions ceilings of both the power and services sectors. It is not clear how the CRU policy intends to count these emissions, and how it would require data centres to align with carbon budgets. It is critical to ensure that any biomethane or hydrogen would also be additional, and would not be diverted from replacing existing fossil fuels usage.
- Additional analysis and feedback to the CRU Energy Demand Strategy Call for Evidence from MaREI and UCC can be viewed here.

An Electrification Action Plan

How can electricity demand grow along with renewables to replace fossil fuels, rather than serve new demands?

Back to Contents

An electrification strategy

Renewables are serving demand growth, not replacing fossil fuels

- Expanding renewable energy capacity is rightly a central mission in Ireland's climate strategy. However, renewable energy supply is only one half of the picture. Its possibility to decarbonise Ireland's energy system, and reduce fossil fuel dependence, if the power produced from wind and solar farms is used to replace fossil fuels through electrification.
- However, as the data in this report has shown, all the increase in renewables generation between 2017 and 2023 has been matched by demand growth from data centres: at the country level, this means renewables have been "running just to stand still" - fossil fuel use has not declined, and emissions remain stubbornly high. This disconnect threatens Ireland's ability to meet carbon targets.
- The data centre industry argues[1] that its growth is necessary to decarbonise Ireland's economy, claiming that new customers electricity customers are needed to support offshore wind development. While it's true that Ireland may one day produce a surplus of clean electricity to meet the needs of power-hungry industries like data centres, this argument ignores the present reality. Today, the extraordinary growth in energy demand from data centres is straining our electricity system and delaying emissions reductions.
- Renewable developers are seeking PPAs with data centres to secure a guaranteed customer to buy their power at a fixed price: future electricity demand is uncertain, and renewables developers cannot all get contracts through renewable auctions.
- This points to an important gap in Ireland's energy policy – clean electricity can power homes, vehicles, and industries, directly replacing fossil fuels. Yet, electrification is happening far too slowly. Moreover, if renewables are diverted to serving data centre demand growth, this may limit the ability of existing energy-intensive industrial consumers to electrify, risking them being left with a more carbon-intensive fuel mis.

An Electrification Action Plan

- An Electrification Action Plan could create a bridge between Ireland's renewable energy potential and climate commitments. This would entail developing a strategy to accelerate the electrification of existing industry, transport and buildings
  - Ireland's **transport** is almost entirely reliant on combustion engines, but electrification is possible and would bring massive benefits. Progress on this front has regressed – EV sales dropped last year with concerns about depreciation, but new electric vehicles are hitting price parity with fossil fuelled cars, and the electrification of busses and tricks is becoming more viable with advancements in battery technology and falling costs.
  - **Industry** is also poised for electrification. Today, 28 per cent of industrial energy demand is met with electricity, but this share has barely increased in two decades. The remaining demand is mainly for heat, which is met by fossil fuels. According to the Sustainable Energy Authority of Ireland, more than half of this can be electrified, and new innovations like thermal batteries can work well with a variable renewable electricity system. Shifting energy-intensive industries from natural gas to electricity would cut emissions, improve energy security, and make industry less vulnerable to fluctuating fossil fuel prices.
  - The electrification of **heating homes and businesses**, with both heat pumps and heat networks also needs to be prioritised.
  - Ireland's offshore wind capacity will eventually exceed domestic electricity needs. Instead of defaulting to data centres, this surplus could power innovative industries that address global challenges. For example, Ireland could produce synthetic fuels for aviation, or even novel proteins and green fertilisers to decarbonise agriculture. Clean electricity could also support carbon removal technologies like Direct Air Capture to help reverse climate change, which is increasingly likely to be necessary given how close the world is to crossing dangerous climate tipping points

[1] Cloud Infrastructure Ireland "Key to unlocking Irelands Offshore Wind Potential", November 2024

Conclusions

Key findings

- **Energy demand from data centres**
  - Data centres are the primary driver of Irish electricity demand growth, matching growth in renewable energy generation.
  - Current growth trends risk locking Ireland into higher emissions, delaying decarbonisation.
- **Greenhouse Gas Emissions**
  - Significant GHG emissions arise from both increased electricity and gas demand, creating further overshoot of legislated carbon budgets.
  - Data gaps in emissions tracking undermine efforts to fully assess carbon budget impacts.
- **Policy gaps**
  - CPPAs provide limited mitigation, with only 16% of data centre demand covered by additional renewable capacity between 2020 and 2023.
  - Biomethane as a mitigation strategy is unsustainable under current targets and production capacities.
- **Additional Risks**
  - On-site gas generation by data centres creates inefficiencies and shifts energy security risks to the gas network, and creates the risk of long-term gas lock in

Recommendations

- **Energy demand management**
  - Enforce stricter conditions on data centre connections to ensure alignment with carbon budgets.
  - Mandate flexible power contracts to limit peak demand impact.
- **Renewables and electrification**
  - Prioritise renewable deployment for sectors that directly replace fossil fuel use.
  - Develop an “Electrification Action Plan” to accelerate decarbonisation in transport, industry, and heating.
- **Policy development**
  - Introduce mandatory real-time GHG emissions reporting for data centres.
  - Enhance regulation around CPPAs to ensure additionality and time-matching of renewable generation.
- **Data transparency and research**
  - Improve data collection on gas use, on-site emissions, and renewable energy procurement.
  - Undertake detailed research on the extent to which data centres are increasing GHG emissions, including from electricity imports.

Appendix 5 - RFI Observation

DIRECT PLANNING APPLICATION TO AN BORD PLEANÁLA

in respect of

Arklow Bank Wind Park Phase 2 - RFI

Bord Pleanála Case Reference: OA27.319864

Submissions on Behalf of Blue Ireland Coalition CLG

Blue Ireland Coalition CLG, Garadice House, 3-4 Fairview, Dublin 3, Ireland.

April infringements package: key decisions

Brussels, 29 April 2026

Overview by policy area

In its regular package of infringement decisions, the European Commission takes legal action against Member States that fail to comply with their obligations under EU law. These decisions, covering various EU policy areas, aim to ensure the proper application of EU law for the benefit of citizens and businesses. The key decisions taken by the Commission are presented below and grouped by policy area. The Commission is also closing 70 cases where the issues with the Member States concerned have been solved. In these cases, the Commission does not have to pursue the infringement procedure further.
The Commission's enforcement activities and Member States' compliance with EU law can be followed through interactive maps and customisable graphs. For more details on the history of a case or to access the full database of infringement decisions, the infringement decisions' register is open for consultation. And more information on the EU infringement procedure can be found in the following Q&A.

1. Environment

(For more information: Anna-Kaisa Itkonen – Tel.: +32 2 295 75 01; Maëlys Dreux – Tel.: +32 229 54673)

Letters of formal notice

Commission calls on Poland to take the necessary measures and restore the ecosystem of the Oder River
The European Commission decided to open an infringement procedure by sending a letter of formal notice to **Poland** (INFR(2026)2009) for failing to fulfil its obligations under the Water Framework Directive (Directive 2000/60/EC), the Industrial Emissions Directive (Directive 2010/75/EU), and the Habitats (Directive 92/43/EEC) and Birds (Directive 2009/147/EC) Directives. Poland's water bodies, habitats and species, are being deteriorated, as exemplified by the toxic algae bloom in the Oder River of summer 2022 which caused massive fish deaths. The Oder is a key waterway in Central Europe and provides a wide range of ecosystem services – such as fisheries, drinking water, recreation and tourism. Restoring and protecting the water cycle is one of the key objectives of the Water Resilience Strategy. In summer 2022, a toxic algae species called 'golden algae' bloomed to an extent that aquatic life, including over 360 tonnes of fish, along a 500-kilometre stretch, was killed. High salinity and high nutrient concentrations are the main reasons for the intense algae bloom. In summer 2024, over 100 tonnes of fish were again found dead in the Oder River basin, as the 'golden algae' remains present in the Oder River basin and the salinity of the water remains high. Poland has authorised saline mine water discharges into the river despite their acknowledged negative impact on the water status. The measures taken by Poland have been insufficient to reverse the deterioration and ensure that water bodies achieve good status. Poland also failed to take the necessary measures to ensure restoration of the protected habitats and species present along the river, such as bitterling or spined loach. Finally, Poland adopted a River Basin Management Plan without taking into account the disaster of summer 2022 and its impacts. In doing so, Poland also failed to fulfil the requirements to carry out an appropriate assessment of the plan's impact on Natura 2000 sites that would be based on up-to-date data. The Commission is therefore sending a letter of formal notice to Poland, which now has two months to respond and address the shortcomings raised by the Commission. In the absence of a satisfactory response, the Commission may decide to issue a reasoned opinion.

Commission calls on Italy to correctly transpose the Drinking Water Directive

The European Commission decided to open an infringement procedure by sending a letter of formal notice to **Italy** (INFR(2026)2038) for failing to correctly transpose the Drinking Water Directive (Directive (EU) 2020/2184). As underlined in the Water Resilience Strategy, full implementation of EU water quality requirements is key to protecting human health and the environment. The recast Drinking Water Directive aims to protect human health by providing cleaner tap water, updating water quality standards, and tackling pollutants of concern, such as endocrine disruptors and microplastics. By 12 January 2023, Member States were required to transpose the Directive into national law and comply with its provisions. There are still several shortcomings in Italy's transposition of this Directive. These include the limitation of the scope of the risk assessment of domestic distribution systems, the postponement of certain obligations, the lack of the obligation to inform vulnerable people about ways to access drinking water, to limit derogations to only duly justified circumstances and to the shortest period possible, as well as the lack of a guidance value to manage the presence of non-relevant pesticide metabolites in drinking water. The Commission is therefore sending a letter of formal notice to Italy, which now has two months to respond and address the shortcomings raised by the Commission. In the absence of a satisfactory response, the Commission may decide to issue a reasoned opinion.

Commission calls on Ireland to bring their national legislation in line with the Single Use Plastics Directive

The European Commission decided to open an infringement procedure by sending a letter of formal notice to **Ireland** (INFR(2026)2037) for failing to correctly transpose the Single-Use Plastics Directive (Directive (EU) 2019/904). The Directive aims to prevent and reduce the impact of certain plastic products on the environment and on human health, as well as to promote the transition to a circular economy with innovative and sustainable business models, products and materials. Ireland has correctly transposed many of the core obligations of the Directive into national law. However, the requirement for producers of single-use plastic items to cover the costs of awareness-raising initiatives is not transposed. In addition, the Irish authorities have not transposed the requirement for ensuring that litter clean-up costs from public authorities are covered by producers. The legislation also lacks provisions allowing producers from other Member States to appoint an authorised representative in Ireland, which then deprives non-Irish EU economic operators from the possibility to be represented at national level. Furthermore, the Irish law lacks measures specified for achieving a quantifiable reduction in single-use plastics in 2026 and for ensuring separate collection for recycling certain single-use plastics. Lastly, Ireland has failed to establish deadlines for extended producer responsibility schemes for some single-use plastic products. The Commission is therefore sending a letter of formal notice to Ireland, which now has two months to respond and address the shortcomings raised by the Commission. In the absence of a satisfactory response, the Commission may decide to issue a reasoned opinion.

Commission calls on Ireland to complete its network of marine Natura 2000 sites

The European Commission decided to open an infringement procedure by sending a letter of formal notice to Ireland (INFR(2026)2051) for failing to fulfil its obligations under the Habitats Directive (Directive 92/43/EEC) and Birds Directive (Directive 2009/147/EC). Under the Habitats Directive, Member States must propose sites of Community importance (SCIs) to protect the EU's most threatened habitat types and species, including several marine ones. Under the Birds Directive, the Member States must classify Special Protection Areas (SPAs) to protect certain bird species, including several seabirds. These sites contribute to the EU-wide network of protected nature sites known as Natura 2000 and to reaching the target of the EU Biodiversity Strategy for 2030 of legally protecting at least 30% of the EU seas. For sites in the marine environment, the Commission had agreed with the Member States that they would have until 2012 to put this network in place. To follow up on this obligation, the Commission opened a series of investigations in 2015 to assess the progress made in several Member States, including Ireland. While Ireland has undertaken significant monitoring of its marine waters, the Irish authorities have not yet formally proposed new marine SCIs and have not yet classified marine SPAs in coastal and offshore areas. More specifically, additional SCIs for reefs, sandbanks, bottlenose dolphin and harbour porpoise need to be established. Ireland should also establish sufficient SPAs for eight bird species listed in Annex I of the Birds Directive and eleven migratory bird species which are regularly present in Ireland. The failure to propose such sites, so many years after the deadline has passed, obstructs the rapid roll-out of renewable energy projects as it creates legal uncertainty for authorities and developers. Ireland has ambitious offshore renewable energy plans, which the Commission fully supports. To advance on this objective, the authorities and developers need to have clarity on where the most environmentally sensitive areas

are. The Commission is therefore sending a letter of formal notice to Ireland, which now has two months to respond and address the shortcomings raised by the Commission. In the absence of a satisfactory response, the Commission may decide to issue a reasoned opinion.

Referral to the Court of Justice

Commission decides to refer Spain to the Court of Justice of the European Union for failing to comply with the Urban Wastewater Directive
Today, the European Commission decided to refer **Spain** (INFR(2017)2100) to the Court of Justice of the European Union for failing to fully comply with the collection, treatment and monitoring obligations set in the Urban Waste Water Treatment Directive (Council Directive 91/271/EEC). Untreated wastewater can put human health at risk and pollutes lakes, rivers, soil and coastal waters and groundwater. The Directive protects both water quality and human health by requiring that Member States collect and treat their urban wastewater for all agglomerations of 2,000 people or more before it is discharged into the environment. Member States should also ensure that discharges from urban wastewater treatment plants remain compliant over time with the Directive's requirements. Correct implementation of the Urban Wastewater Treatment Directive thus contributes to water resilience across the EU. The Commission sent a letter of formal notice to Spain in October 2017 and a reasoned opinion in November 2019. The Commission considers that efforts made by the Spanish authorities have, to date, been insufficient and is therefore referring Spain to the Court of Justice of the European Union. More information is in the press release.

2. Internal Market, Industry, Entrepreneurship and SMEs

(For more information: Siobhan McGarry – Tel.: +32 2 296 47 98; Rüya Perincek – Tel.: +32 460 76 25 10)

Letters of formal notice

Commission calls on Hungary and Slovakia to cease discriminatory treatment of EU citizens when fuelling vehicles
The European Commission decided to open infringement procedures by sending letters of formal notice to **Hungary** (INFR(2026)4008) and **Slovakia** (INFR(2026)4009) for discriminatory fuel prices for drivers of cars registered abroad. In Slovakia, the price of diesel for drivers of cars registered outside Slovakia is regulated and fixed on a weekly manner following the evolution of prices in neighbouring countries, while drivers of cars registered in Slovakia can enjoy a lower market price. The measure was originally adopted for 30 days only but has been further prolonged on 17 April 2026. In Hungary, protected fixed prices have been introduced for drivers of vehicles with Hungarian licence plates, while drivers of vehicles registered abroad must pay higher market prices. These measures infringe several provisions of primary and secondary EU law related to Single Market, namely the free movement of goods (Treaty on the Functioning of the EU (TFEU)), the free movement of services (TFEU or Directive 2006/123/EC), the free movement of workers and their equal treatment (TFEU and Regulation No 492/2011), the free movement of road transport services (Regulation (EC) No 1072/2009 and Regulation (EC) No 1073/2009) and freedom of establishment (TFEU or Directive 2006/123/EC). In addition, the measures concerned have not been notified prior to their adoption, in breach of Article 5(1) of Directive (EU) 2015/1535 (Single Market Transparency Directive). In addition, Hungary introduced a prior authorisation scheme for the export of crude oil and fuel products, in violation of Article 35 TFEU. The Commission is therefore sending letters of formal notice to Hungary and Slovakia, which now have two months to respond to the letters and address the shortcomings raised by the Commission. In the absence of a satisfactory response, the Commission may decide to issue a reasoned opinion.

Commission calls on France to comply with EU rules on free movement of goods such as biomethane
The European Commission decided today to launch an infringement procedure by sending a letter of formal notice to **France** (INFR(2026)4002) for the lack of compatibility of a national certificate scheme for biomethane production with the free movement of goods within the Internal Market (Articles 34-36 TFEU). Biomethane is a renewable gas made from organic waste that can be injected into natural gas networks. Under the French scheme, suppliers must either produce biomethane themselves or buy certificates from producers located in mainland France. Biomethane produced in

other EU Member States, even if it has been certified as sustainable, it is not recognised for traceability in this system. While the Commission supports environmental goals like reducing emissions, prioritising domestic biomethane over imports is disproportionate when less restrictive options exist. For instance, counting biomethane where it is consumed rather than produced would support renewable targets while respecting internal market rules. The Commission also promotes integrating biomethane across the EU gas market through cooperation between Member States, as outlined in the REPowerEU Action Plan. France is also in breach of the Single Market Transparency Directive (Directive (EU) 2015/1535) since the scheme and the respective national implementing measures were not notified to the Commission at a draft stage, prior to their adoption. France now has two months to address the concerns raised by the Commission. In the absence of a satisfactory response, the Commission may decide to issue a reasoned opinion.

Commission calls on Spain to comply with Court ruling on late payments
Today, the European Commission decided to open an infringement procedure by sending a letter of formal notice to **Spain** (INFR(2026)2049) for failing to align its retail sector legislation with the interpretation provided by the Court of Justice in Case C-677/22. Under Spanish law, payment terms for consumer goods can be systematically extended beyond 60 days, sometimes exceeding 120 days, a practice that appears inconsistent with the Court's ruling. Timely payments are crucial for European businesses to grow and invest in the Single Market. The Commission is therefore sending a letter of formal notice to Spain, which now has two months to respond and address the shortcomings raised by the Commission. In the absence of a satisfactory response, the Commission may decide to issue a reasoned opinion.

Reasoned opinion

Commission asks Belgium to ensure businesses are paid in a timely fashion
Today, the European Commission decided to send a reasoned opinion to **Belgium** (INFR(2025)2130) regarding systemic payment delays by Brussels Capital Region municipalities to their suppliers, as well as the failure of Flemish municipalities and the Brussels Capital Region to pay the EUR 40 flat-fee compensation for overdue payment of invoices. The Commission is trying to bring more fairness between the parties when negotiating payment terms and facilitating access to liquidity, in line with the obligations laid down by the Late Payments Directive. Late payments negatively impact businesses, particularly SMEs, by reducing liquidity, hindering growth, and weakening resilience. The Commission has, therefore, decided to issue a reasoned opinion to Belgium, which now has two months to respond and take the necessary measures. Otherwise, the Commission may decide to refer Belgium to the Court of Justice of the European Union.

3. Migration and Home Affairs

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Letters of formal notice

Commission calls on Germany, France and Austria to correctly transpose the provisions of the Directive on combating money laundering by criminal law
The European Commission decided to open infringement proceedings by sending a letter of formal notice to **Germany** (INFR(2026)2043), **France** (INFR(2026)2042) and **Austria** (INFR(2026)2040) for failing to correctly transpose provisions of the Directive on combating money laundering by criminal law (Directive (EU) 2018/1673), including definitions and rules on the liability of legal persons. The Directive defines criminal offences and sanctions against natural and legal persons in relation to money laundering, with the aim of facilitating police and judicial cooperation between EU Member States and preventing criminals from taking advantage of more lenient legal systems. In view of the incorrect transposition of the Directive including on definitions and rules on the liability of legal persons, the Commission is sending a letter of formal notice to Austria, Germany and France. These Member States now have two months to respond and address the shortcomings raised by the Commission. In the absence of a satisfactory response, the Commission may decide to issue a reasoned opinion.

Commission calls on Hungary to align its national legislation with the EU Facilitators Package

The European Commission decided to open an infringement procedure by sending a letter of formal notice to **Hungary** (INFR(2026)2039) for failing to fulfil its obligations under Council Directive 2002/90/EC to impose effective, proportionate and dissuasive sanctions for the offence of facilitating unauthorised entry, transit and residence into the EU (i.e. migrant smuggling), and under Council Framework Decision (2002/946/JHA) which sets rules on criminal penalties regarding these offences. Moreover, the Hungarian legislation is incompatible with the very objectives of the Area of Freedom, Security and Justice to ensure a high level of security in the Union. It also undermines the common policy on immigration and border control and represents a serious violation of the principle of sincere cooperation. On 31 July 2025, the Commission referred Hungary to the Court of Justice in relation to the 2023 Government Decree which resulted in the release from prison of convicted smugglers and their expulsion to other Member States or third countries. This procedure is still pending. The 2023 Government Decree was repealed by a law of 19 June 2025. The same law introduced modifications to the criminal procedural code allowing for a conditional suspension of proceedings against individuals suspected of having committed human smuggling offences. The suspension of proceedings applies to non-Hungarian nationals who can be expelled under Hungarian law, admit guilt, disclose the circumstances of the offence and leave the territory of Hungary in 72 hours. The relevant provisions create a risk of systematic impunity and render ineffective the criminalisation provisions foreseen in the EU legislation. By not effectively prosecuting suspects of migrant smuggling, the 2025 Law systematically compromises not only the public interest in ensuring a high level of security within the area of freedom, security and justice, but also an effective immigration and border control policy. The Commission is therefore sending a letter of formal notice to Hungary, which now has exceptionally one month to respond and address the shortcomings raised by the Commission. In the absence of a satisfactory response, the Commission may decide to issue a reasoned opinion.

Referrals to the Court of Justice

Commission decided to refer Bulgaria, Spain, France, Luxembourg, the Netherlands, Poland, and Sweden to the Court of Justice of the European Union for failing to transpose the Directive on critical entities resilience (CER)
The European Commission decided to refer **Bulgaria** (INFR(2024)0258), **Spain** (INFR(2024)0271) **France** (INFR(2024)0275), **Luxembourg** (INFR(2024)0283), **the Netherlands** (INFR(2024)0289), **Poland** (INFR(2024)0291), and **Sweden** (INFR(2024)0297) to the Court of Justice of the European Union for failing to transpose and notify national measures transposing the Directive on the resilience of critical entities (Directive (EU) 2022/2557 - CER Directive). Member States had to transpose into their national legal order the CER Directive by 17 October 2024. The CER Directive ensures the continued provision of services that are of vital importance for EU society and economy in key sectors such as energy, transport, health, water, banking and digital infrastructure. It requires Member States to conduct regular risk assessments to identify critical entities and ensure these entities implement appropriate measures to protect the uninterrupted provision of essential services. The directive takes an all-hazards approach, covering natural and man-made risks such as terrorist attacks, cyber threats, criminal infiltration and sabotage. To date, none of the Member States concerned have transposed any measures of the Directive into national legislation. Therefore, the Commission is referring them to the Court of Justice of the European Union, requesting the Court to impose financial sanctions on each of these Member States. More information is in the press release.

4. Justice

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(For more information on Equality: Eva Hrncirova - Tel.: +32 2 298 84 33; Anna Gray – Tel.: +32 2 298 08 73)

Letters of formal notice

Commission calls on Poland to correctly transpose EU rules on price reductions in relation to services
The European Commission decided to open an infringement procedure by sending a letter of formal notice to **Poland** (INFR(2026)2050) for failing to correctly transpose the rules on price reductions provided in the Modernisation Directive (Directive (EU) 2019/2161).This Directive amended four

Directives: the Unfair Commercial Practices Directive, the Consumer Rights Directive (Directive 2011/83/EU), the Unfair Contract Terms Directive (Council Directive 93/13/EEC), and the Price Indication Directive (Directive 98/6/EC). It aims to ensure a high level of consumer protection while harmonising national rules for the benefit of the internal market. The Commission considers that Polish national provisions transposing the amendments of the Price Indication Directive go beyond its scope, as those national provisions apply not only to movable goods, as required by the Price Indication Directive, but also to services. Poland therefore does not comply with the Unfair Commercial Practices Directive, which covers all commercial practices, including announcements of price reductions for services, and prohibits Member States from adopting stricter rules that exceed its requirements. The Commission is therefore sending a letter of formal notice to Poland, which now has two months to respond and address the shortcomings raised by the Commission. In the absence of a satisfactory response, the Commission may decide to issue a reasoned opinion.

Commission calls on Greece and Croatia to correctly transpose EU rules on legal aid
The European Commission decided to open an infringement procedure by sending a letter of formal notice to **Greece** (INFR(2026)2052) and **Croatia** (INFR(2026)2053) for failing to correctly transpose EU rules on legal aid for suspects and accused persons (Directive (EU) 2016/1919). EU law ensures that the basic rights of suspects and accused persons are protected, including for persons requested under a European arrest warrant. Under the Directive, decisions on legal aid must be made without undue delay by a competent and independent authority, such as a court of justice. However, in Croatia, decisions before the indictment are made by the public prosecutor, who does not meet the requirement of independence under EU law. Croatian law also fails to clearly guarantee legal aid in certain circumstances when a person is brought before justice to decide on pre-trial detention. In certain situations, Greece only grants legal aid upon request, which is contrary to the Directive. Additionally, when evaluating eligibility to legal aid, the Greek legal system fails to consider the complexity of the case or the severity of sanctions at stake, as required by EU law. Decisions on legal aid are also often delayed and lack clarity on timing. The police and prosecutors are involved in such decisions in urgent cases. This does not meet the requirement of independence under EU law. Furthermore, individuals are not always informed in writing when their request for legal aid is denied, falling short of the required standards by the Directive. The Commission is therefore sending a letter of formal notice to Greece and Croatia, which now have two months to respond and address the shortcomings raised by the Commission. In the absence of a satisfactory response, the Commission may decide to issue a reasoned opinion.

Reasoned opinions

Commission calls on, Belgium, Bulgaria, Czechia, Cyprus, Latvia, Hungary, Austria, Poland and Portugal to fully transpose EU rules on gender balance in company boards
Today, the European Commission decided to send reasoned opinions to **Belgium** (INFR(2025)0005), **Bulgaria** (INFR(2025)0011), **Czechia** (INFR(2025)0025), **Cyprus** (INFR(2025)0018), **Latvia** (INFR(2025)0073), **Hungary** (INFR(2025)0057), **Austria** (INFR(2025)0001), **Poland** (INFR(2025)0085) and **Portugal** (INFR(2025)0092) for failing to communicate the national measures transposing Directive (EU) 2022/2381 on gender balance in company boards. The Directive sets a target for large EU listed companies of 40% of the under-represented sex among their non-executive directors and 33% among all directors. The deadline for the transposition by Member States was 28 December 2024. In January 2025, the Commission decided to open infringement procedures by sending letter of formal notice to several Member States for failing to communicate the respective measures on the transposition of the Directive. To date, Belgium, Bulgaria, Czechia, Cyprus, Latvia, Hungary, Austria, Poland and Portugal have still not communicated full transposition measures, despite having been granted sufficient time to adopt and notify the required measures. Therefore, the Commission has decided to issue a reasoned opinion to the nine Member States, which now have two months to respond and take the necessary measures. Otherwise, the Commission may decide to refer the cases to the Court of Justice of the European Union, with requests to impose financial sanction.

Commission calls on Spain to protect the collective interest of consumers through EU representative actions
Today, the European Commission decided to send a reasoned opinion to **Spain** (INFR(2023)0015) for failing to fully incorporate into national law the Representative Actions Directive (EU) 2020/1828. Adopted in 2020, the Directive aims to ensure that all consumers across the EU fully benefit from their rights under EU law. It empowers qualified entities, such as consumer organisations to seek redress. Redress can include measures such as compensation, replacement or repair for a group of consumers

who have been harmed by an illegal commercial practice. Member States had until 25 December 2022 to incorporate the Directive into national law. In January 2023, the Commission issued a letter of formal notice to several Member States, including Spain, for failing to notify complete transposition measures. Since then, Spain has only notified partial transposition of the Directive. Although Spanish law already provides, to some extent, the mechanism of representative actions, it misses essential elements of the Directive, such as, for example, on the possibility for qualified entities to bring cross-border representative actions. Therefore, the Commission has decided to issue a reasoned opinion to Spain, which now has two months to respond and take the necessary measures. Otherwise, the Commission may decide to refer the case to the Court of Justice of the European Union, with a request to impose financial sanctions.

Referrals to the Court of Justice

Commission decides to refer Czechia and Hungary to the Court of Justice of the European Union for incorrectly transposing rules on the European Arrest Warrant
Today, the European Commission decided to refer **Czechia** (INFR(2020)2312) and **Hungary** (INFR(2021)2071) to the Court of Justice of the European Union for failing to comply with the Framework Decision on the European Arrest Warrant (2002/584/JHA). The Commission sent a first letter of formal notice in December 2020 to Czechia and in June 2021 to Hungary for non-communication and incorrect transposition of the Framework Decision. The Commission maintains that Czech law does not ensure that the requested person is either temporarily transferred to the issuing Member State or heard in the executing Member State, pending the decision on surrender. Furthermore, it does not ensure that the duration of a temporary transfer is determined by mutual agreement between the issuing judicial authority and the executing judicial authority. The Commission maintains that Hungarian law incorrectly transposes the provisions on grounds for refusal, by obliging judicial authorities to refuse European Arrest Warrant requests for certain offences that are not criminalised in Hungary. The Commission considers that efforts by the authorities have, to date, been insufficient and is therefore referring Czechia and Hungary to the Court of Justice of the European Union. More information is in the press release.

5. Energy and climate

(For more information: Anna-Kaisa Itkonen – Tel.: +32 2 295 75 01; Cristiana Marchitelli – Tel: +32 2 298 94 07; Ana Crespo Parrondo – Tel.: +32 2 298 13 25)

Reasoned opinions

Commission urges Croatia, Poland and Portugal to transpose EU rules improving the Union's electricity market design
Today, the European Commission decided to send reasoned opinions to **Croatia** (INFR(2025)0143), **Poland** (INFR(2025)0162) and **Portugal** (INFR(2025)0166) for not having transposed into national law the new EU electricity market design rules, set out in Directive (EU) 2024/1711 and amending Directives (EU) 2018/2001 and (EU) 2019/944. The new rules aim to make electricity prices for consumers more stable and less dependent on the price of fossil fuels. Implementing the legislation is key to ensuring that European consumers - both households and businesses - face energy costs that better reflect the lower production costs of renewables and that prices are more predictable. The reformed electricity market design also allows for better consumer protection, both in terms of wider choice when signing contracts and in the event of disconnection. Member States had to notify the transposition of the 2024 Directive by 17 January 2025, except for provisions on free choice of supplier and energy sharing, for which they have until 17 July 2026. In March 2025, the Commission sent letters of formal notice to 26 Member States for failing to fully transpose the Directive into national legislation. After having examined the replies from Member States, the Commission has decided to issue reasoned opinions to Croatia, Poland and Portugal for failing to notify transposition measures. The three Member States concerned now have two months to respond and take the necessary measures. Otherwise, the Commission may decide to refer the cases to the Court of Justice of the European Union, with requests to impose financial sanctions.

Commission urges Hungary to comply with rules on intra-EU investor-State arbitration
The European Commission decided to send a reasoned opinion to **Hungary** (INFR(2025)2204) for failing to prevent violations of the prohibition on intra-EU investor-State arbitration, as established by

the case-law of the Court of Justice of the European Union. In its judgment in Case C-741/19, ("the Komstroy judgment") , the Court of Justice held that Articles 267 and 344 TFEU prevent an international agreement, such as Article 26 of the Energy Charter Treaty, from allowing an investor from one Member State to bring a dispute concerning investments in another Member State before an arbitral tribunal whose jurisdiction that Member State has agreed to accept. The violations subject to the reasoned opinion result from the actions of the Hungarian State-controlled company MOL, and companies controlled by it, that breach the prohibition of intra-EU investor State arbitration. First, MOL requested a third-country court to recognise and enforce an intra-EU investor-State arbitral award issued in its favour on the basis of Article 26 of the Energy Charter Treaty. Second, a company controlled by MOL initiated a new intra-EU investor-state arbitration procedure against another EU Member State on the basis of Article 26 of the Energy Charter Treaty. The Commission maintains that according to settled case-law of the Court of Justice of the European Union, Court of Justice judgments apply retroactively and the liability of a Member State under Article 258 TFEU can be extended to: (I) acts of private law entities under its supervision or effective control or function ;(II) the bodies to which it assigns a task in the public interest or specific privileges; and (III) any entity whose action reflects or implements the policy of the State. The Commission is therefore sending a reasoned opinion to Hungary, which now has two months to respond and take the necessary measures. In the absence of a satisfactory response, the Commission may decide to refer the case before the Court of Justice of European Union.

Referrals to the Court of Justice

Commission decides to refer Greece, Malta and Portugal to the Court of Justice of the European Union to ensure transposition of the reinforced rules to promote renewable energy

Today, the European Commission decided to refer **Greece** (INFR(2025)0214), **Malta** (INFR(2025)0233) and **Portugal** (INFR(2025)0241) to the Court of Justice of the European Union for failing to fully transpose into national law the provisions of the amending Directive (EU) 2023/2413 on the promotion of energy from renewable sources. The new rules aim to accelerate the deployment of renewable energy and the roll-out of homegrown clean energy across the EU in order to reduce greenhouse gas emissions, strengthen energy independence and lower energy prices. It seeks to deploy renewable energy in all sectors of the economy, not only in the power sector, but also and especially in those sectors where progress is more difficult like heating and cooling, buildings, transport and industry, where new or strengthened targets have been set. They introduce horizontal and cross-cutting measures to promote the deployment of renewables, such as the strengthening of guarantees of origin, facilitating energy system integration through the promotion of electrification and renewable hydrogen, and safeguards to ensure a more sustainable bioenergy production. The promotion of renewable energy is crucial for Europe's competitiveness and path to climate neutrality and a key element of the Affordable Energy Action Plan as well as the REPowerEU plan. The Directive was adopted in 2023. Member States had to notify the transposition of the Directive by 21 May 2025, except for some provisions related to permitting, which were already due by 1 July 2024. The Commission sent Greece, Malta and Portugal a letter of formal notice in July 2025 and a reasoned opinion in December 2025 for not having transposed the Directive. Greece and Portugal have not yet notified any transposition measures. Malta has not provided sufficiently clear and precise information on how the directive has been transposed. The Commission is therefore referring Greece, Malta and Portugal to the Court of Justice of the European Union, with requests to impose financial sanctions. More information is in the press release.

6. Taxation

(For more information: Louise Bogey – Tel.: +32 2 296 97 76; Bridget Moylan – Tel.: +32 2 298 28 44)

Reasoned opinion

Commission calls on Spain to put an end to discriminatory taxation of non-resident taxpayers working and habitually living in Spain

Today, the European Commission has decided to send a reasoned opinion to **Spain** (INFR(2025)4007) for violating the free movement of capital (Article 63 TFEU) when taxing non-resident taxpayers on their dwellings used as habitual residence. In general, Spain taxes deemed income from real estate

owned by individuals at 2% of their cadastral value. However, properties used as dwellings constituting the habitual abode of resident taxpayers in Spain are exempt from taxation. This tax exemption does not cover non-resident taxpayers. Therefore, the Commission has decided to issue a reasoned opinion to Spain, which now has two months to respond and take the necessary measures. Otherwise, the Commission may decide to refer the case to the Court of Justice of the European Union.

Referral to the Court of Justice

Commission decides to refer Hungary to the Court of Justice of the European Union for failing to abolish its retail tax regime
Today, the European Commission decided to refer **Hungary** (INFR(2024)4022) to the Court of Justice of the European Union for failing to bring its retail tax regime in line with the freedom of establishment guaranteed by Articles 49 and 54 of the Treaty on the Functioning of the European Union. Due to the current design of the retail tax regime, foreign controlled retail companies operating in Hungary as integrated companies or linked undertakings, are subject to high and steeply progressive tax rates on their turnover. However, domestic retailers operating on the Hungarian market under their respective brands and logos via franchise systems are not subject to the same highest rates because their turnover is not consolidated for taxation purposes. Notably, the tax regime prevents the foreign controlled retail companies from restructuring their business operations like those domestic retail companies. Therefore, the retail tax regime constitutes a restriction to the freedom of establishment. The Commission sent a letter of formal notice to Hungary in October 2024, followed by a reasoned opinion in June 2025. Since Hungary denies the infringement, the Commission is referring it to the Court of Justice of the European Union. More information is in the press release.

7. Mobility and Transport

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Letters of formal notice

Commission calls on Belgium, France and Portugal to carry out the network-wide road safety assessment as required by EU rules
The European Commission decided to open infringement procedures by sending letters of formal notice to **Belgium** (INFR(2026)2047), **France** (INFR(2026)2048), and **Portugal** (INFR(2026)2045) for failing to carry out the network-wide road safety assessment and report the results to the Commission. Directive on road infrastructure safety management (Directive 2008/96/EC), as amended by Directive (EU) 2019/1936, applies to all roads belonging to the TEN-T road network. It also covers all motorways, primary roads connecting major cities and regions, as well as all interurban EU-funded roads. Member States had to carry out the network-wide road safety assessment by 2024 and report to the Commission by 31 October 2025 on the safety classification of their road network. France and Portugal have not sent the reports for their networks as required by the Directive, while Belgium sent only partial results. The Commission is therefore sending letters of formal notice to Belgium, France, and Portugal, which now have two months to respond and address the shortcomings raised by the Commission. In the absence of satisfactory responses, the Commission may decide to issue reasoned opinions.

8. Financial Stability, Financial Services and Capital Markets Union

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Reasoned opinions

Commission calls on Spain and Poland to transpose the amendments to the 4th Anti-Money Laundering Directive and complete the implementation of other measures introduced by the Transfer of Funds Regulation
Today, the European Commission decided to send a reasoned opinion to **Spain** (INFR(2025)2079) and **Poland** (INFR(2025)2081) for failing to transpose the amendments to the 4th Anti-Money

Laundering Directive (AMLD) (Directive (EU) 2015/849) introduced by the Transfer of Funds Regulation (Regulation (EU) 2023/1113) and for failing to notify to the Commission the rules on administrative penalties and other measures applicable to infringements of the Regulation. The Transfer of Funds Regulation (TFR) lays down rules on the information on payers and payees accompanying transfers of funds in any currency, and on originators and beneficiaries accompanying transfers of crypto-assets, for the purposes of preventing, detecting and investigating money laundering and terrorist financing. It replaces and broadens the scope of the former Regulation on information accompanying transfers of funds (Regulation (EU) 2015/847) and amends the 4th Anti-Money Laundering Directive in order to introduce new requirements on information accompanying transfers of crypto-assets. In addition, the TFR requires that Member States adapt their national legal frameworks. These provisions were already contained in the previous version of the TFR (Regulation (EU) 2015/847) but require additional measures from Member States to ensure they also apply administrative sanctions and measures, in particular for the breaches related to crypto-assets services providers. The two Member States have failed to notify transposition of the amendments made to the 4th AMLD and have not completed the implementation of the Regulation on administrative penalties and other measures by the 30 December 2024 deadline. The TFR is a key European legislative act designed to combat money laundering and terrorist financing by ensuring the traceability of financial transfers. Failing to implement it has legal, financial, and operational risks for institutions and individuals and, especially, for all Crypto-Asset Service Providers operating in the EU. Therefore, the Commission has decided to issue reasoned opinions to the two Member States concerned, which now have two months to reply and take the necessary measures. Otherwise, the Commission may decide to refer the cases to the Court of Justice of the European Union.

Commission calls on Spain, the Netherlands, Portugal and Sweden to fully transpose the European Single Access Point (ESAP) Omnibus Directive to ensure investors' access to corporate public information

Today, the European Commission decided to send a reasoned opinion to **Spain** (INFR(2025)0269), **the Netherlands** (INFR(2025)0281), **Portugal** (INFR(2025)0285) and **Sweden** (INFR(2025)0288) for failing to fully transpose the European Single Access Point (ESAP) Omnibus Directive (Directive EU 2023/2864) in relation to the changes introduced in the Transparency Directive (Directive 2004/109/EC) following a letter of formal notice sent in July 2025. The ESAP Omnibus Directive is part of the ESAP legislative package that facilitates the creation of a centralised mechanism offering easily accessible, comparable and usable public information to investors and other stakeholders. Easy and structured access to information by market participants will contribute to the integration of EU capital markets, in line with the Savings and Investments Union objectives. This will facilitate the financing of EU companies, thus driving growth and job creation in the EU. The legislative package foresees three phases of ESAP development. The first phase will begin in July 2026, when disclosures required under the Transparency Directive, the Prospectus Regulation and the Short Selling Regulation will be submitted to national competent authorities so they can be made available on ESAP. For that first step, Member States had to transpose the changes introduced in the Transparency Directive by 10 July 2025, as indicated in the letter of formal notice sent in July 2025. Therefore, the Commission has decided to issue reasoned opinions to the four remaining Member States who had not transposed the changes, which now have two months to reply and take the necessary measures. Otherwise, the Commission may decide to refer the cases to the Court of Justice of the European Union, with requests to impose financial sanctions.

9. Digital economy

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Additional letter of formal notice

Commission asks Croatia to comply with the Digital Services Act and empower the national authority to enforce it

The European Commission decided to send an additional letter of formal notice to **Croatia** (INFR(2024)2166) for not complying with the Digital Services Act (DSA). The Commission already raised its concerns in a letter of formal notice sent to Croatia in July 2024. The Commission is of the view that Croatia fails to comply with Regulation (EU) 2022/2065. Under the DSA, Member States

must designate Digital Services Coordinators, national authorities responsible for enforcing the Regulation within their jurisdiction. An operational Digital Services Coordinator is required to give full effect to the provisions of the DSA in the territory of their Member State, to enable users to benefit from its rules and to create legal certainty for market players. Following the first letter of formal notice, Croatia adopted legislation implementing the DSA on 18 April 2025. However, the Commission considers that Croatia is still failing to empower its Digital Services Coordinator and wrongfully implemented the powers to sanction foreseen by the DSA. In particular, the Croatian law does not always respect the maximum limits of 6% for fines and 5% of average daily worldwide turnover or income for periodic penalty payments for online platforms, nor does it ensure that all penalties are effective, proportionate, and dissuasive. Additionally, it does not allow fines to be imposed on individuals for providing incorrect or incomplete information or for failing to cooperate with inspections, as required by the Regulation. Croatia now has two months to respond and address the shortcomings raised by the Commission. In the absence of a satisfactory response, the Commission may decide to issue a reasoned opinion.

10. Jobs and social rights

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Letter of formal notice

Commission urges Portugal to remove discriminatory employment conditions in the public sector
The European Commission decided to open an infringement procedure by sending a letter of formal notice to **Portugal** (INFR(2026)4001) for failing to bring their national legislation fully in line with the Directive on fixed-term work (Council Directive 1999/70/EC), which prohibits discrimination against fixed-term workers. Portuguese law excludes fixed-term employees in the public sector from improving their position in the salary scale contrary to permanent workers who perform the same work and go through the same evaluations. According to the Commission, this represents discrimination contrary to EU law. The Commission is therefore sending a letter of formal notice to Portugal, which now has two months to respond and address the shortcomings raised by the Commission. In the absence of a satisfactory response, the Commission may decide to issue a reasoned opinion.

Reasoned opinions

Commission urges Spain to remove discriminatory employment conditions in the public sector
Today, the European Commission decided to send a reasoned opinion to **Spain** (INFR(2014)4224) for failing to bring their national legislation fully in line with the Directive on fixed-term work (Council Directive 1999/70/EC), which prohibits discrimination against fixed-term workers. Spanish law contains less favourable employment conditions for fixed-term employees working in the Spanish public sector compared to permanent employees. According to the Commission, this constitutes discrimination contrary to EU law, and it therefore opened this infringement proceeding in 2014. While Spain resolved and clarified some of the issues set out in the latest letter of formal notice sent by the Commission in July 2024, in other cases the explanations provided remain unsatisfactory. Therefore, the Commission has decided to issue a reasoned opinion to Spain, which now has two months to respond and take the necessary measures. Otherwise, the Commission may decide to refer the case to the Court of Justice of the European Union.

Commission urges Spain to prevent abusive use of fixed-term work relationships and avoid discriminatory employment conditions in the public sector
Today, the European Commission decided to send a reasoned opinion to Spain (INFR(2014)4334) for failing to sufficiently protect public sector workers against the abusive use of successive fixed-term contracts. This is contrary to EU rules (Council Directive 1999/70/EC), which require that Member States introduce, in their national law, measures to prevent and, if required, penalise abuse through successive fixed-term employment contracts. Spanish law does not include such measures for certain types of fixed-term work relationships in the public sector. Although Spain has changed its national rules after the opening of the infringement procedure in 2015 and the latest letter of formal notice

sent by the Commission in October 2024, the explanations provided remain unsatisfactory. Therefore, the Commission has decided to issue a reasoned opinion to Spain, which now has two months to respond and take the necessary measures. Otherwise, the Commission may decide to refer the case to the Court of Justice of the European Union.

Additional reasoned opinion

Commission asks Belgium to comply with EU rules on professional qualifications
The European Commission decided to send an additional reasoned opinion to **Belgium** (INFR(2018)2162) for not having properly incorporated the Professional Qualifications Directive (2005/36/EC) into national law. The Directive facilitates professional mobility and recognition of qualifications across the borders. These EU rules play an essential part in addressing the shortage of skilled labour across the EU. According to the Commission, Belgium imposes excessive language requirements for teaching professionals seeking to work in the French Community, which severely limits the possibility of foreign teachers to work in Belgium. Belgium now has two months to respond to the arguments raised by the Commission. Otherwise, the Commission may refer Belgium to the Court of Justice of the European Union.

11. Competition

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Reasoned opinion

Commission calls on Belgium to comply with its obligations under EU law as regards the recognition of State-investor arbitration awards
The European Commission decided to send a reasoned opinion to **Belgium** (INFR(2025)2199) for failing to comply with its obligations under EU law as regards the recognition of intra-EU and extra-EU State-investor arbitration awards. The arbitration awards in question oblige Spain to pay compensation to investors because of a modification of its renewable energy scheme. Spain notified the arbitration awards in question to the Commission for the necessary review according to EU State aid rules. Belgium recognised the arbitral awards with a view to their enforcement in Belgium, before the Commission assessment. This way, Belgium created an imminent risk for Spain to be forced to pay the compensation in breach of the standstill obligation of Article 108(3) TFEU and Commission Decision SA.40348 on the renewable energy scheme. The requests for recognition constitute an attempt to circumvent the State aid rules that Belgium should have opposed under the principle of sincere cooperation, as laid down in Article 4(3) of the TEU, read in conjunction with Article 108(3) of the TFEU, Decision SA.40348 and the case law of the Court of Justice on investment arbitration. The Commission sent a letter of formal notice to Belgium in December 2025. In its reply to the letter of formal notice, Belgium provided several explanations that are not sufficient to revert the Commission assessment. The Commission is therefore sending a reasoned opinion to Belgium, which now has two months to respond and take the necessary measures. In the absence of a satisfactory response, the Commission may decide to refer the case before the Court of Justice of European Union.

INF/26/720

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Related media

Installation of the banner 'Democracy, protect what matters' on the front of the Berlaymont building

Appendix 6 - RFI Observation

DIRECT PLANNING APPLICATION TO AN BORD PLEANÁLA

in respect of

Arklow Bank Wind Park Phase 2 - RFI

Bord Pleanála Case Reference: OA27.319864

Submissions on Behalf of Blue Ireland Coalition CLG

Blue Ireland Coalition CLG, Garadice House, 3-4 Fairview, Dublin 3, Ireland.

Irish Whale and Dolphin Group

Figure 3.57 A harbour porpoise swimming in Irish waters. Photo © Oriol Giralt Paradell

Porpoises under pressure in Irish waters

The ObSERVE Phase II Aerial Project Reports have recently been published by the Department of Environment, Climate and Communications, providing an important assessment of the distribution and abundance of seabirds and cetaceans in Irish waters. Extensive aerial surveys were conducted by UCC in the Summer of 2021 and the Summer and Winter of 2022, and the results analysed and modelled to produce population estimates for many coastal and offshore species.

Minister of State with responsibility for Communications and Circular Economy, Ossian Smyth said: "*The ObSERVE II Aerial Project has collected key data that has greatly improved our knowledge of the environment off the coast of Ireland. This information will help inform the way forward for future regulation and sustainable management of Ireland's maritime area in tandem with advancing the conservation of protected species, and the identification of important areas for their natural ecology and its conservation*".

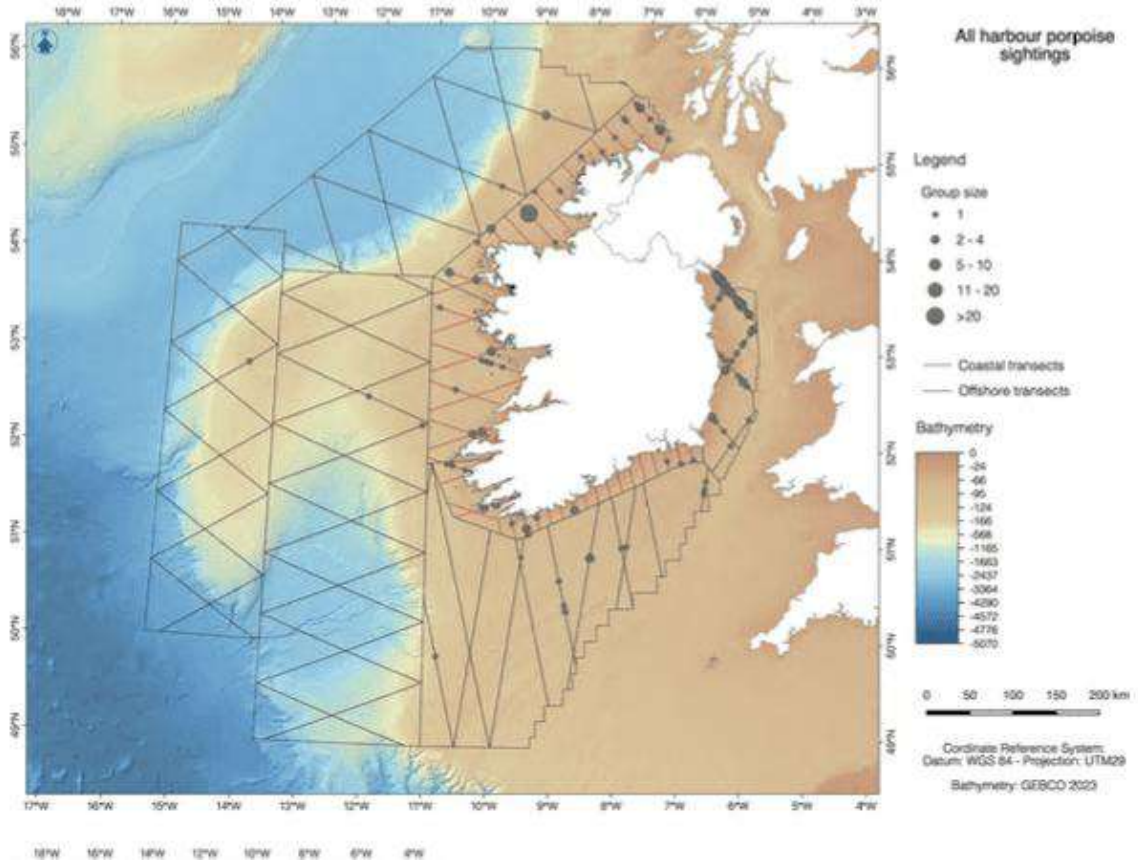


Figure 3.58: Sightings of harbour porpoise across all surveys

While data were gathered on many cetacean species, the results for harbour porpoise (*Phocoena phocoena*) were notable and most concerning. The Irish Sea, in particular the northern part, is indicated as an area of importance for these highly protected animals, and this corresponds with the results from the ObSERVE Phase I project published in 2018 based on surveys in 2015-2017. However, density estimates for harbour porpoise are much lower from the Phase II surveys, and the Celtic Sea region results show an even greater decrease in numbers: "*During Phase I of the ObSERVE programme the predicted density distribution maps also highlighted the Celtic Sea as a relatively important area for harbour porpoise, with densities of 0.227 individuals per km^2 in Summer. During Phase II, Summer densities in this region were lower at 0.035 individuals per km^2 in Summer 2021, and 0.033 individuals per km^2 in Summer 2022.*"

The IWDG first flagged decreases in the density of harbour porpoises in our inshore waters during NPWS funded Harbour Porpoise SAC surveys. Densities in all three SACs surveyed, Blasket Islands SAC and Roaringwater Bay and Islands SAC off the southwest coast and the Rockabill to Dalkey Island SAC off the east coast, all showed very significant declines in densities over the last two surveys at each site since 2014. The

fact that all three sites have shown similar declines suggests the effect is widespread and not restricted to a particular area. The IWDG thought this was likely due to a change in their distribution, driven by the availability of their preferred prey which meant they were less likely to be found within this small protected areas (SACs) and not caused by a population decline.

This downward trend in harbour porpoise numbers in the Irish Sea and Celtic Sea has been recorded in the literature since 2005, while the IWDG Cetacean Strandings Scheme has shown an increase in porpoise strandings over the same period.

Notwithstanding the uncertainty of the modelling and the general paucity of data, all of this indicates a population under pressure. Harbour porpoise, protected under both Annex II and Annex IV of the Habitats Directive, are particularly vulnerable to anthropogenic pressures. By-catch in fisheries, prey depletion, disturbance, pollution and climate change are all potential drivers for these worrying results, which must be considered in the context of the planned construction of five offshore windfarms in the Irish Sea in the coming decade. Porpoises are especially sensitive to underwater noise and in an effort to mitigate for this, other European jurisdictions apply strict limits on the noise allowed from impact piling during windfarm construction. The ObSERVE II results add urgency to the adoption of a similar precautionary approach to underwater noise in Ireland, which will be essential if we are to protect these vulnerable animals and comply with Irish and European legislation.

The full reports are available here: https://www.gov.ie/en/publication/12374-observe-programme/

Appendix 7 - RFI Observation

DIRECT PLANNING APPLICATION TO AN BORD PLEANÁLA

in respect of

Arklow Bank Wind Park Phase 2 - RFI

Bord Pleanála Case Reference: OA27.319864

Submissions on Behalf of Blue Ireland Coalition CLG

Blue Ireland Coalition CLG, Garadice House, 3-4 Fairview, Dublin 3, Ireland.

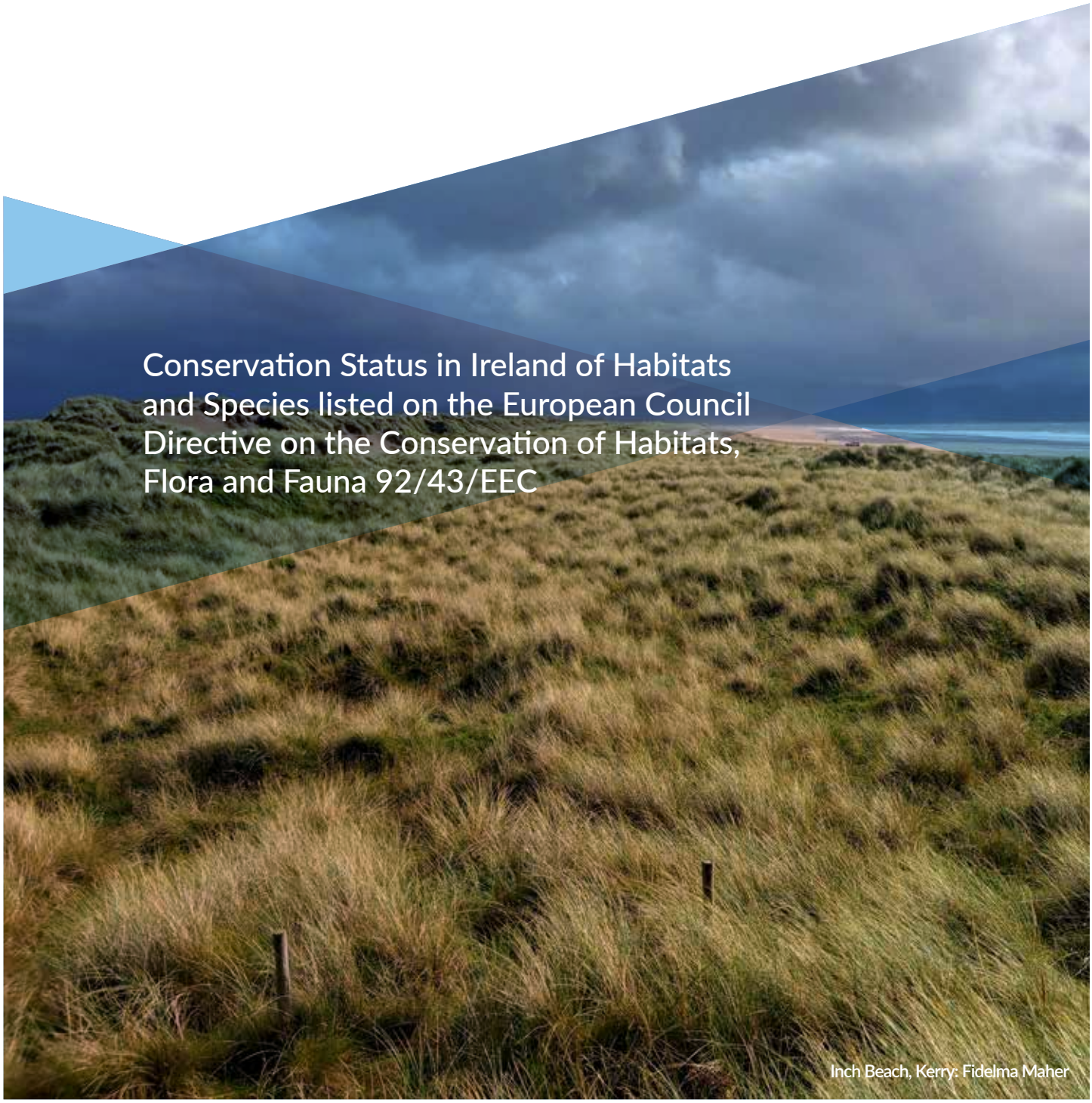
NPWS
An tSeirbhís Páirceanna Náisiúnta agus Fiadhúlra
National Parks and Wildlife Service

The Status of EU Protected Habitats and Species in Ireland

2025

The Status of EU Protected Habitats and Species in Ireland

Conservation Status in Ireland of Habitats and Species listed on the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC



Inch Beach, Kerry: Fidelma Maher

CONTENTS

Foreword 5
Contributors 6
Overview 7
Habitat summaries 11
Species summaries 43
Results 77
Conclusions 95
Appendix 99

HABITATS

1110 Sandbanks 12
1130 Estuaries 12
1140 Tidal mudflats and sandflats 13
1150 Lagoons* 13
1160 Large shallow inlets and bays 14
1170 Reefs 14
1180 Submarine structures made by leaking gases 15
1210 Drift lines 15
1220 Vegetated shingle 16
1230 Vegetated sea cliffs 16
1310 *Salicornia* mud 17
1330 Atlantic salt meadows 17
1410 Mediterranean salt meadows 18
1420 Halophilous scrub 18
2110 Embryonic shifting dunes 19
2120 Marram dunes (white dunes) 19
2130 Fixed dunes (grey dunes)* 20
2140 *Empetrum* dunes* 20
2150 Dune heath* 21
2170 Dunes with Creeping Willow 21
2190 Dune slacks 22
21A0 Machair* 22
3110 Oligotrophic isoetid lake habitat 23
3130 Slender Naiad-type lakes 23
3140 Hard water lakes 24
3150 Rich pondweed lake habitat 24
3160 Acid oligotrophic lakes 25
3180 Turloughs* 25
3260 Vegetation of flowing waters 26
3270 Chenopodion rubri 26
4010 Wet heaths 27
4030 Dry heaths 27
4060 Alpine and subalpine heath 28
5130 Juniper scrub 28
6130 Calaminarian grasslands 29
6210 Orchid-rich calcareous grassland* 29
6230 Species-rich *Nardus* grassland* 30
6410 *Molinia* meadows 30
6430 Hydrophilous tall-herb swamp 31
6510 Hay meadows 31
7110 Raised bog (active)* 32
7120 Degraded raised bogs 32
7130 Blanket bog (active)* 33
7140 Transition mires 33
7150 Rhynchosporion depressions 34
7210 *Cladium* fens* 34
7220 Petrifying springs* 35
7230 Alkaline fens 35
8110 Siliceous scree 36
8120 Calcareous scree 36
8210 Calcareous rocky slopes 37
8220 Siliceous rocky slopes 37
8240 Limestone pavement* 38
8310 Caves 38
8330 Sea caves 39
91A0 Old oak woodland 39
91D0 Bog woodland* 40
91E0 Alluvial woodland* 40
91J0 Yew woodland* 41

SPECIES

6985 Killarney Fern (*Vandenboschia speciosa*) 44
1528 Marsh Saxifrage (*Saxifraga hirculus*) 44
1833 Slender Naiad (*Najas flexilis*) 45
6216 Shining Sickle Moss (*Hamatocaulis vernicosus*) 45
1395 Petalwort (*Petalophyllum ralfsii*) 46
1376 Maërl (*Lithothamnion corallioides*) 46
1377 Maërl (*Phymatholithon calcareum*) 46
1400 White Cushion Moss (*Leucobryum glaucum*) 47
1409 *Sphagnum* genus (*Sphagnum* spp.) 48
1413 *Lycopodium* group (*Lycopodium* spp.) 48
1378 *Cladonia* (*Cladina* morphotype) species 48
1013 Geyer's Whorl Snail (*Vertigo geyeri*) 49
1014 Narrow-mouthed Whorl Snail (*Vertigo angustior*) 49
1016 Desmoulin's Whorl Snail (*Vertigo moulinsiana*) 50
1024 Kerry Slug (*Geomalacus maculosus*) 50
1029 Freshwater Pearl Mussel (*Margaritifera margaritifera*) 51
1092 White-clawed Crayfish (*Austropotamobius pallipes*) 51
1065 Marsh Fritillary (*Euphydryas aurinia*) 52
1095 Sea Lamprey (*Petromyzon marinus*) 52
1096 Brook Lamprey (*Lampetra planeri*) 53
1099 River Lamprey (*Lampetra fluviatilis*) 53
5046 Killarney Shad (*Alosa killarnensis*) 54
1103 Twaite Shad (*Alosa fallax*) 54
5076 Pollan (*Coregonus pollan*) 55
1106 Atlantic Salmon (*Salmo salar*) 55
6284 Natterjack Toad (*Epidalea calamita*) 56
1213 Common Frog (*Rana temporaria*) 56
1223 Leatherback Turtle (*Dermochelys coriacea*) 57
1303 Lesser Horseshoe Bat (*Rhinolophus hipposideros*) 57
1309 Common Pipistrelle (*Pipistrellus pipistrellus*) 58
5009 Soprano Pipistrelle (*Pipistrellus pygmaeus*) 58
1317 Nathusius' Pipistrelle (*Pipistrellus nathusii*) 59
1322 Natterer's Bat (*Myotis nattereri*) 59
1314 Daubenton's Bat (*Myotis daubentonii*) 60
1330 Whiskered Bat (*Myotis mystacinus*) 60
1326 Brown Long-eared Bat (*Plecotus auritus*) 61
1331 Leisler's Bat (*Nyctalus leisleri*) 61
1334 Mountain Hare (*Lepus timidus*) 62
1355 Otter (*Lutra lutra*) 62
1357 Pine Marten (*Martes martes*) 63
1364 Grey Seal (*Halichoerus grypus*) 63
1365 Harbour Seal (*Phoca vitulina*) 64
1345 Humpback Whale (*Megaptera novaeangliae*) 64
1349 Common Bottlenose Dolphin (*Tursiops truncatus*) 65
1350 Short-beaked Common Dolphin (*Delphinus delphis*) 65
1351 Harbour Porpoise (*Phocoena phocoena*) 66
2027 Killer Whale (*Orcinus orca*) 66
2029 Long-finned Pilot Whale (*Globicephala melas*) 67
2030 Risso's Dolphin (*Grampus griseus*) 67
2031 White-sided Dolphin (*Lagenorhynchus acutus*) 68
2032 White-beaked Dolphin (*Lagenorhynchus albirostris*) 68
2034 Striped Dolphin (*Stenella coeruleoalba*) 69
2035 Cuvier's Beaked Whale (*Ziphius cavirostris*) 69
2038 Sowerby's Beaked Whale (*Mesoplodon bidens*) 70
2618 Minke Whale (*Balaenoptera acutorostrata*) 70
2621 Fin Whale (*Balaenoptera physalus*) 71
5020 Blue Whale (*Balaenoptera musculus*) 71
2624 Sperm Whale (*Physeter macrocephalus*) 72
5033 Northern Bottlenose Whale (*Hyperoodon ampullatus*) 72
2619 Sei Whale (*Balaenoptera borealis*) 73

VAGRANTS

1348 Northern Right Whale (*Eubalaena glacialis*) 74
2028 False Killer Whale (*Pseudorca crassidens*) 74
2037 True's Beaked Whale (*Mesoplodon mirus*) 74
2622 Pygmy Sperm Whale (*Kogia breviceps*) 74
5029 Beluga/White Whale (*Delphinapterus leucas*) 75
5034 Gervais' Beaked Whale (*Mesoplodon europaeus*) 75
1102 Allis Shad (*Alosa alosa*) 75
1320 Brandt's Bat (*Myotis brandtii*) 75
1304 Greater Horseshoe Bat (*Rhinolophus ferrumequinum*) 75

Dooey, Donegal: Fidelma Maher

FOREWORD

by Christopher O'Sullivan T.D.

MINISTER FOR NATURE, HERITAGE AND BIODIVERSITY

This fourth national report on the status of habitats and species protected under the EU Habitats Directive provides the most detailed, up-to-date assessment of Ireland's progress in meeting our legal obligations to nature. The report has found that 90% of habitats remain in Unfavourable status, with half showing ongoing declines.

Given the huge efforts to turn the tide on biodiversity loss in recent years, these will be disappointing findings for many – but we cannot lose hope. Instead, we must be heartened by the huge effort underway across all corners of the country to protect and restore our natural world and remind ourselves of the need for patience. While nature can bounce back quickly, the recovery of habitats and species to the high standards set out in the Habitats Directive can take time.

We must also redouble our commitment to nature: continuing investment, strengthening collaboration and improving delivery as we strive to stop the loss of biodiversity and move towards a future where it is protected and restored.

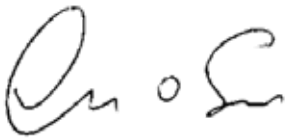
It is important to note the positive signs, too. The majority of species are assessed as being in Favourable status, with stable or improving trends for seals, Pine marten and Marsh fritillary, as well as several plant, bat, whale and dolphin species. Ireland is a European stronghold for these species, and we must not lose sight of the importance of our role as we continue to protect them.

We've also seen a landmark achievement with the recent increase in the area of Active Raised Bog, the first positive indicator for this globally important habitat since monitoring began in 2005. Thanks to both NPWS-led programmes and partnerships with BnM and local communities, we are seeing real progress in recovery. Indeed, Ireland is demonstrating how community-led, landscape-scale restoration can support a wide range of habitats, with initiatives like LIFE IP Wild Atlantic Nature, Waters of LIFE and LIFE on Machair leading the way at the interface of local action for national biodiversity goals across peatlands, uplands and coastal habitats.

Furthermore, we are making every effort to incorporate biodiversity into our agriculture, forestry and water policies, with significant resources committed under the Agri-Climate Rural Environment Scheme, the Forestry Programme 2023–2027 and the Water Action Plan 2024. These cross-sectoral initiatives will be instrumental in addressing many of the root causes of habitat decline, particularly in our freshwater and marine environments.

One of the most positive developments since the last reporting cycle has been the strengthening of our National Parks and Wildlife Service (NPWS). With a significant increase in staffing since 2020 and renewed strategic direction, NPWS is now better placed than ever to deliver on its core mandate of protecting Ireland's wildlife and overseeing the implementation of national and EU biodiversity policy. We are also investing in State-owned land and strategic acquisitions that allow for swifter delivery of conservation outcomes, while the expansion of restoration programmes and the ongoing implementation of conservation actions across Natura 2000 sites are all contributing towards improvements in habitat quality.

While many pressures on nature remain persistent, notably nutrient pollution, invasive and problematic species and the legacies of drainage and land-use change, I believe we are at a pivotal moment for nature. Looking ahead, the next reporting cycle will coincide with the implementation of the EU Nature Restoration Law, which sets legally binding targets for restoring degraded habitats, including the ones assessed in this report. To deliver on this, the NPWS is developing new ways of working with its colleagues across Government and the wider public service, growing new partnerships with communities, and working hard to build trust with farmers, fishermen and foresters. While the findings in this report may be sobering, I am optimistic that we are up for the challenge of bringing Ireland into a new era of biodiversity conservation where people and nature thrive together.



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ADDITIONAL DATA
Additional data were derived from many sources and are listed in detail in Volumes 2 and 3.

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OVERVIEW

Killarney Woodland: Nicolas Raymond

OVERVIEW

INTRODUCTION

The EU Directive on the conservation of Habitats, Flora and Fauna (92/43/EEC), commonly known as "the Habitats Directive", was adopted in 1992, came into force in 1994 and was first transposed into Irish law in 1997. The main aim of the Habitats Directive is to contribute towards the conservation of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favourable conservation status. These annexes list habitats (Annex I) and species (Annexes II, IV and V) which are considered threatened in the EU territory. The listed habitats and species represent a considerable proportion of biodiversity in Ireland and the Directive itself is one of the most important pieces of legislation governing the conservation of biodiversity in Europe.

Under Article 11 of the Directive, each member state is obliged to undertake surveillance of the conservation status of the natural habitats and species in the Annexes and under Article 17, to report to the European Commission every six years on their status and on the implementation of the measures taken under the Directive. In August 2025, Ireland submitted the fourth assessment of conservation status for 59 habitats and 60 species (including three overview assessments of species at a group level). A further eight species are considered to be vagrant in Ireland.

THE LISTED HABITATS AND SPECIES

Annex I: Habitat types whose conservation requires the designation of Special Areas of conservation. Ireland hosts 16 Priority habitats, i.e. habitats which are considered to be in danger of disappearing within the EU territory.

Annex II: Animal and plant species whose conservation requires the designation of Special Areas of Conservation

Annex IV: Animal and plant species in need of strict protection.

Annex V: Animal and plant species whose taking in the wild and exploitation may be subject to management measures.

To assist with the identification of the listed habitats in the Directive, the EU Commission publishes an *Interpretation Manual of European Union Habitats*[1]. The habitats that occur in Ireland are a good representation of Ireland's semi-natural and natural habitats covering marine, freshwater, peatland, grassland and woodland habitats.

Ireland is a stronghold for many of the species listed in the Annexes. Some species suffered past exploitation, e.g. cetaceans; others, e.g. Freshwater Pearl Mussel (*Margaritifera margaritifera*), require pristine water quality and are therefore good indicators of habitat quality.

DEFINITIONS OF CONSERVATION STATUS

The conservation status of a habitat is defined in Article 1 of the Directive as the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species. The conservation status of a natural habitat will be taken as favourable when:

- its natural range and areas it covers within that range are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The conservation status of a species is defined as the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within the territory of the member states. The conservation status of a species will be taken as favourable when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

HOW CONSERVATION STATUS IS ASSESSED

Conservation status is assessed at a national level, not just in Special Areas of Conservation.

Guidelines for assessing the conservation status of habitats and species were updated in 2023 by the European Topic Centre on Biological Diversity (ETC/BD), in conjunction with the Member States represented on the Expert Reporting Group under the Nature Directives[2].

[1] Commission of the European Communities. 2013 Interpretation Manual of European Union Habitats, version EUR 28. DG-Environment – Nature and Biodiversity. Brussels. Commission of the European Communities.

[2] http://cdr.eionet.europa.eu/help/habitats_art17

The assessment brings together information on four parameters for habitats and species:

HABITAT	SPECIES
Range	Range
Area	Population
Structure & Functions	Habitat for the species
Future Prospects	Future Prospects

Favourable Reference Values are set as targets against which current values are judged. These reference values should be at least equal to the value when the Directive came into force unless this value is not deemed to be enough to ensure the long-term survival of the habitat or species being assessed.

Favourable Reference Value for *Range* is the total geographical area within which all significant ecological variations of the habitat or species are included, and which is sufficiently large to allow the long-term survival of the habitat or species. Favourable Reference Values for habitat *Area* and species *Population* are the minimum required for the long-term survival of the habitat or species in question.

For habitats, the assessment of *Structure and Functions* includes an assessment of the condition and the typical species that characterise the habitat.

For species, the extent and quality of suitable habitat is assessed to determine whether the long-term survival of the species is assured.

Conservation measures undertaken for Annex I habitats, Annex II and V species are listed. The major pressures and threats are also listed for each habitat and species. The impacts of these pressures, threats and measures are used to determine the *Future Prospects*.

The rate of loss or the distance away from Favourable Reference Values are used to determine whether a parameter is Favourable, Unfavourable-Inadequate, Unfavourable-Bad or Unknown following a rules-based approach (see the 2023 guidelines for full details). For a Favourable *Overall Assessment* all parameters must be assessed as Favourable (with one Unknown acceptable); if any one of the parameters is assessed as Unfavourable-Bad, the Overall Assessment is also Unfavourable-Bad; any other combination results in an Unfavourable-Inadequate Overall Assessment. The Overall trend is derived from the trends for Range, Area and Structure and Functions for habitats; and Range, Population and Habitat for species, following a rules-based approach.

THE MAJOR CHANGES TO THE CURRENT REPORTING GUIDELINES

The main change in the current reporting guidelines compared to 2019 is how species population estimates for vertebrate and vascular plants are derived. These estimates are now based on the number of mature individuals rather than at a 1 km^2 grid cell level. Additional detail is now required for Habitat for the Species with a view to determining the sufficiency of both the area and quality of occupied habitat by species for their long-term survival.

The standardised list of pressures and threats has been updated and compiled into categories that better reflect the major sectoral drivers of change. The list of conservation measures has been updated to reflect the pressures that need to be addressed. Conservation measures are now required for Annex V species and not just Annex II and Annex IV species. The trend for area of habitat in good condition within Special Areas of Conservation is estimated to determine the contribution of this network towards achieving Favourable Conservation Status.

Research and survey have led to a better understanding of the distribution and ecology of many habitats or species and in some cases, this has led to a refinement of targets, reduced the number of unknowns, and potentially a change of status.

Changes between assessments in 2007, 2013 and 2019 can be explained by a combination of improved knowledge, changes in the assessment methodology and, where relevant, by genuine change.

NOTE ON MAPS

The maps presented in this report give the known or best estimate of distribution, illustrated as dark pink squares (either 10 km or 50 km grids). The *Range* is drawn as an envelope around the distribution using a standardised procedure. Horizontal or vertical gaps in the habitat distribution of 3 or more grid squares or oblique gaps of 2 or more squares are deemed enough to justify a break in the range. Where ecological conditions for the development of the habitat are deemed unsuitable, gaps of just 1 grid square may also be permitted.

The maps are derived using an Irish National Grid coordinate reference system projection for terrestrial assessments and a LAEA (Lambert Azimuthal Equal-Area ETRS89) coordinate reference system projection for offshore marine assessments. All maps were transformed to the LAEA projection as part of the EU submission; transformations are not displayed as part of this report as they are not the best representation of the distribution data for Ireland.

All maps produced in this report are licenced by Tailte Éireann – Surveying (Licence number CYAL50446484).

WHO CARRIED OUT THE ASSESSMENTS?

The conservation assessments were carried out by staff of the National Parks and Wildlife Service (NPWS) of the Department of Housing, Local Government & Heritage and Inland Fisheries Ireland (IFI) of the Department of Climate, Energy and Environment (DCEE), in conjunction with external experts. Contributors are listed in the Acknowledgements section.

WHERE DID THE DATA COME FROM?

The data which informed the conservation assessments were collated from a number of sources, primarily from scientific monitoring programmes commissioned by NPWS and DCEE (including IFI). Additional data were sourced from, inter alia, local authority biodiversity data sets, the Environmental Protection Agency and Department of Agriculture, Food and the Marine. The National Biodiversity Data Centre provided supplementary distribution data for some species. Scientific publications were also reviewed to capture relevant academic data.

WHAT THIS PUBLICATION PRESENTS

This publication provides a synopsis for each of the listed habitats and species occurring in Ireland (please note a shortened version of the official habitat name has been given). This publication also presents a map of the known distribution and range for each habitat and species and an overview of the assessment results. Summary statistics of the national dataset are presented in the Results section. It is often difficult to provide a high-level meaningful narrative on the impact of pressures on the status of habitats and species, particularly for the diverse list of species. If more specific detail is required, the detailed assessments and associated references for habitats and species collated in Volumes 2 and 3 respectively can be consulted; these volumes are available for download on the NPWS website[3]. Finally, the publication draws conclusions and indicates conservation priorities for the next 5 years and beyond.

WHERE HAVE THE DATA BEEN SUBMITTED?

The data have been submitted to the ETC/BD. A summary report for biogeographic regions within the EU will be published in conjunction with the European Environment Agency.

WHAT WILL THE DATA BE USED FOR?

These data will be used to assess progress with targets under Ireland's National Biodiversity Plan[5], the EU Biodiversity Strategy and the Global Biodiversity Framework for the Convention on Biological Diversity[6]. The data will inform the objectives set for the Natura network. The assessment results will inform the drafting of the National Restoration Plan, which prioritises the work needed in Natura sites and the wider countryside over the next 5-25 years.

[3] http://npws.ie/publications/article17assessments/
[4] https://www.npws.ie/sites/default/files/files/4th_National_Biodiversity_Action_Plan.pdf
[5] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52020DC0380
[6] https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.pdf

HABITATS

Active Raised Bog: Fernando Fernandez

1110 SANDBANKS

The EU interpretation manual describes 'Sandbanks which are slightly covered by seawater all the time' as permanently submerged sandbanks where the water depth is seldom more than 20 m Below Chart Datum (BCD). In Irish waters this habitat, where it occurs, is comprised of distinct banks (i.e. elongated, rounded or irregular 'mound' shapes) that may arise from horizontal or sloping plains of sediment that range from gravel to fine sand. They are primarily composed of sandy sediments permanently covered by water, at depths of less than 20 m BCD, though the banks may extend to water depths greater than 20 m.

The diversity and types of community associated with this habitat are determined particularly by sediment type together with a variety of other physical, chemical and hydrographical factors. Near-shore hydrodynamics have been identified as a major control on sandbank morphology and coastal configuration. There are currently 19 identified sandbank features in Ireland.

Sandbank habitats in Irish waters are predominantly composed of a fine sand community typified by the presence of the polychaete worm *Nephtys cirrosa*. These habitats commonly record a range of species including crustaceans (*Bathyporeia elegans, Urothoe brevicornis, Pontocrates altamarinus, Pisidia longicornis*), polychaetes (*Polygordius lacteus, Saccocirrus papillocercus*, *Pisione remota, Nephtys cirrosa, Magelona mirabilis, Eumida bahusiensis, Nephtys longosetosa, Spiophanes bombyx, Glycera lapidum*) and molluscs *(Donax vittatus, Fabulina fabula*). These species are adapted to mobile substrates that are a consequence of dynamic coastal environments in ireland. All of the noted species recorded in Irish waters are also frequently found in similar shallow coastal sediment habitats. Sandbanks with a significant proportion of coarse sediment are also present, e.g. Hempton's Turbot Bank.

No significant pressures were identified as having an adverse effect on this habitat. The Overall Status is assessed as *Favourable* with a stable trend, as in the previous reporting period.

MERC

OVERALL STATUS: FAVOURABLE

1130 ESTUARIES

The EU interpretation manual describes Estuaries as the downstream part of a river valley, subject to the tide and extending from the limit of brackish waters. Estuaries are coastal inlets where there is generally a significant freshwater influence but the salinity can be highly temporally variable. Estuaries are an extremely diverse and dynamic habitat and play a major role in maintaining the health of coastal ecosystems. They support a mosaic of other habitats depending on their geomorphology and hydrology. Boulder and cobble beds frequently fringe the margins of estuaries, especially further upstream, and intertidal mudflats are often associated with the margins of estuaries where the tidal influence allows slowing of riverine flow which allows deposition of sediment.

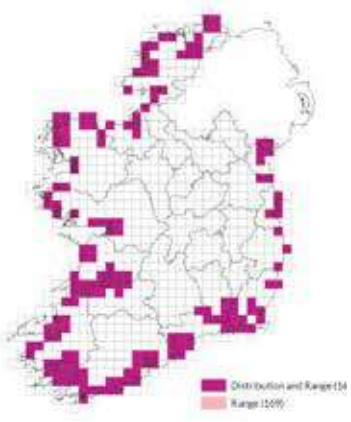
One of the most important factors in the prevailing estuarine conditions is the degree of fresh and saltwater mixing and the rate at which this mixing occurs. Mixing is influenced by the volume and flow rate of the outflowing river but also by wind waves, tidal forces, temperature and the salinity of the surrounding waters. Turbidity is a natural feature of most estuaries, particularly those formed at the mouth of larger catchments.

The range of Marine Community Types (MCT) found within estuaries is quite variable across Ireland. The most prevalent community in this habitat is the Mud to fine sand community, where a third of the national resource of this community is within the Lower River Shannon SAC. The next most prevalent MCT habitat, recognised at around 30% of Estuaries, is Fine sand to sand.

Additional Annex I habitats such as Reefs (1170) and Sandbanks (1110) are also found within this habitat. Estuarine habitats also form a significant resource for various bird and mammal species for feeding, breeding and resting.

Pressures impacting the habitat include increased nutrient enrichment from a range of sources, and disturbance due to fishing activities. The Overall Status of the habitat has been assessed as *Bad*, but this change from Inadequate in 2019 is due to improved knowledge rather than genuine change, and the trend is assessed as stable.

MERC



OVERALL STATUS: BAD

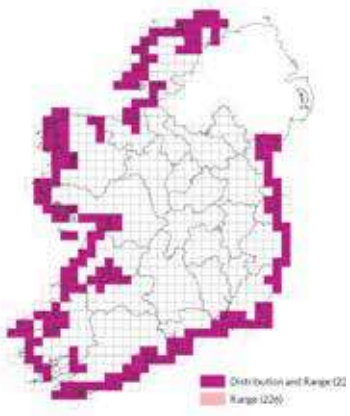
1140 TIDAL MUDFLATS AND SANDFLATS

Tidal mudflats and sandflats are comprised of the intertidal section of the coastline where sands and muds dominate. They are dynamic ecosystems, dependent on the balance of natural accretion and erosion. The fundamental building block of this habitat is sediment ranging from around 1 µm to 2 mm. The finer silt and clay sediments are dominant in mudflats and the larger sand fractions are associated with areas exposed to significant wave energy. The fine sediment of intertidal mudflats is most often associated with river deposition. The limit of tidal ingress often coincides with the beginning of flanking mudflat habitats. The competing forces of seaward-flowing freshwater meeting the flooding tide reduces net flow velocity, and consequently the carrying capacity for sediment, leading to deposition. Coarser intertidal sediment is more often found on open coasts.

The types of biological communities found in mudflats and sandflats are quite variable across Ireland. The most prevalent community identified was the Mud to fine sand community. 44% of the national resource of this community was within Lower River Shannon SAC. The next most prevalent broad community type recognised at around 40% of the habitat resource was Fine sand to sand community, and again the largest proportion of the national resource of this community was within Lower River Shannon SAC. The most abundant macrofaunal species in this habitat are burrowing bristle worms and bivalves. The only vascular plant associated with this habitat is the mainly intertidal eelgrass *Zostera noltei* and this species is found within a number of SACs.

The main pressure on Tidal mudflats and sandflats is nutrient enrichment of enclosed bays with poor mixing, due mainly to diffuse pollution as a result of agricultural and forestry activities and wastewater discharges. The Overall Status of the habitat is *Inadequate*, as in 2019. The trend has changed from deteriorating to stable due to more accurate data rather than a genuine change.

MERC



OVERALL STATUS: INADEQUATE =

1150 LAGOONS*

Lagoons are expanses of coastal salt water, of varying salinity, which are wholly or partially separated from the sea. There are five morphological lagoon types in Ireland and, with the exception of karst lagoons, which are confined to the mid-west and rock/peat lagoons to the west and north-west, they occur all around the coast. The type of lagoon may determine the typical species found within it.

Artificial lagoons are the most common type, numerically, and represent one third of the habitat area. The classic 'sedimentary' lagoons with a sedimentary barrier represent the highest proportion of the habitat area. These may or may not have a permanent tidal inlet but more than half have a barrier of cobbles rather than sand or shingle; this is considered unusual in Europe.

Nineteen lagoons are referred to as 'rock/peat' lagoons. These lagoons, found on the west coast, are high-salinity lagoons with rock barriers similar to the Scottish 'obs' and are a particularly unusual type of lagoon in European terms. Eleven relatively small lagoons are referred to as 'karst' lagoons and are found in the limestone areas of Counties Clare and Galway. They may have a permanent tidal inlet and even a cobble barrier, but many are some distance from the sea with no visible connection to it. All receive both fresh and seawater through subterranean fissures in the bedrock. Finally, six lagoons are referred to as 'saltmarsh' lagoons; these are much like very large, permanent saltmarsh pools.

The typical species are the Beaked Tasselweed (*Ruppia maritima*), stoneworts (*Chara canescens, Chara baltica*, *Chara connivens* and *Lamprothamnium papulosum*) and the Baltic Prawn (*Palaemon adspersus*). However, many species typical of euryhalic environments occur.

Key pressures on lagoons include nutrient enrichment, hydrological alterations and drainage. *Spartina* sp. and *Sargassum muticum* were recorded in field observations but they are not considered to represent a threat at a national level at this time. The Overall Status for Lagoons is assessed as *Bad* with a deteriorating trend, unchanged since the 2019 assessment.

Aquafact International Services

OVERALL STATUS: BAD ▼

1160 LARGE SHALLOW INLETS AND BAYS

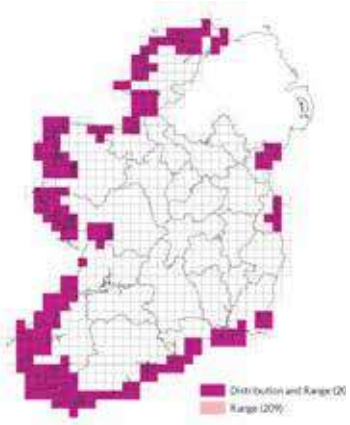
Large shallow inlets and bays are indentations of the coast where, in contrast to estuaries, the influence of freshwater is generally limited or reduced. They are typically shallower and more sheltered than open coasts. They vary widely in habitat and species diversity depending on their location, exposure, geology and sediment composition, which determine their constituent habitat communities.

The three most prevalent sediment communities include: Fine sand to sand community, Mud to fine sand community, and Muddy sands/sandy muds community. The remainder of this habitat is variously composed of hard substrate communities including geogenic subtidal and intertidal reef and sea caves. Geogenic intertidal reef dominates a high proportion of the landward margins of the habitat, especially on the west coast of Ireland. Depending on exposure, intertidal reef habitats are characterised by sheltered fucoid-dominated shores to exposed mussel (*Mytilus edulis*) and barnacle-dominated shores. Biogenic reef habitats formed from mussels and the honeycomb worm (*Sabellaria alveolata*) are also present in the intertidal areas of this habitat. Subtidal reef is also found throughout the habitat and is characterised by bedrock or cobble and boulder fields. Submerged or partially submerged sea caves are common around the coast of Ireland and host a range of distinct communities which vary considerably from the surrounding reef habitats.

A significant proportion of keystone species are found within the boundaries of Large shallow inlets and bays including Maërl and eelgrasses. A number of rare and/or unusual species also occur in this habitat including the rare anemones *Edwardsia delapiae* and *Pachycerianthus multiplicatus, and* sensitive subtidal species such as *Neopentadactyla mixta, Sabella pavonina, Virgularia mirabilis* and *Limaria hians*. The habitat also forms an important resource for various bird and mammal species for feeding, breeding and resting.

Pressures on the habitat include fish and shellfish harvesting and cultivation activities causing physical loss and disturbance of seafloor habitats, nutrient enrichment, dredging and invasive alien species. The Overall Status is assessed as *Bad* and deteriorating, the same assessment as reported in 2019.

MERC



OVERALL STATUS: BAD

1170 REEFS

Reefs are widespread marine features with immobile hard substrates available for colonisation by epifauna. Reef habitat in Irish waters ranges from the intertidal to 4,500 m below the sea surface and out to the 200 nautical miles limit. Factors influencing this habitat include tidal immersion, influence of freshwater, variation in temperature, desiccation, exposure to waves, stability of substrate, and weathering of substrate.

Intertidal reef is usually dominated by algae which provide shade and structure for a wide range of species. Subtidal reefs are largely found in exposed areas. With increasing depth less light penetrates, the prevalence of kelp and red algae reduces, and faunal communities composed of benthic sponge and anemones begin to dominate. A notable type of reef habitat is that generated by the habitat-forming accretions of animals. These biogenic reefs increase the structural complexity beyond the surrounding areas and usually result in greater biodiversity. In the inshore, these may be formed by the protective structures of worms, and in the offshore, by stony deep-water coral species. On the Rockall Bank, a highly unusual accumulation of living and dead sponges forming a complex habitat was found. These areas of potential 'sponge reef' formations are very rare and have previously only been recorded in Canadian waters.

In Mulroy Bay, Ireland's only sheltered reef, unusual species such as sponges *Dercitus bucklandi*, *Stelletta grubii*, undescribed species of *Polymastia* and the anthozoan *Parerythropodium coralloides* occur. In Kilkieran Bay an unusual sponge and ascidian community occurs characterised by the sponges *Esperiopsis fucorum*, *Haliclona simulans*, *Myxilla incrustans*, *Polymastia mamillaris*, among others, and ascidians *Ascidiella aspersa*, *Ascidia mentula*, *Ciona intestinalis*, *Corella parallelogramma* and *Dendrodoa grossularia*.

The main pressures on reefs come from fishing methods that damage the seafloor and can cause permanent loss to the keystone communities. The Overall Status of the habitat is *Bad*. The change in status from Inadequate in 2019 is mainly attributed to more accurate data becoming available.

MERC

OVERALL STATUS: BAD

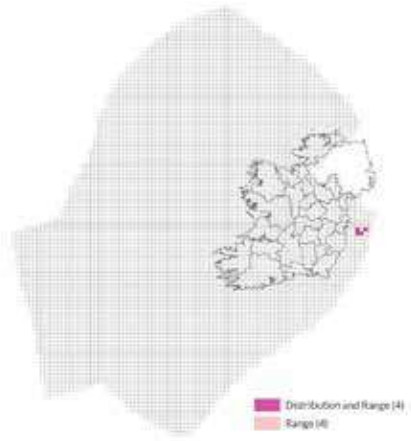
1180 SUBMARINE STRUCTURES MADE BY LEAKING GASES

This marine habitat feature is defined as submarine structures consisting of sandstone slabs, pavements, and pillars up to 4 m high, formed by the aggregation of carbonate cement resulting from microbial oxidation of gas emissions, mainly methane. The formations are interspersed with gas vents that intermittently release gas. These formations support a zonation of diverse benthic communities consisting of invertebrate specialists of deeper water of hard marine substrates different from that of surrounding habitat. Sheltering fauna within the caves and interstices further contribute to the biodiversity of the habitat. A variety of sublittoral topographic features are included in this habitat such as overhangs, vertical pillars and stratified leaf-life structures with numerous indentations.

Surveys on this habitat feature noted that on the large rocks and boulders, dense clusters of the anemone *Metridium senile* occur. Dense beds of hydroids, including *Nemertesia* spp., *Hydrallmania falcata* and *Tubularia indivisa*, are widely recorded, particularly along the edge of features. A wide variety of anemones occur; these include the cerianthid *Cerianthus lloydii* on soft overlying sediment, and among others, *Alcyonium digitatum, Sagartia elegans, Urticina felina*, and *Actinothoe sphyrodeta* on harder ground, principally on pavement areas. In the crevices, overhangs and between rocks, the edible crab *Cancer pagurus* is very abundant, while squat lobsters *Munida* sp. and *Homarus gammarus* lobsters also occur. A variety of sponges, including the boring sponge *Cliona celata* and the lace sponge *Clathrina coriacea* are present, as is the bryozoan *Flustra foliacea*. The feather star *Antedon bifida* is commonly seen in the crevices and under overhangs. The fish species recorded included *Trisopterus luscus* (Bib) and *Chirolophis ascanii* (Yarrell's Blenny). None of these species would typically occur in the surrounding habitat of mobile sand.

The main pressure on this habitat comes from marine fish and shellfish harvesting activities, which cause physical loss and disturbance of seafloor habitats. The Overall Status of this habitat is assessed as *Favourable* with a stable trend, as in 2019.

NPWS



OVERALL STATUS: FAVOURABLE

1210 DRIFT LINES

Drift lines occur on sandy or shingle substrate at the upper part of the strand, around the high tide mark. Water-borne material including organic matter is deposited on the shore and provides nutrients and a seed source for vegetation. The vegetation predominantly consists of annual species, such as oraches (*Atriplex* spp.), Sea Rocket (*Cakile maritima*) and Prickly Saltwort (*Salsola kali*), which are highly specialised to deal with the harsh conditions of high salinity, wind exposure and drought. This habitat is generally very species-poor and fragmented, and tends not to occupy large areas due to its narrow, linear nature. It exists in a state of instability and may be absent in some years due to natural and/or anthropogenic causes. In Ireland, the habitat includes drift line vegetation on sandy substrates as well as drift line vegetation on shingle.

The Overall Status is assessed as *Inadequate* due to pressures associated with activities such as recreation and coastal defences, which can interfere with sediment dynamics, and the fact that the current area is still below the favourable reference area. This assessment is unchanged since 2019. However, the trend is now stable, an improvement since the 2019 report, as there were no significant losses of habitat due to anthropogenic activity.

Jim Martin

OVERALL STATUS: INADEQUATE

1220 VEGETATED SHINGLE

Vegetated shingle occurs along the coast where shingle (cobbles, pebbles, and gravel ≥2 mm wide) has accumulated to form elevated ridges or banks above the high tide mark. On the upper beach the pioneer community of this vegetation type can be characterised by perennial species such as Sea Beet (*Beta vulgaris* subsp. *maritima*), Sea-kale (*Crambe maritima*), Rock Samphire (*Crithmum maritimum*), Yellow Horned-poppy (*Glaucium flavum*), Sea Radish (*Raphanus raphanistrum* subsp. *maritimus*), Sea Campion (*Silene uniflora*), and Sea Mayweed (*Tripleurospermum maritimum*). The majority of the area within this pioneer community is usually bare shingle. At the top of the beach and moving inland, a wider range of vegetation types can be found at larger shingle sites, including a lichen-rich community and coastal forms of grassland, heath and scrub. The grassland community can be characterised by grass species such as bents (*Agrostis* spp.), False Oat-grass (*Arrhenatherum elatius*) and Cock's-foot (*Dactylis glomerata*), and broadleaf herbs such as Yarrow (*Achillea millefolium*), Thrift (*Armeria maritima*), Wild Carrot (*Daucus carota*) and Autumn Hawkbit (*Scorzoneroides autumnalis*), among other species. The scrub community is characterised by the woody species Honeysuckle (*Lonicera periclymenum*), Blackthorn (*Prunus spinosa*), Bramble (*Rubus fruticosus*), Gorse (*Ulex europaeus*) and the climber Hedge Bindweed (*Calystegia sepium*). The majority of the grassland and scrub communities are rooted within soil, whereas the pioneer community is usually rooted in gravel, sand or organic matter, such as decomposing seaweed and other plant material.

Pressures on vegetated shingle include activities causing habitat loss (e.g., rock armour, parking areas, shingle extraction, spread of invasive and problematic native species) as well as pressures that affect the structure of the habitat, such as recreational walking/trampling. The Overall Status assessment remains *Inadequate*, as in 2019, but the trend is now deteriorating, rather than stable, due to area losses.

Emmi Virkki

OVERALL STATUS: INADEQUATE

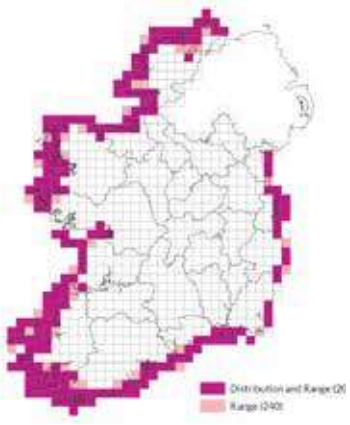
1230 VEGETATED SEA CLIFFS

All sea cliffs on the Irish coast can be considered to correspond to the EU Annex I habitat Vegetated sea cliffs of the Atlantic and Baltic coasts (1230). A sea cliff is a steep or vertical slope located on the coast, the base of which is in either the intertidal or subtidal zone. Hard cliffs, composed of hard rock such as basalt, are at least 5 m high, while soft cliffs, composed of softer substrates such as shale or boulder clay, are at least 3 m high. Sea cliff habitat covers approximately 20% of the coastline of Ireland and is primarily distributed along the southern, western and north-western seaboards. The cliff top is generally defined by an obvious reduction in gradient, with the slope below shaped by coastal erosion and the area above often formed by inland geomorphic processes. Both the cliff and cliff top are subject to maritime influence in the form of salt spray and exposure to coastal winds.

Vegetated sea cliffs support a range of plant communities including scrub, heath, grassland, and maritime annual vegetation. Typical species include Rock Samphire (*Crithmum maritimum*), Thrift (*Armeria maritima*), sea-lavenders (*Limonium* spp.), Common Scurvygrass (*Cochlearia officinalis*), Sea Plantain (*Plantago maritima*), Red Fescue (*Festuca rubra*), Sea Spleenwort (*Asplenium marinum*), Rock Sea-spurrey (*Spergularia rupicola*), Golden-samphire (*Limbarda crithmoides*), English Stonecrop (*Sedum anglicum*), Roseroot (*Rhodiola rosea*), Tree-mallow (*Malva arborea*), Spring Squill (*Scilla verna*) and Ling (*Calluna vulgaris*).

The key pressures identified in this reporting period include construction and quarrying, damage from tourism activities, natural erosion and invasive species. The Overall Status remains *Inadequate* with a stable trend, unchanged from 2019.

Orla Daly



OVERALL STATUS: INADEQUATE

1310 *SALICORNIA* MUD

'*Salicornia* and other annuals colonising mud and sand' is a pioneer saltmarsh community that may occur on muddy sediment seaward of established saltmarsh, or form patches within other saltmarsh communities where the elevation is suitable and there is regular tidal inundation. In Ireland, three sub-types are recognised: (1) *Salicornia* type (2) *Suaeda* type and (3) the much rarer *Sagina* type. Mono-specific swards of *Salicornia* spp. growing on muddy sediments are the most common plant community belonging to this Annex I habitat type found in Ireland.

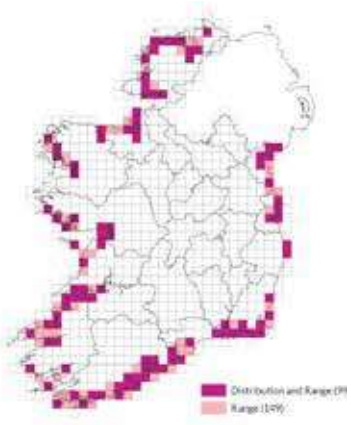
The typical species for this habitat are Common Saltmarsh-grass (*Puccinellia maritima*), glassworts (*Salicornia* spp.), Hard Grass (*Parapholis strigosa*), Buck's-horn Plantain (*Plantago coronopus*), Sea Pearlwort (*Sagina maritima*), Knotted Pearlwort (*Sagina nodosa*) and Annual Sea-blite (*Suaeda maritima*).

As this habitat is dominated by annuals it can be ephemeral or transient in nature and is highly susceptible to erosion. Its distribution can vary considerably from year to year and it can move in response to changing conditions, e.g., in estuaries with shifting river channels.

The Overall Conservation Status was assessed as *Bad*, a deterioration from Favourable during the last reporting period. This change is due to a decrease in range and area of the habitat, and the assessments for structure and functions and future prospects of the habitat deteriorating to *Bad*.

Based on the results of the 2021-23 surveys, invasion by cord-grasses (*Spartina* spp.) is the main issue affecting the 1310 habitat at present. During the last round of reporting, *Spartina* was not assessed to be such an issue, with no evidence that *Spartina* cover had increased nationally since the previous reporting period in 2013. It is unclear what factors are driving the current expansion of *Spartina* cover in Ireland.

Kristi Leyden



OVERALL STATUS: BAD

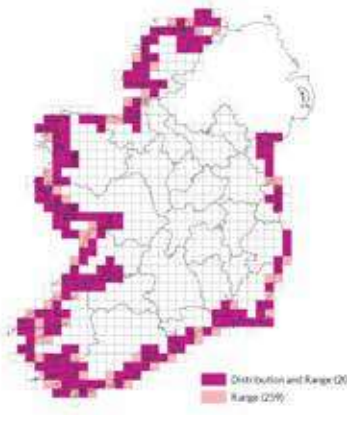
1330 ATLANTIC SALT MEADOWS

Atlantic salt meadows generally occupy the widest part of the saltmarsh gradient. They also contain a distinctive topography with an intricate network of creeks and salt pans occurring on medium and large-sized saltmarshes. Atlantic salt meadows contain several distinctive zones that are related to elevation and submergence frequency. The lowest part along the tidal zone is generally dominated by Common Saltmarsh-grass (*Puccinellia maritima*) with species like glassworts (*Salicornia* spp.), Annual Sea-blite (*Suaeda maritima*) and Lax-flowered Sea-lavender (*Limonium humile*) also important. The invasive Common Cord-grass (*Spartina anglica*) can be locally abundant in this habitat. The mid-marsh zones are generally characterised by Thrift (*Armeria maritima*) and/or Sea Plantain (*Plantago maritima*). This zone is generally transitional to an upper saltmarsh herbaceous community with Red Fescue (*Festuca rubra*), Saltmarsh Rush (*Juncus gerardii*) and Creeping Bent (*Agrostis stolonifera*).

This habitat is also important for other wildlife including wintering waders and wildfowl. Atlantic salt meadows are distributed around most of the coastline of Ireland. The intricate topography of the Irish coastline with many inlets has created an abundance of sites that are sheltered and allow muddy sediments to accumulate, leading to the development of saltmarsh.

The Overall Status is assessed as *Bad*. This represents a genuine change from the 2019 report, caused by further losses in habitat and a deterioration of the structure and functions of the habitat, driven mainly by pressures from agriculture (including ecologically unsuitable grazing regimes and land reclamation) and continued invasion by *Spartina*.

Marcin Penk



OVERALL STATUS: BAD

1410 MEDITERRANEAN SALT MEADOWS

Mediterranean salt meadows occupy the upper zone of saltmarshes and usually occur adjacent to the boundary with terrestrial habitats. They are widespread on the Irish coastline; however, they are not as extensive as Atlantic salt meadows. The habitat is distinguished from Atlantic salt meadows by the presence of rushes such as Sea Rush (*Juncus maritimus*) and/or Sharp Rush (*Juncus acutus*), along with a range of species typically found in Atlantic salt meadows, including Sea Aster (*Aster tripolium*), Sea-purslane (*Atriplex portulacoides*), Sea-milkwort (*Lysimachia maritima*), Saltmarsh Rush (*Juncus gerardii*), Parsley Water-dropwort (*Oenanthe lachenalii*), Sea Plantain (*Plantago maritima*) and Common Saltmarsh-grass (*Puccinellia maritima*).

The Overall Status is assessed as *Inadequate* with a deteriorating trend, mainly due to pressures associated with invasive species such as Common Cord-grass (*Spartina anglica*), and agriculture (e.g., overgrazing, undergrazing and land reclamation). This assessment is unchanged since the 2019 report.

John Brophy

OVERALL STATUS: INADEQUATE

1420 HALOPHILOUS SCRUB

Halophilous scrub is defined as perennial vegetation of saline muds that belongs to the phytosociological class *Sarcocornetea fruticosi*. In Ireland this habitat is characterised by the presence of a single species, Perennial Glasswort (*Sarcocornia perennis*, previously known as *Arthrocnemum perenne*) on saltmarsh. This fleshy, slightly woody perennial can grow up to 30 cm tall and often extends to form tussocks up to 1 m in diameter. The main habitat of *Sarcocornia perennis* is gravelly or sandy foreshores and relatively well-drained sediments of coastal saltmarshes. This species is very rare in Ireland and is listed on the Flora (Protection) Order, 2022. It is also listed in the Vascular Plant Red List as Vulnerable. Consequently, this habitat is the rarest Annex I saltmarsh habitat found in Ireland and has been recorded from only seven saltmarsh sites in the south-east coast of Ireland, all of which are within two SACs. Perennial Glasswort is generally found in the mid-lower saltmarsh zone, often with Common Saltmarsh-grass (*Puccinellia maritima*) and Lax-flowered Sea-lavender (*Limonium humile*). It also occurs with glasswort species (*Salicornia* spp.) and among clumps of Common Cord-grass (*Spartina anglica*).

The Overall Status is assessed as *Bad*, as in 2019. However, the trend has improved to stable, due to the recovery of the 1420 habitat at Taulaght, where the algal mats reported to have smothered the 1420 habitat in the previous monitoring period are no longer having an impact. This has restored the range back to its 2013 level.

Marcin Penk

OVERALL STATUS: BAD

2110 EMBRYONIC SHIFTING DUNES

Embryonic shifting dunes are low sand mounds, generally less than a metre high, occurring between the high tide mark and the partially stabilised Marram (white) dunes. Embryonic shifting dunes are unstable habitats where wind-blown sand is common and they are still vulnerable to saltwater intrusion. They represent the initial phase of dune formation and typically form where sand gathers around salt-tolerant species such as Lyme-grass (*Leymus arenarius*) and Sand Couch (*Elymus junceiformis*). Other plants such as Sea Rocket (*Cakile maritima*), Sea Sandwort (*Honckenya peploides*) and Prickly Saltwort (*Salsola kali*) may also occur. The presence of these species allows for the continued accumulation of airborne sand and embryonic dune formation. These embryonic dunes are transient in nature, some are eliminated by storms, while others proceed to the next stage of succession, continuing to accumulate sand deposits.

The main pressures on this habitat relate to damage caused by recreation, coastal defences (which can interfere with sediment dynamics), the invasive species Sea-buckthorn (*Hippophae rhamnoides*), and climate change-related impacts such as storms. The Overall Status is assessed as *Inadequate*. The overall trend has been revised down to deteriorating, due to genuine losses in habitat.

Emmi Virkki

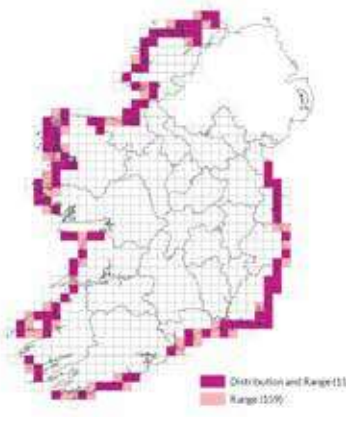
OVERALL STATUS: INADEQUATE

2120 MARRAM DUNES (WHITE DUNES)

Marram dunes (or white dunes) are dunes which are partly stabilised and are dominated by Marram (*Ammophila arenaria*). They tend to be taller than embryonic shifting dunes and form further inland from these. The dunes are actively created by Marram, which traps sand, but vegetation cover is incomplete. The dunes can build and erode quickly because of the presence of bare sand. For this reason they are sometimes referred to as 'mobile dunes'. Typical species used in the assessment are Marram (*Ammophila arenaria*), Sand Couch (*Elymus junceiformis*) and Lyme-grass (*Leymus arenarius*). Other species also occur, such as Sand Sedge (*Carex arenaria*), Sea Spurge (*Euphorbia paralias*) and Sea-holly (*Eryngium maritimum*), along with a number of yellow Asteraceae, including Cat's-ear (*Hypochaeris radicata*), Groundsel (*Senecio vulgaris*) and Common Ragwort (*Jacobaea vulgaris*).

Pressures associated with Marram dunes include damage from recreation, and coastal defences, which may interfere with local sediment dynamics. The Overall Status is assessed as *Inadequate*, which is unchanged from 2019. However, the overall trend has been assessed as deteriorating due to a slight decrease in the percentage of the habitat that is in good condition.

Jim Martin



OVERALL STATUS: INADEQUATE

2130 FIXED DUNES (GREY DUNES)*

Fixed dunes are relatively sheltered with sand mobility greatly reduced in comparison to fore-dune habitats, and have developed a more or less closed carpet of vegetation. The sandy substrate is frequently overlain by a layer of humus, and lichens and mosses are often abundant. Species diversity and composition varies, but usually the fixed dune vegetation is typical of herb-rich grassland. Species such as Red Fescue (*Festuca rubra*), bent grasses (*Agrostis* spp.), Yarrow (*Achillea millefolium*), Common Bird's-foot-trefoil (*Lotus corniculatus*), Kidney Vetch (*Anthyllis vulneraria*), Ribwort Plantain (*Plantago lanceolata*), eyebrights (*Euphrasia* spp.), Wild Thyme (*Thymus drucei*) and Lady's Bedstraw (*Galium verum*) are common. Fixed dunes can also be an important habitat for orchids such as Pyramidal Orchid (*Anacamptis pyramidalis*) and Bee Orchid (*Ophrys apifera*).

The Overall Status is assessed as *Bad* with a deteriorating trend, as in the 2019 report, due to pressures associated with recreation, a wide range of invasive species (including rabbits) and ecologically unsuitable grazing practices.

Jim Martin

OVERALL STATUS: BAD

2140 *EMPETRUM* DUNES*

Decalcified *Empetrum* dunes are either found on the landward edge of dune systems where the surface layers of sand have been leached of their calcium content, or where sand has become fixed over siliceous rock. Typical species include Crowberry (*Empetrum nigrum*), Ling (*Calluna vulgaris)*, Wild Thyme (*Thymus drucei*), Common Bird's-foot-trefoil (*Lotus corniculatus*), Carnation Sedge (*Carex panicea*), and the sand-binding species Sand Sedge (*Carex arenaria*) and Marram (*Ammophila arenaria*). Decalcified *Empetrum* dunes are distinguished from Decalcified dune heath by the presence of Crowberry, which is usually the most frequent dwarf shrub, within a more open dune heath community.

The main pressures identified on the habitat were grassland abandonment, recreational activities, and bracken encroachment; however, none of these were considered to impact on the long-term viability of the habitat. The Overall Status is therefore assessed as *Favourable*, unchanged from the 2019 assessment.

Jim Martin

OVERALL STATUS: FAVOURABLE

2150 DUNE HEATH*

Decalcified dune heath is most often found on the landward edge of dune systems where the surface layers of sand have been leached of their calcium content, or where sand has become fixed over siliceous rock. Typical species include Ling (*Calluna vulgaris*), Common Bird's-foot-trefoil (*Lotus corniculatus*), Sweet Vernal-grass (*Anthoxanthum odoratum*), Common Dog-violet (*Viola riviniana*) and the sand-binding species Sand Sedge (*Carex arenaria*) and Marram (*Ammophila arenaria*).

The main pressures on this habitat are associated with land abandonment, recreational activities, and bracken encroachment. The Overall Status is assessed as *Inadequate*, as in 2019, but the trend has been revised to deteriorating due to a decrease in the percentage of habitat in good condition.

Jim Martin

OVERALL STATUS: INADEQUATE

2170 DUNES WITH CREEPING WILLOW

Dunes with Creeping Willow are typically found either within dune slacks on sandy hummocks, or on the sides of dune ridges adjacent to slacks. They represent a transition between arid dune ridges and the wet conditions found in dune slacks. Although these dunes may occasionally be inundated, to be classified as this habitat the area should flood only rarely and briefly. It is characterised by a dominance of Creeping Willow (*Salix repens*), which often forms a dense ground cover. There should be an absence of the moisture-loving species typically found in dune slacks. Species associated with this habitat include Glaucous Sedge (*Carex flacca*), Sand Sedge (*Carex arenaria*), Creeping Bent (*Agrostis stolonifera*), Mouse-ear-hawkweed (*Pilosella officinarum*), eyebrights (*Euphrasia* spp.), Common Rest-harrow (*Ononis repens*) and Common Bird's-foot-trefoil (*Lotus corniculatus*).

The Overall Status is assessed as *Inadequate*, as in 2019, due mainly to pressures associated with recreation, problematic native and non-native species (e.g., Sea-buckthorn (*Hippophae rhamnoides*), Bracken (*Pteridium aquilinum*)), agricultural impacts such as intensification, ecologically unsuitable grazing, and conversion to agricultural habitat. However, a decreasing trend in the Area parameter, due to area loss caused by expansion of Sea-buckthorn, means that the overall trend has changed to deteriorating.

Orla Daly

OVERALL STATUS: INADEQUATE

2190 DUNE SLACKS

Dune slacks are topographically the lowest lying regions within a dune system, found in hollows or depressions either behind or between dune ridges. The waterlogged condition of the soil is an important determinant of the vegetation; the water table is usually within 1 m of the surface, with diurnal, seasonal and annual fluctuations. Dune slacks can remain flooded from two to six months annually, with fluctuations in the water table based on precipitation and evapotranspiration. They can be classified as either primary or secondary, depending on how they are formed. Primary slacks are formed by rapidly advancing dune ridges cutting off former beach plains from the influence of the sea, while secondary slacks are formed by blowing out in older dunes. In each case, the wind erodes the bare sand until the groundwater level is reached and pioneer dune slack vegetation begins to colonise. Dune slacks have a number of vegetation communities demonstrating phases of succession within slacks, from pioneer to mature slacks. They are floristically rich and support wetland communities. Typical species include rushes (*Juncus* spp.), sedges (*Carex* spp.), Marsh Pennywort (*Hydrocotyle vulgaris*), Water Mint (*Mentha aquatica*), Creeping Bent (*Agrostis stolonifera*), Silverweed (*Potentilla anserina*), Bog Pimpernel (*Lysimachia tenella*) and orchids such as Marsh Helleborine (*Epipactis palustris*), marsh-/spotted-orchids (*Dactylorhiza* spp.) and Common Twayblade (*Neottia ovata*).

Pressures on the habitat come from a number of sources, including ecologically unsuitable grazing, leisure activities and drainage. Succession to scrub is also a problem, particularly where it is linked to desiccation of the slack. Area losses continue to occur, caused in the current reporting period by conversion to agriculture and expansion of Sea-buckthorn (*Hippophae rhamnoides*), which is a non-native invasive species.

The Overall Status of the habitat is assessed as *Inadequate* and deteriorating, unchanged since the 2019 assessment.

Rory Hodd

OVERALL STATUS: INADEQUATE

21A0 MACHAIR*

Machairs are complex and dynamic systems which are considered natural landforms that are the product of both wind erosion and cultural activities. They are globally restricted to the north-west coasts of Ireland and Scotland. Frequent species include Red Fescue (*Festuca rubra*), Common Bird's-foot-trefoil (*Lotus corniculatus*), Ribwort Plantain (*Plantago lanceolata*), Daisy (*Bellis perennis*), Sand Sedge (*Carex arenaria*), Lady's Bedstraw (*Galium verum*) and White Clover (*Trifolium repens*).

There is, however, no suite of species unique to machair and physical characteristics are important in its definition. A machair should typically be a flat, sandy, coastal plain, in an oceanic location with a cool, moist climate. The sandy substrate should have a significant percentage of shell-derived material, producing a lime-rich soil with a pH normally greater than 7. The vegetation should be herb-rich, with a low frequency of sand-binding species. Wetness of the soil varies, due to the proximity of the water table, with much of the vegetation transitional between wet and dry communities. There should be a history of human interference, principally from grazing. This habitat is found in exposed locations between Galway Bay and Malin Head, Co. Donegal.

Pressures on the habitat include ecologically unsuitable grazing regimes (particularly overgrazing), invasive species and recreational activities causing disturbance. The Overall Status is assessed as *Inadequate* with a stable trend, unchanged from the 2019 report.

Aoife Delaney

OVERALL STATUS: INADEQUATE

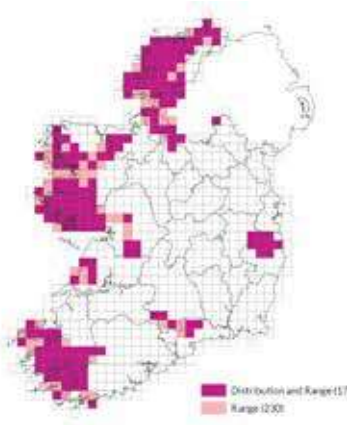
3110 OLIGOTROPHIC ISOETID LAKE HABITAT

Ireland is a European stronghold for this soft-water, nutrient-poor lake habitat. It is relatively species-poor and dominated by plants such as Quillwort (*Isoetes lacustris*) and Water Lobelia (*Lobelia dortmanna*). Other common species include Bulbous Rush (*Juncus bulbosus*) and Bog Pondweed (*Potamogeton polygonifolius*), while Pipewort (*Eriocaulon aquaticum*), Awlwort (*Subularia aquatica*) and Slender Stonewort (*Nitella gracilis*) are more notable species. This habitat is frequent in peatland catchments. It is also found in upland lakes, such as corries, and earlier references to it as a 'lowland lake' type were incorrect.

The oligotrophic isoetid lake habitat has a widespread distribution in Ireland and occurs in a large number of lakes. It is under significant pressure from drainage and other damage to peatland, and from eutrophication. Damage to peatland can result in hydrological changes in lakes, increased organic matter, water colour and turbidity, changes in sediment characteristics, acidification and even enrichment. The habitat requires oligotrophic conditions. It is recognised that ensuring the long-term future of this lake habitat requires action at catchment scale to address peatland damage, as well as to reduce nutrient and other pollution.

The Overall Status is assessed as *Inadequate* with an unknown trend. This change from the Bad status reported in 2013-2018 is the result of improved knowledge and use of a different method. Additional baseline survey and research is needed to further improve knowledge of the habitat's characteristics, ecological requirements and status.

Áine O'Connor



OVERALL STATUS: INADEQUATE

3130 SLENDER NAIAD-TYPE LAKES

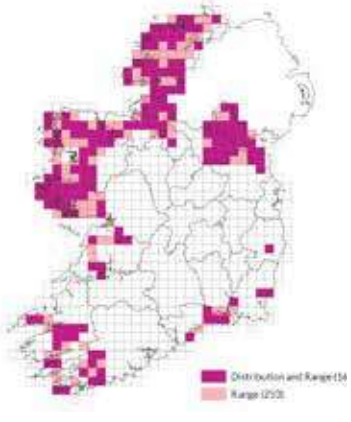
Habitat 3130 is known in Ireland as the intermediate-alkalinity or Slender Naiad-type lake habitat. It is characterised by a species-rich flora and three main vegetation zones including a rare deep-water community. The deep-water community has rare and scarce typical species such as the Annex II Slender Naiad (*Najas flexilis*), *Hydrilla verticillata*, Pillwort (*Pilularia globulifera*) and the stoneworts *Nitella confervacea* and *Nitella translucens*. The habitat contains a mix of species found in more basic and more acidic lakes, and the co-occurrence of *Potamogeton perfoliatus* and *Isoetes lacustris* is characteristic.

The habitat is widespread but scarce along the western fringe of Ireland, and rare in the rest of Europe. It occurs in lakes with clear water, low nutrients and alkalinity intermediate between that of oligotrophic and marl lakes, in catchments of mixed geology. Base-rich influences may come from basalt, limestone, marble, or calcareous sand, and peatland and heath are often widespread in the catchments.

The deep-water flora is highly sensitive, particularly to reductions in the amount of light reaching the lake bed caused by increased water colour and shading by large plants and phytoplankton. The habitat was in unfavourable condition at 89% of the area monitored. It has deteriorated significantly in recent years at three of its most important Irish sites, two because of eutrophication, and one owing to drainage and eutrophication. The Slender Naiad population has gone extinct at one of these lakes and collapsed at another.

The Overall Status of habitat 3130 is assessed as *Bad* and deteriorating, a change from the Inadequate Status recorded in 2019. This is due to a genuine deterioration in habitat at a number of nationally important 3130 lakes. Effective catchment management is needed to restore this important habitat to favourable status.

Cilian Roden



OVERALL STATUS: BAD

3140 HARD-WATER LAKES

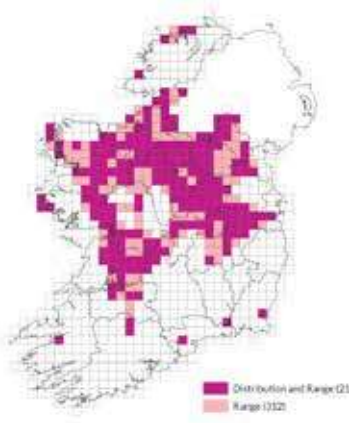
The Hard-water or marl lake habitat is strongly associated with lowland lakes over limestone bedrock. Primitive organisms dominate, particularly stoneworts (macroalgae). Stonewort diversity is high and includes rare and threatened species such as Naked Stonewort (*Chara dissoluta*), Coral Stonewort (*C. tomentosa*), Rugged Stonewort (*C. subspinosa*) and Dwarf Stonewort (*Nitella tenuissima*). Marl lakes in good condition have exceptionally clear water with stoneworts growing to depths of 10 m or more and up to six distinct, stonewort-dominated zones. Higher plants generally are sparse and restricted in distribution. Irish stony, hard-water lakes are also of international importance for 'krustenstein', a living crust with abundant cyanobacteria that covers rocks in shallow waters.

Ireland has some of the best examples of this rare and highly oligotrophic habitat in Europe and the world. Habitat 3140 occurs in a large number and variety of sites in Ireland including large stony lakes, turloughs, calcareous dune slacks, fens and canals. As a result, Ireland has particular responsibility for restoring this natural habitat to favourable conservation status within the EU.

The hard-water lake habitat is under significant pressure from eutrophication, the primary sources of nutrients and organic matter being agriculture and municipal and industrial wastewaters. Abstraction for drinking water is also a pressure.

The Overall Assessment for habitat 3140 is *Bad*, unchanged from 2019. The overall trend is reported as stable. Effective measures will need to be rolled out across catchments to improve the habitat's status and trends.

Cilian Roden



OVERALL STATUS: BAD

3150 RICH PONDWEED LAKE HABITAT

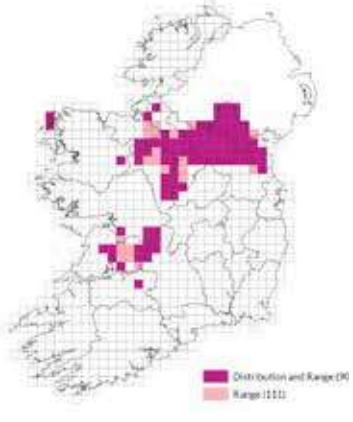
Little is known about the characteristics or ecology of the Rich pondweed lake habitat in Ireland. It can be distinguished from habitat 3130 by the absence of the oligotrophic isoetid zones and deep-water rarities, and from 3140 by the lower abundance of stoneworts. Habitat 3150 is likely to occur in lowland, base-rich lakes and to have high abundance and diversity of pondweeds (*Potamogeton* spp.). Other rooted, predominantly submerged higher plants may regularly co-occur, including *Myriophyllum spicatum*, *Hippuris vulgaris*, *Callitriche* spp., *Sagittaria sagittifolia* and *Ceratophyllum demersum*, and free-floating species such *Lemna trisulca* may be common. It has been suggested that lakes with rich pondweed floras or Frogbit (*Hydrocharis morsus-ranae*) should be targeted to better elucidate the habitat's characteristics.

The habitat is thought to be associated with large lakes in large catchments, such as those of the Shannon system, and with small, more productive lakes such as those found in the drumlin belt of Cavan, Monaghan and Leitrim, or lowlands south-east of the Burren. The pondweed-rich variant found in Ireland is considered to require mesotrophic waters, and typically has well-developed reed swamp, fen and/or marsh communities around the lake shoreline.

Lakes with habitat 3150 are found in mineral soil catchments and, hence, some of the most intensive agricultural lands in Ireland. Consequently, the habitat has been under pressure from eutrophication since the 1970s or before and it may represent a degraded community that has replaced habitats 3140, 3130 or 3110. Other significant pressures include urban wastewater, abstraction, drainage and forestry.

The Overall Assessment of the habitat is *Inadequate*, unchanged from 2019. The trend is unknown, mainly owing to the low confidence in the use of Water Framework Directive status data in the assessment of Annex I lake habitats.

Cilian Roden



OVERALL STATUS: INADEQUATE

3160 ACID OLIGOTROPHIC LAKES

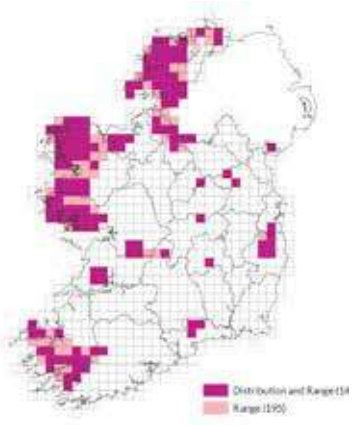
Habitat 3160, the Acid oligotrophic lake or Natural dystrophic lakes habitat, is found in pool systems and small lakes in a mosaic with blanket bog and wet heath. As for other ombrotrophic peatland habitats, habitat 3160 is botanically species-poor, but has relatively greater invertebrate species richness. It also has high algal diversity, notably in desmids. Additionally, while individual pools or lakes may be species-poor, not all sites are the same so that the habitat displays higher species richness at landscape and regional scales. Some of the typical 3160 invertebrate, bryophyte and algal species are strongly associated with, and sometimes restricted to, the habitat. The habitat also shows strong regional variation across its Irish range, with altitude, geology, and distance from the sea.

Lakes and pools with habitat 3160 are dominated by Coleoptera (water beetles), followed by Trichoptera (caddisfly larvae) and Heteroptera (aquatic bugs, such as water boatmen) and have abundant Odonata (dragonflies and damselflies).

Damage to peatland from turf cutting, foresty and agriculture results in hydrological changes in the habitat, as well as increased sedimentation, colour, turbidity, organic matter and ammonia. Fertilisation of forests can contribute to enrichment of the habitat. Conservation measures to restore raised bog have resulted in the creation of new 3160 pools, however these may be temporary and replaced by active raised bog communities through natural succession.

The Overall Assessment of habitat 3160 is *Inadequate*, unchanged from 2019, but with an increasing trend, a change from the stable trend recorded in 2019. This is a genuine change, owing to improving trends for Range and Area as a result of conservation measures on raised and blanket bog.

Giovanni Cappelli



OVERALL STATUS: INADEQUATE

3180 TURLOUGHS*

Turloughs are basins that flood annually and are restricted to regions of well-bedded, relatively pure karstified Carboniferous limestone. Water inflow and outflow is predominantly through the ground. Turloughs can be described as the floodplains of underground rivers. They show a distinctive zonation of plants related to flooding, and typically contain wetland vegetation communities in their lower zones such as lakes, fens and wet grassland, and drier vegetation communities more characteristic of limestone soils in their upper zones such as grasslands, scrub and woodlands. Turlough communities can include other Annex I habitats, notably Hard water lakes (3140), Alkaline fen (7230), Chenopodion vegetation (3270) and Limestone pavement (8240). Turloughs are also important for aquatic and terrestrial invertebrates, and for wintering and breeding birds.

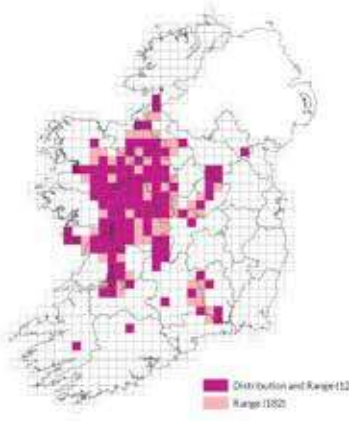
Hydrology is the key driver of turlough ecology, particularly the influence of flood duration and groundwater. Grazing is integral to the ecology of turlough habitats and it is important that appropriate levels are maintained. The climax vegetation for the drier parts of turloughs is wet woodland, but owing to grazing practices, turlough woodland is now quite rare.

The main pressures are drainage, water pollution and ecologically unsuitable grazing, and at a wider landscape scale, flood relief schemes. Recent studies indicate early signs of climate change pressures.

Twenty squares were added to the range since 2019, due to increased knowledge from remote sensing and field survey by Geological Survey Ireland, which has improved knowledge of the distribution of the habitat.

The Overall Status is assessed as *Inadequate* with a stable trend, unchanged from 2019.

Hannah Mulcahy



OVERALL STATUS: INADEQUATE

3260 VEGETATION OF FLOWING WATERS

This habitat has a broad definition, ranging from upland, flashy, oligotrophic, bryophyte- and algal-dominated rivers, to tidal reaches dominated by higher plants. In Ireland, the highest riverine conservation interest is associated with lowland depositing and tidal rivers and unmodified, fast-flowing, low-nutrient rivers. A number of rare submerged and marginal species are found in the former, including Opposite-leaved Pondweed (*Groenlandia densa*), starworts (e.g. *Callitriche truncata*), Triangular Club-rush (*Schoenoplectus triqueter*), Needle Spike-rush (*Eleocharis acicularis*) and mud-dwelling mosses (e.g. *Ephemerum* spp.). The low-nutrient, high-velocity river types are associated with high bryophyte diversity, cascades, riffles and riparian woodland. Important communities also occur in groundwater-fed, base-rich oligotrophic rivers.

Many Irish rivers have been heavily modified, particularly through arterial drainage and channelisation. These activities have changed channel morphology and introduced larger amounts of fine sediment. Such fines provide a rooting medium for plants and, as a result, Stream Water-crowfoot (*Ranunculus penicillatus*) has increased in abundance. In consequence, the habitat has, erroneously, become synonymous with water-crowfoots in Ireland. Crowfoot-dominated reaches frequently have low diversity and are of low conservation value, and an abundance of the species generally indicates poor condition and damage.

The main problems for river habitats in Ireland are damage through hydrological and morphological change, eutrophication and other water pollution. The EPA is also continuing to highlight the decline in high quality rivers. While not all variants of the river habitat require low nutrient conditions, this trend is a significant concern. Agriculture and municipal and industrial discharges are the most significant sources of nutrient and organic pollution. The Overall Status of the habitat is *Inadequate* and deteriorating, the same as the last two assessments.

Brian Nelson

OVERALL STATUS: INADEQUATE

3270 CHENOPODION RUBRI

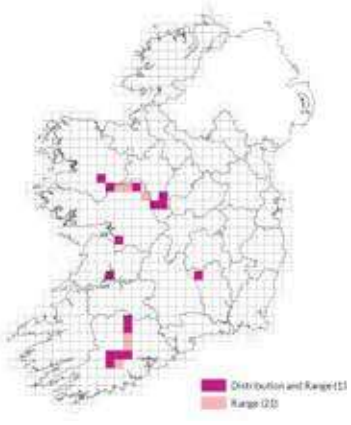
In Ireland, Chenopodion rubri habitat occurs in riverine turloughs where it is associated with late recession of flood water and summer flooding. However, the largest known site for Chenopodion vegetation in Ireland is Carrigadrohid Reservoir at the Gearagh, Co. Cork. The habitat is found on damp mineral soils, often fine, alluvial muds, but also stony substratum. Typical species are small, short-lived, fast-growing annuals. These are poor competitors that occupy the habitat because it is exposed for a short time and too late in the growing season to allow perennial species to complete their life cycles.

The on-going development of this habitat depends on a continuous supply of fine sediment. Most sites receive sediment from external sources via streams or large underground conduits. Wave action can lead to erosion, re-suspension and subsequent deposition of sediment within a basin.

Direct losses of the habitat have occurred, as well as indirect losses owing to prolonged flooding. Reduced flood duration is also a threat, with changes in precipitation regimes due to climate change. Pressures on the habitat include infrastructure such as hydropower dams, transport infrastructure, drainage and other land uses.

The Overall Status is assessed as *Inadequate* with a deteriorating trend. This represents a change from 2019, when it was assessed as Favourable with a stable trend. While this ephemeral habitat naturally varies in area each year, genuine losses have been documented at three sites. The change in status and trend is due to recorded losses of the habitat.

Hannah Mulcahy



OVERALL STATUS: INADEQUATE

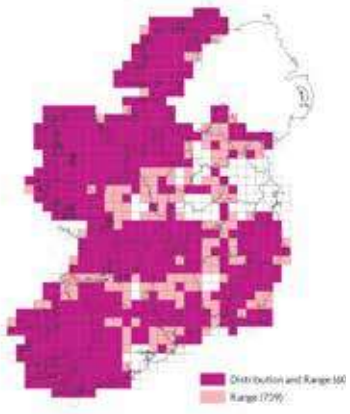
4010 WET HEATHS

Wet heath is a highly variable peatland habitat, intermediate in many regards between dry heath and blanket bog, occurring on gently sloping ground and usually on peat of 15 to 50 cm depths. It is characterised by a mix of Ling (*Calluna vulgaris),* Purple Moor-grass (*Molinia caerulea*), Cross-leaved Heath (*Erica tetralix*), Deergrass (*Trichophorum germanicum*), locally Bog Myrtle (*Myrica gale*) and other species. Not all of these need occur to qualify as wet heath since dwarf shrubs may be scarce or absent on degraded heath and replaced by dominant Deergrass or Purple Moor-grass. Ground flora is variable but *Sphagnum* mosses such as *S. capillifolium, S. papillosum, S. compactum, S. tenellum, S. subnitens* and pleurocarpous mosses such as *Pleurozium schreberi* and *Hylocomium splendens*, and *Cladonia* lichens, are characteristic.

Area losses and impacts on species, structure and functions have continued into the current reporting period, the latter reported as primarily due to overgrazing and related stock impacts on dwarf shrubs, vegetation cover and structure which can lead to erosion. Afforestation is a significant factor in area losses outside SACs. Other pressures include burning, invasive species, windfarm roads and ancillary infrastructure, paths, tracks, landslides, and erosion from recreational use. Aerial nitrogen deposition and air pollution from agricultural activities are also impacting. Climate change is acknowledged as an increasing threat, through predicted more frequent temperature extremes, more frequent or more prolonged droughts and extreme rainfall events.

The Overall Status of Wet heath is *Bad* with a deteriorating trend, unchanged from the previous reporting period.

Orla Daly



OVERALL STATUS: BAD

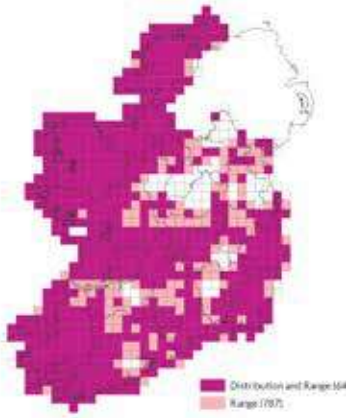
4030 DRY HEATHS

Dry heaths comprise vegetation dominated by ericaceous dwarf shrubs typically occurring on well-drained, nutrient-poor, acidic, mineral soils or on shallow peats and peaty podzols. Ling (*Calluna vulgaris*) is generally the main species but Bell Heather (*Erica cinerea*), Western Gorse (*Ulex gallii*) and Bilberry (*Vaccinium myrtillus*) may also be important components. Dry heaths occur from sea level to around 400 m, where they may transition to Alpine and Boreal heaths (4060). Calcareous dry heaths, where dwarf shrub communities have developed on leached soils over a base-rich substrate (e.g. in the Burren), are included in 4030 habitat and may support several species of calcareous grassland. Stands of *Ulex europaeus* are classed as scrub habitat and thus not included in 4030 habitat.

Losses in area were recorded in the current reporting period and attributed to afforestation, wind farms, excavation, land reclamation, landslides, and recreational activities causing erosion. Pressures reported as affecting the structure and functions of the habitat include burning and overgrazing. Climate change is acknowledged to be a potential threat to dry heaths, through predicted increased frequency of temperature and rainfall extremes and more frequent or more prolonged drought periods.

The Overall Status of Dry heath is assessed as *Bad*, as in the last two reporting periods, but the trend is now reported as deteriorating, down from stable in 2019. This is due to continuing losses in area recorded in the current reporting period and a high proportion of the habitat being in bad condition.

Orla Daly



OVERALL STATUS: BAD

4060 ALPINE AND SUBALPINE HEATH

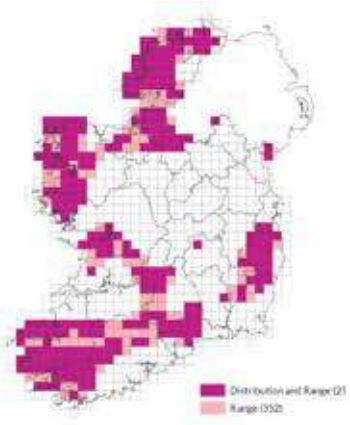
Two distinct subtypes of Alpine and subalpine heath have been identified as occurring in Ireland. The most widespread subtype occurs in an upland peatland context, mainly above 450-500 m altitude, but also occurs close to sea level in exposed coastal situations in north-western Ireland. It can also occur as secondary vegetation where blanket peat has eroded. The vegetation is characterised by the presence of low-growing, wind-clipped dwarf shrubs, the most characteristic of which is Ling (*Calluna vulgaris*), typically with an abundance of the moss *Racomitrium lanuginosum*. A suite of specialised Arctic- or Boreal-montane species may occur within 4060 habitat, especially at higher altitudes, but their presence is not a requisite to identify habitat as corresponding to 4060.

The second subtype occurs in lowland and low upland areas on karstic limestone in the Burren and adjacent areas. It consists of calcareous heath, characterised by the occurrence of the Arctic/Boreal-montane shrubs Mountain Avens (*Dryas octopetala*) and Bearberry (*Arctostaphylos uva-ursi*), alongside typical species of calcareous grassland. Where *Dryas* is prominent, these heaths have affinities to habitat 6170 Alpine and subalpine calcareous grasslands; however a recent review has concluded that, based on current data, *Dryas*-dominated heaths should remain within 4060 for now.

The main pressures on Alpine and subalpine heath are overgrazing, aerial nitrogen deposition from agricultural activities, burning, recreation activities causing erosion, and invasive alien species. Climate change is acknowledged to be a potential threat, through temperature and precipitation extremes and more prolonged periods of drought.

The Overall Status of the habitat is *Bad*, as in the previous two reporting periods, but the overall trend has changed from improving to stable, due to the stabilisation of improvements in structure and functions.

Rory Hodd



OVERALL STATUS: BAD

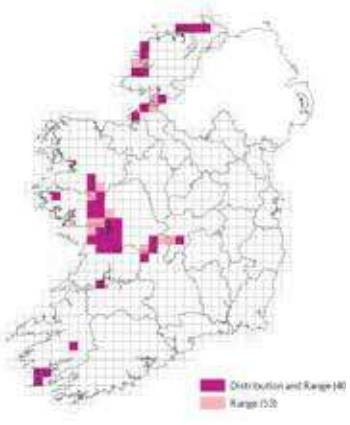
5130 JUNIPER SCRUB

In Ireland a Juniper formation is defined as a discrete area supporting 50 or more Juniper plants where no plant is more than 20 m from another. In practice this means that, in addition to reaching the 50-plant threshold, Juniper plants should achieve a minimum density of 25 plants per hectare to qualify as a formation.

Juniper formations are mostly associated with lowland dry calcareous and neutral grassland, exposed calcareous rock, dry siliceous heath, exposed siliceous rock and dry calcareous heath; however, formations can also occur on coastal dunes and at higher altitudes. Both upland and lowland juniper formations in Ireland are dominated almost exclusively by prostrate or spreading forms of *Juniperus communis*.

Local pressures were noted at some Juniper stands, including overgrazing, erosion, small areas of Juniper scrub removal and invasive species. However, any high or medium-impact pressures recorded during the last two reporting periods usually affected only small areas of the habitat, or occurred at a low frequency across the sites surveyed. None of the pressures recorded were deemed to be significant at a national level. Short periods of disturbance may even be beneficial by promoting regeneration. The Overall Status is assessed as *Favourable* and the trend is stable, the same result as in 2019.

Fionnuala O'Neill



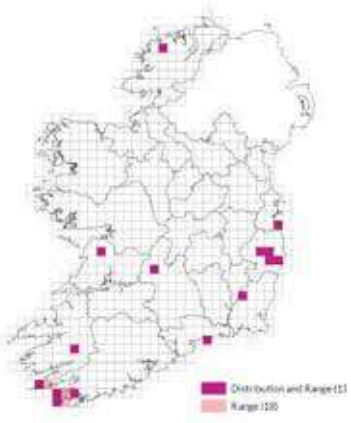
OVERALL STATUS: FAVOURABLE

6130 CALAMINARIAN GRASSLAND

Calaminarian grassland has a very restricted distribution in Ireland, occurring only on artificial spoil heaps around old mine workings that are contaminated with the heavy metals copper, lead and zinc. This habitat is unknown from natural situations in Ireland. It is characterised primarily by the presence of metallophyte bryophytes that are tolerant of high concentrations of heavy metals. These species include *Cephaloziella nicholsonii, C. integerrima, C. massalongoi, Ditrichum cornubicum, D. plumbicola, Scopelophila cataractae* and *Pohlia andalusica*, all of which are rare and threatened in Ireland and Europe. In Ireland, this habitat has very low cover of vascular plants, often being dominated by bare ground, and has few vascular plant indicators. Exceptions include Spring Sandwort (*Minuartia verna*) as well as Thrift (*Armeria maritima*) and Sea Campion (*Silene uniflora*), when found in inland, lowland sites.

This habitat is undergoing a slow, ongoing decline across most sites in Ireland, as the heavy metals are leaching out of the soil over time and vegetation succession, usually to heath, is occurring. The habitat is also vulnerable to reclamation and damage from recreational and other activities, as it is often viewed as waste ground. The Overall Status remains *Inadequate* with a deteriorating trend.

Neil Lockhart



OVERALL STATUS: INADEQUATE

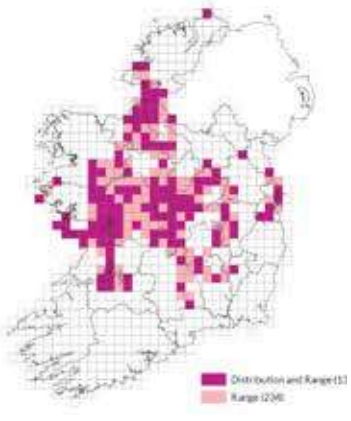
6210 ORCHID-RICH CALCAREOUS GRASSLAND*

The Annex I habitat 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) comprises species-rich plant communities found on shallow, well-drained calcareous substrates. It is considered a priority habitat only if it is an important orchid site, which in Ireland refers to sites that have any native orchid species other than the relatively common *Dactylorhiza fuchsii* and *Dactylorhiza maculata*. This habitat includes a mixture of grasses and herbs, with calcicole species typically frequent. It often occurs on obvious geological features such as eskers, outcropping limestone rock and in association with limestone pavement. The Burren (Clare/Galway) and Dartry Mountains (Sligo/Leitrim) are particularly important areas for this Annex I habitat, but it can also be found scattered across much of the midlands.

A typical sward is herb-rich and diverse, with over 40 species commonly recorded in a 4 m^2 plot. Herbs include Wild Carrot (*Daucus carota*), Lady's Bedstraw (*Galium verum*), hawkbits (*Leontodon hispidus, L. saxatilis*), Mouse-ear Hawkweed (*Pilosella officinarum*) and Bulbous Buttercup (*Ranunculus bulbosus*). Grasses and sedges include Quaking-grass (*Briza media*), Crested Hair-grass (*Koeleria macrantha*), Downy Oat-grass (*Avenula pubescens*), Spring-sedge (*Carex caryophyllea*) and Glaucous Sedge (*Carex flacca*). The highest quality calcareous grasslands include orchids and other herbs such as Mountain Everlasting (*Antennaria dioica*), Kidney Vetch (*Anthyllis vulneraria*), Harebell (*Campanula rotundifolia*), Greater Knapweed (*Centaurea scabiosa*), Autumn and Field Gentian (*Gentianella* spp.), Fairy Flax (*Linum catharticum*) and Cowslip (*Primula veris*). Additional species characteristic of calcareous rocky habitats are found in the Burren region.

Despite a number of conservation-focused farming schemes which bring about localised and regional improvements, the Overall Status is assessed as *Bad* with a deteriorating trend due to on-going habitat losses mainly associated with unsuitable grazing regimes, agricultural intensification causing loss of species-rich communities, and abandonment of farmland resulting in succession to scrub. This result is unchanged from 2019.

Maria Long



OVERALL STATUS: BAD

6230 SPECIES-RICH *NARDUS* GRASSLANDS*

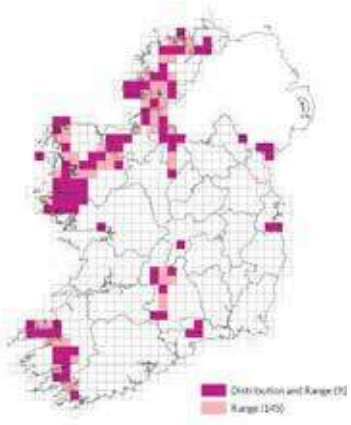
Habitat 6230 'Species-rich *Nardus* grasslands on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)' is typically found on siliceous substrates in upland areas (montane and sub-montane zone), usually near the upper limit of enclosed farmland. It has probably always been a relatively rare habitat in Ireland and it relies on extensive grazing, usually by sheep, to maintain the habitat over almost all of its range in Ireland. Habitat 6230 often occurs in a mosaic with heath. To qualify as the Annex I habitat, there must be a notable richness of species present.

Typically, this habitat occurs on slopes where there is flushing of at least mildly base-rich water, resulting in the occurrence of a range of species indicative of basic influence, such as Wild Thyme (*Thymus drucei*), Fairy Flax (*Linum catharticum*) and the moss *Ctenidium molluscum*, in association with species characteristic of acidic uplands, including Tormentil (*Potentilla erecta*) and Heath Bedstraw (*Galium saxatile*). It is this mix of species of calcareous and siliceous conditions that provides the requisite element of species richness.

A significant additional element of species richness is often provided by bryophytes, particularly in the far west of Ireland, but there should also be a species-rich element of vascular plants present. Grasslands on calcareous substrates such as limestone cannot be included within this habitat. Grasslands that show relatively high species richness but are flushed with strongly acidic water and are dominated by *Sphagnum* species or *Polytrichum commune* should also not be included within this habitat.

The Overall Status is assessed as *Bad* due to on-going pressures such as unsuitable grazing regimes (under- or overgrazing), conversion to other land use types (e.g., forestry, improved agricultural grassland), bracken encroachment and succession. The trend is deteriorating, a change from the stable trend recorded in 2019.

Rory Hodd



OVERALL STATUS: BAD

6410 *MOLINIA* MEADOWS

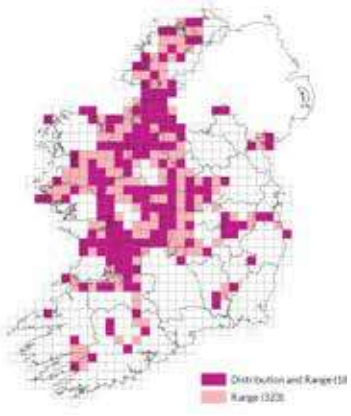
The Annex I habitat 6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) is represented in Ireland by both fen and grassland communities on nutrient-poor soils. The 6410 habitat is either managed as traditional hay meadow (typically cut once a year in late summer or autumn with the hay crop removed) or more usually as extensive pasture. Within Ireland, *Molinia* meadows occur in lowland plains on neutral to calcareous gleys, sometimes with a marl layer beneath the surface, or on peaty soils both in lowland and upland situations.

Molinia meadows generally have a central to north-western distribution in Ireland. *Cirsium dissectum* is one of the key indicator species for the habitat, and the distributions of 6410 and *Cirsium dissectum* are similar in Ireland. The Annex I habitat is less common in the east and south of the country, with only scattered instances recorded within those regions.

Typical species of the habitat, besides Purple Moor-grass (*Molinia caerulea*) and Meadow Thistle, include Sneezewort (*Achillea ptarmica*), small sedges such as Star Sedge (*Carex echinata*), Common Sedge (*C. nigra*) and Flea Sedge (*C. pulicaris*), Marsh Hawk's-beard (*Crepis paludosa*), Meadowsweet (*Filipendula ulmaria*), Fen Bedstraw (*Galium uliginosum*), Sharp-flowered Rush (*Juncus acutiflorus*), Heath Wood-rush (*Luzula multiflora*), Adder's-tongue (*Ophioglossum vulgatum*), Greater Bird's-foot-trefoil (*Lotus pedunculatus*), Tormentil (*Potentilla erecta*), Devil's-bit Scabious (*Succisa pratensis*) and Marsh Violet (*Viola palustris*).

The Overall Status is *Bad*, as it has been for the last three monitoring periods, and the overall trend is still deteriorating, due to on-going losses of habitat. Significant historical losses of this habitat have also occurred since the EU Habitats Directive came into force. The main pressures on the habitat are associated with agricultural intensification (e.g. land drainage, fertiliser application), undergrazing and forestry.

Maria Long



OVERALL STATUS: BAD

6430 HYDROPHILOUS TALL-HERB SWAMP

Hydrophilous tall-herb fringe communities are characterised by a high proportion of tall herb species in hydrophilous or nitrophilous conditions. The habitat occurs in two situations - upland, typically on base-rich ledges, and lowland, along the unmanaged margins of slow-moving rivers, lakes and other wetlands.

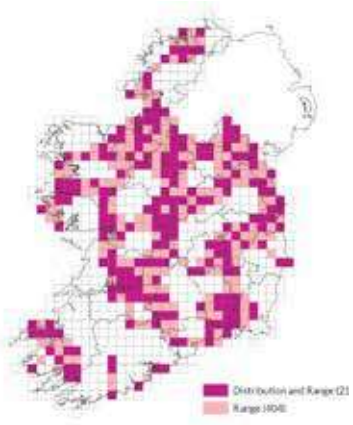
In upland situations, 6430 is a community of flushed ground with at least mildly base-rich water and a prominent component of tall herb species. It is typically restricted to fragmented, relict stands on inaccessible ledges away from grazing pressure. In the lowlands, the typical occurrence is as stands dominated by tall herbs, with a diversity of species present, fringing rivers, lakes and other wetlands, usually as a narrow strip and often seasonally inundated. There should be a diversity of tall herb species present, not a monodominant sward of one species with scattered herbs. Reeds and tall grasses and sedges do not form a significant component of the vegetation.

Tall herb species common to both variants include Wild Angelica (*Angelica sylvestris*), Marsh Hawk's-beard (*Crepis paludosa*), Meadowsweet (*Filipendula ulmaria*) and Common Valerian (*Valeriana officinalis*). Other tall herbs in the lowland variant include Cowbane (*Cicuta virosa*), Yellow Loosestrife (*Lysimachia vulgaris*), Purple-loosestrife (*Lythrum salicaria*), Greater Water-parsnip (*Sium latifolium*), Common Meadow-rue (*Thalictrum flavum*), and these are accompanied by smaller herbs such as Marsh-marigold (*Caltha palustris*), Hedge Bindweed (*Calystegia sepium*), Bittersweet (*Solanum dulcamara*) and Tufted Vetch (*Vicia cracca*). The upland variant contains such species as lady's mantles (*Alchemilla* spp.), Common Scurvygrasses (*Cochlearia officinalis* agg.), hawkweeds (*Hieracium* agg.), Alpine Saw-wort (*Saussurea alpina*) and Lesser Meadow-rue (*Thalictrum minus*).

The main pressures on the lowland habitat are invasive alien species, such as Himalayan Balsam (*Impatiens glandulifera*) and Giant Hogweed (*Heracleum mantegazzianum*), drainage, and impacts along riverbanks and canals to maintain paths for walking or access for fishing. In the uplands, overgrazing is an issue.

The Overall Status of the habitat is *Bad* with a deteriorating trend, as in the last reporting period.

Rory Hodd



OVERALL STATUS: BAD

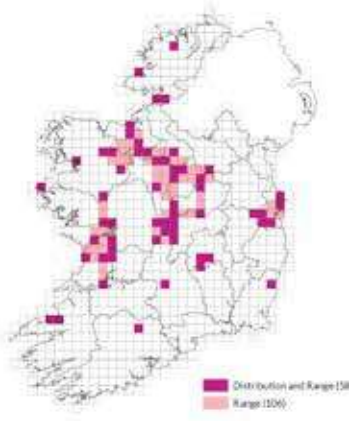
6510 HAY MEADOWS

The Annex I habitat 6510 Lowland hay meadows is represented in Ireland by mesotrophic semi-natural grasslands that are almost always managed as traditional hay meadows, typically cut once a year in late summer or autumn, with the hay crop removed. These meadows are synonymous with the fertile plains of the larger river systems such as the Shannon and Moy. However, they have been found on flatter ground amongst low hills and drumlins, and there are also some sites on the coast. Increasingly the habitat is also being found in demesnes and parks which are managed for nature. The habitat is only rarely found in submontane (200-400 m) areas. The areas of 6510 mapped in the Shannon Callows account for approximately 40% of the known area within the State.

Hay meadow grasslands are typically herb-rich and may include Yellow-rattle (*Rhinanthus minor*), Common Bird's-foot-trefoil (*Lotus corniculatus*), Oxeye Daisy (*Leucanthemum vulgare*) and orchids, as well as the nationally rare Great Burnet (*Sanguisorba officinalis*), Meadow Barley (*Hordeum secalinum*) and Smooth Brome (*Bromus racemosus*). More common species include Meadow Foxtail (*Alopecurus pratensis*), Common Knapweed (*Centaurea nigra*), Meadowsweet (*Filipendula ulmaria*), Cat's-ear (*Hypochaeris radicata*), hawkbits (*Leontodon* spp.) and Ribwort Plantain (*Plantago lanceolata*).

The Overall Status assessment for hay meadows is *Bad*, as in the previous three reporting periods. The main pressures on this habitat relate to agricultural practices such as intensification, abandonment and conversion to improved agricultural grassland. However, ecological improvements have been noted in some properties managed by State agencies where mowing regimes have been adjusted to enhance biodiversity. This has resulted in a change in overall trend from deteriorating to improving, although significant historical losses mean that the favourable reference values for range and area are still some way from being realised.

Maria Long



OVERALL STATUS: BAD

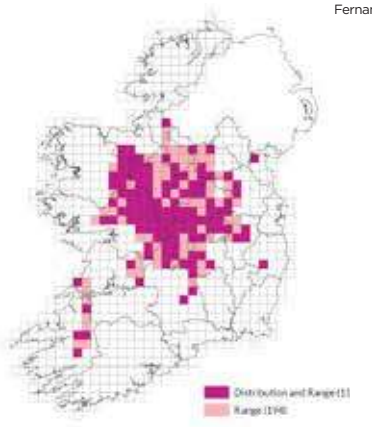
7110 RAISED BOGS (ACTIVE)*

Raised bogs are accumulations of deep acid peat (3-12 m) that originated in shallow lake basins or topographic depressions. They have a typical elevated surface or dome, which develops as raised bogs grow upwards from the surface. Raised bogs are primarily rainwater-fed (ombrotrophic) and characterised by acid and nutrient-poor conditions which support a distinctive suite of vegetation types. They support specialised plant assemblages dominated by a range of mosses of the genus *Sphagnum*. The bog surface may support a patterned micro-topography of pools, hummocks and lawns that provide a range of water regimes supporting different species assemblages. Raised bogs are more frequent in the lowlands of central and mid-west Ireland, occurring principally on land below 130 m. In Ireland they are confined to areas with an annual rainfall below 1,250 mm. Two sub-types are recognised: Western raised bogs (or Intermediate) and True Midland raised bogs.

Active raised bog is characterised by the presence of an acrotelm, which is defined as the living, actively growing upper layer of a raised bog, the surface of which is composed mainly of living bog bosses (*Sphagnum* spp.). Up until this reporting period, active raised bog was defined as occurring only on the high bog. However, a growing acknowledgement of the occurrence of peat-forming vegetation on cutover areas at some sites led to an NPWS appraisal of these habitats. This concluded that Active raised bog can be found in cutover areas. These areas have the capacity to develop into embryonic Active raised bog but longer time periods (>30 years) are likely to be required for high quality habitat to develop.

The main pressures on active raised bog are peat extraction, drainage, afforestation and burning. Active raised bog is also coming under increasing pressure from ammonia emissions and climate change. The Overall Status is assessed as *Bad*, unchanged since the last assessment, but the overall trend is now improving due to continued successful restoration efforts.

Fernando Fernandez



OVERALL STATUS: BAD

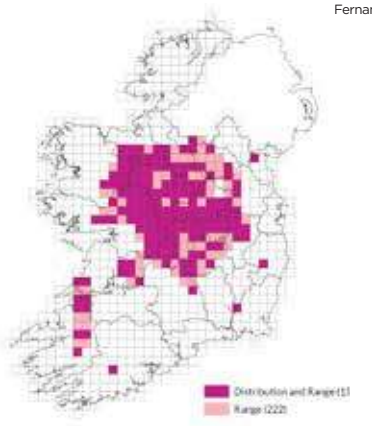
7120 DEGRADED RAISED BOGS

Raised bogs are accumulations of deep acid peat (3-12 m) that originated in shallow lake basins or topographic depressions. They have a typical elevated surface or dome, which develops as raised bogs grow upwards from the surface. Raised bogs are primarily rainwater-fed (ombrotrophic) and characterised by acid and nutrient-poor conditions which support a distinctive suite of vegetation types. They support specialised plant assemblages dominated by a range of mosses of the genus *Sphagnum*. The bog surface may support a patterned micro-topography of pools, hummocks and lawns that provide a range of water regimes supporting different species assemblages. Raised bogs are more frequent in the lowlands of central and mid-west Ireland, occurring principally on land below 130 m. In Ireland they are confined to areas with an annual rainfall below 1,250 mm. Two sub-types are recognised: Western raised bogs (or Intermediate) and True Midland raised bogs.

Degraded raised bog is characterised by the complete absence (or patchy, thin cover) of an acrotelm, which is the living, peat-forming upper layer. Previously, all vegetated areas of high bog not delineated as Active raised bog were defined as Degraded raised bog, on the assumption that most could be restored to active peat-forming conditions. However, this definition changed in the last reporting period. Degraded raised bog is now defined by an eco-hydrological model that predicts where there is potential to restore active conditions on the high bog. Only areas with the physical conditions capable of supporting Active raised bog are now considered as Degraded raised bog, and these areas must still be capable of natural regeneration to active bog within 30 years. The remainder of the high bog that is neither active not degraded raised bog is now referred to as 'supporting raised bog habitat'.

The main pressures on Degraded raised bog are peat extraction, drainage, afforestation and burning. Degraded raised bog is also coming under increasing pressure from ammonia emissions and climate change. The Overall Status is assessed as *Bad*, unchanged since the last assessment, but the overall trend is now improving due to continued successful restoration efforts.

Fernando Fernandez



OVERALL STATUS: BAD

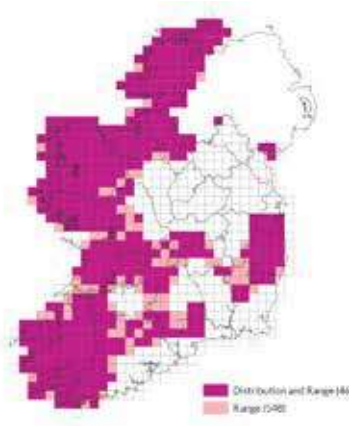
7130 BLANKET BOG (ACTIVE)*

Blanket bog is a climatic climax ecosystem occurring in Ireland's uplands and western lowlands where mean annual rainfall exceeds 1,250 mm, and on slopes up to *c*.25° in hyperoceanic areas. It occurs on peat thickness of generally >50 cm (up to 4 m on uplands and up to 8 m in lowlands). Both active and non-active 7130 habitats qualify as Annex I habitat. The former has priority status and supports areas of vegetation that are normally peat-forming. Non-active Blanket bog is defined based on likely rate of recovery of peat-forming vegetation. The assessment presented here is for the combined active and non-active Blanket bog habitat.

Plant communities and microtopography of Blanket bog are variable. Quality lowland examples typically support Black Bog-rush (*Schoenus nigricans*), Purple Moor-grass (*Molinia caerulea*), Common Cottongrass (*Eriophorum angustifolium*), Cross-leaved Heath (*Erica tetralix*), White Beak-sedge (*Rhynchospora alba*) and Ling (*Calluna vulgaris*). Hummocks of *Sphagnum rubellum* and *S. papillosum* are typical, sometimes topped by *Racomitrium lanuginosum*. Pools support aquatic species, *Sphagnum cuspidatum, S. denticulatum*, sundews (*Drosera* spp.), bladderworts (*Utricularia* spp.), and locally Pipewort (*Eriocaulon aquaticum*) and Water Lobelia (*Lobelia dortmanna*). Upland blanket bog can have considerable dwarf shrub cover of Ling, Crowberry (*Empetrum nigrum*) and Bilberry (*Vaccinium myrtillus*), and in the sward, Deergrass and Hare's-tail Cottongrass (*Eriophorum vaginatum*). In wet, intact upland bog, a well-developed bryophyte layer occurs, with *Sphagnum capillifolium* often dominant, alongside *S. papillosum, Hypnum cupressiforme, Racomitrium lanuginosum* and *Diplophyllum albicans*. Lichens of the *Cladonia* genus are characteristic of both types of blanket bog.

The main pressures are peat extraction, overgrazing, burning, afforestation, and agricultural activities causing nitrogen deposition. Climate change, with extremes in temperature and precipitation, is an increasing threat. The Overall Status is assessed as *Bad* and deteriorating, as in the last two monitoring reports.

Rory Hodd



OVERALL STATUS: BAD

7140 TRANSITION MIRES

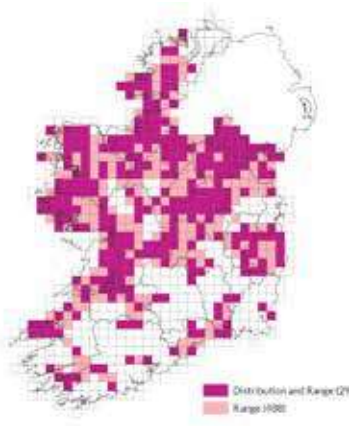
Transition mires are peat-forming communities, typically occurring as swards or floating mats over saturated peat or open water. The habitat encompasses a broad range of plant communities characteristic of ombrotrophic to soligenous waters. Vegetation ranges from extensive floating mats of small to medium sedges with *Sphagnum*, to localised basic flushes over acid peat with base-tolerant *Sphagnum* and some brown mosses. Aquatic and semi-aquatic vegetation is frequently present.

Transition mires are generally mineral-rich (but not necessarily calcium-rich), and have oligotrophic to mesotrophic water with slightly basic to moderately acidic pH. Transition mires may occupy a transitional zone between bog and fen vegetation (such as in the lagg zone of a raised bog), or where groundwater seeps through deep peat (upland soligenous flushes, for instance). They can also represent a transitional stage between groundwater-fed fen and rainwater-fed bog, as peat accumulates and isolates the vegetation from groundwater.

This habitat is widespread but localised in Ireland. It has been recorded in blanket bog regions in the north and west, in limestone regions in the north-west and midlands, and in inter-drumlin hollows and lakes in the border counties. A number of rare and protected species occur in, or are confined to, transition mire habitats in Ireland, such as the Flora (Protection) Order 2022 species Shining Sickle Moss (*Hamatocaulis vernicosus*) (also an Annex II species, 6216), Bog Orchid (*Hammarbya paludosa*) and Slender Cottongrass (*Eriophorum gracile*).

The main pressures are water pollution, drainage and hydrological changes, as well as grazing/agricultural management. The Overall Status is assessed as *Bad*, as in the last three reporting periods. The trend is assessed as deteriorating, this change from the stable trend recorded in 2019 being due to the availability of more accurate data from a recent national fen survey.

Joanne Denyer



OVERALL STATUS: BAD

7150 RHYNCHOSPORION DEPRESSIONS

The habitat 'Depressions on peat substrates of the Rhynchosporion', which is defined by the presence of *Rhynchospora alba* and/or *R. fusca* and a number of other species, is considered to be an integral part and microhabitat of active raised bog and blanket bog.

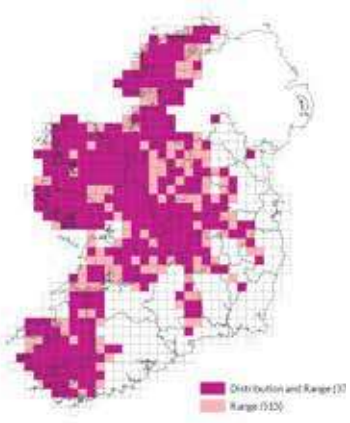
In raised bogs, *Rhynchospora* vegetation communities are only considered as 7150 when they occur in their most developed form in the wettest sections of the active raised bogs, which correspond with pools, *Sphagnum* lawns and hollows.

It is also an integral part of blanket bog ecosystems, particularly of lowland blanket bog along the western seaboard. Only when *Rhynchospora* species are associated with plant communities of the naturally wetter, sometimes quaking and hydrologically most sensitive areas of blanket bog, and associated wetland habitats, are they identified as 7150. Within such areas, 7150 habitat tends to occur in hollows or small depressions or as extensive water tracks and interconnecting shallow pool areas around hummocks, along pool margins and on low-level flats or lawns that often form an interface between hummocks and pools. It can also occur within flushed areas.

Data from extensive blanket bog surveys show that Rhynchosporion vegetation does not appear to occur on Ireland's blanket bog above 300 m. *Rhynchospora alba* can be found extensively as a single species in modified habitats, such as degraded raised and blanket bogs. It can rapidly colonise disturbed areas and form a depauperate community that lacks the other species indicative of the 7150 habitat and is therefore not considered to correspond with this habitat in the Irish context.

The main pressures on 7150 habitat are associated with activities impacting on the supporting bog habitats, especially peat extraction, overgrazing, burning, drainage, afforestation and agricultural activities causing nitrogen deposition. Climate change is identified as a potential threat, through predicted greater temperature extremes, more frequent and or/prolonged droughts and precipitation extremes. The Overall Status of the habitat is assessed as *Inadequate*, a change since 2019 that is primarily due to use of a different method in the assessment of structure and functions. The overall trend of deteriorating is unchanged.

Orla Daly



OVERALL STATUS: INADEQUATE

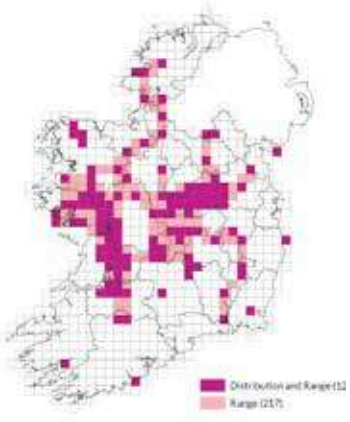
7210 *CLADIUM* FENS*

The Annex I habitat *Cladium* fens refers to *Cladium mariscus* beds which are in contact with species-rich vegetation of small-sedge fens (i.e., *Cladium mariscus* and species of the Caricion davallianae). This can occur where there are species-rich open swards of *Cladium mariscus* with elements of small-sedge fen, fen meadow and tall-herb fen, or where mono-dominant stands of *Cladium mariscus* transition to or form a mosaic with small-sedge fen, fen meadow and tall-herb fen habitats. This latter situation tends to be more common in Ireland. In these instances, the whole stand of *Cladium mariscus*, including areas that support species-poor vegetation, is referable to the Annex I habitat.

Cladium fen can occur in a wide range of habitats, in both topogenous and soligenous situations, such as the emergent zone of calcareous lakes, valley fens, floodplains, wet meadows and mineral-rich flush areas within blanket bogs in the west of Ireland. The habitat is characterised by waterlogged peat soils, a high water table (at or above the surface), and near neutral to alkaline, oligotrophic to mesotrophic water. *Cladium* fens are found throughout Ireland, most commonly in lowland areas in the midlands and west. They are occasional elsewhere.

The main pressures on the habitat are from drainage, pollution and issues related to abandonment. The Overall Status is assessed as *Bad* with a deteriorating trend. The change in status and trend, from Inadequate and stable in 2019, is due to the availability of more accurate data from a recent national fen survey.

Joanne Denyer



OVERALL STATUS: BAD

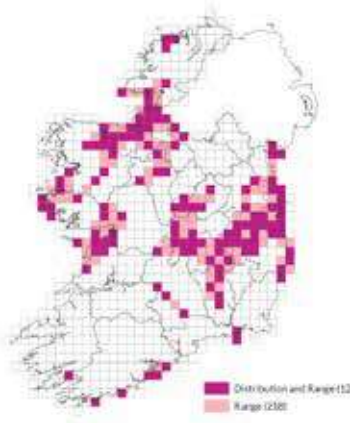
7220 PETRIFYING SPRINGS*

Petrifying springs are a specialised habitat that forms where calcareous waters deposit tufa, a porous rock made of calcium carbonate. The tufa formation may be small deposits around the bases of plants within the spring, or very large mounds and cascades. The resulting ecological conditions, with high pH, constant inundation by water and deposition of precipitated calcium carbonate, constitute a challenging environment for species to colonise, and the communities associated with petrifying springs are therefore highly specialised. Springheads may be distinct point locations giving rise to small streams immediately below the point of emergence, or water may seep to the surface in a more diffuse pattern over a larger area. Petrifying springs can occur in semi-natural habitats such as coastal cliffs, upland fens and wooded springs, but are also found in artificial habitats such as quarries, seepages on walls and roadside ditches.

Irish petrifying springs are usually dominated by bryophytes, including *Bryum pseudotriquetrum, Campylium stellatum, Didymodon tophaceus, Palustriella* spp., *Philonotis calcarea* and *Scorpidium* spp. Vascular plants include Few-flowered Spike-rush (*Eleocharis quinqueflora*), Bog Pimpernel (*Lysimachia tenella*), Grass-of-Parnassus (*Parnassia palustris*), Common Butterwort (*Pinguicula vulgaris*) and Lesser Clubmoss (*Selaginella selaginoides*). The stonewort *Chara vulgaris* is also characteristic. High-quality positive indicator species, which include Yellow Saxifrage (*Saxifraga aizoides*) and the bryophytes *Mesoptychia bantriensis, Moerckia flotoviana, Catoscopium nigritum, Seligeria* spp. and *Tomentypnum nitens*, are largely restricted to western springs, particularly in the north-west.

The key pressures on the habitat relate to water quality, changes to hydrology, and abandonment. The Overall Status for petrifying springs is *Inadequate*, as in 2019, but the overall trend is now reported as stable rather than deteriorating due to more accurate data.

Melinda Lyons



OVERALL STATUS: INADEQUATE

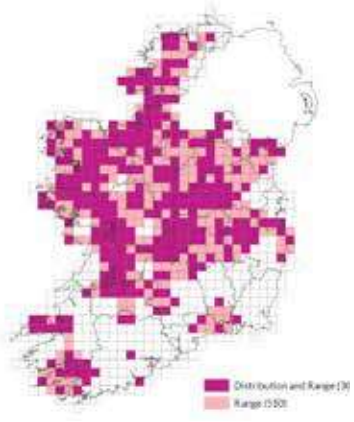
7230 ALKALINE FENS

Alkaline fens are groundwater-fed, generally peat-forming systems with extensive areas of species-rich small sedge and brown moss communities. They occur in areas where there is a high water table and a base-rich, often calcareous, water supply. Alkaline fens can develop in areas where vertical water movement predominates (topogenous), such as poorly drained basins or hollows and open water transitions; or where horizontal water movement is also important (soligenous), such as flushes, valley fens and the laggs of raised bogs. However, this distinction is not always clear, such as in large floodplain fens which can include both elements.

Alkaline fens are relatively widespread in Ireland. The most extensive areas of alkaline fens occur in lowland basins associated with limestone groundwater bodies (most often in western and midland areas). Alkaline fens associated with flushes and open water transitions tend to be smaller, but may be more widespread than those in lowland basins.

The main pressures on the habitat are from drainage and other hydrological changes (e.g., for agriculture or forestry), conversion to a different land-use type, pollution and issues related to overgrazing or abandonment. The Overall Status is assessed as *Bad* with a deteriorating trend, unchanged from 2019.

Joanne Denyer



OVERALL STATUS: BAD

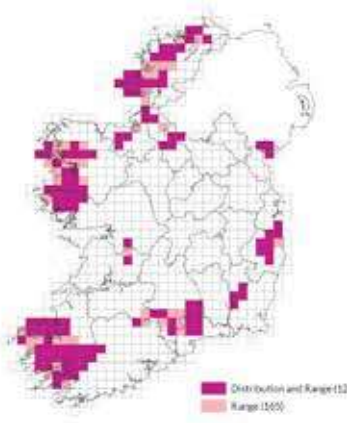
8110 SILICEOUS SCREE

Siliceous scree habitat in Ireland consists of accumulations of siliceous rock fragments on slopes below upland cliffs or on exposed/frost-shattered mountain summits or ridges. While there is no strict lower altitudinal threshold, this habitat is interpreted as referring to examples of scree occurring in a broadly upland landscape context. Rock sizes may vary from large blocks ('talus') that can be very stable, to smaller fragments that may be highly mobile. Areas of loose rock on summits or plateaux exposed by erosion of peat and areas akin to fell-field are not included in 8110 habitat, nor are screes beneath a vegetation cover that indicates other habitats (e.g. dry heath or scrub).

Siliceous scree vegetation can be very sparse and consist chiefly of bryophyte and lichen assemblages, though calcifuge ferns (e.g. Broad Buckler-fern (*Dryopteris dilatata*) and Wilson's Filmy-fern (*Hymenophyllum wilsonii*) and, in western areas, the saxifrage species St. Patrick's-cabbage (*Saxifraga spathularis*) are typically present. Siliceous scree supports several species of high conservation value including legally protected (Flora Protection Order, 2022) and Red-listed bryophytes, particularly those of the 'mixed northern hepatic mat' community, including *Adelanthus lindenbergianus*, which are also rare or threatened on a European scale.

The only medium-influence pressure identified as impacting on siliceous scree is overgrazing, with all other pressures rated as being of low influence. Climate change is identified as an increasing threat, through more frequent temperature and precipitation extremes and more frequent or more prolonged droughts. The Overall Status is *Inadequate* with a stable trend, unchanged since the 2019 assessment.

Rory Hodd



OVERALL STATUS: INADEQUATE

8120 CALCAREOUS SCREE

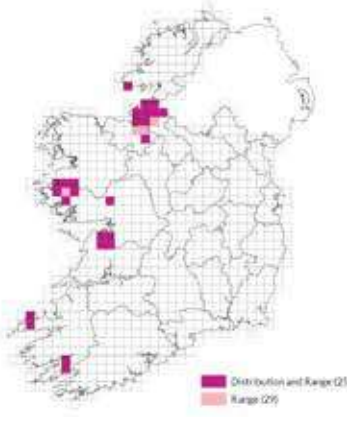
Calcareous scree habitat in an Irish upland context consists of accumulations of calcareous rock fragments on slopes below upland cliffs and on rocky slopes. Rocks may vary in size from large blocks ('talus') that can be very stable, to smaller fragments that can be highly mobile. Most areas of calcareous scree in Ireland are derived from a limestone bedrock, but in some instances are derived from other sedimentary rocks, as well as metamorphic rocks, such as Connemara marble. Areas of scree beneath woodland, scrub or other habitats are not included within this habitat and should be assigned to the covering habitat. While there is no strict altitudinal threshold, 8120 habitat is limited to examples of scree occurring in a broadly upland landscape context.

The vegetation may be very sparse and can chiefly comprise bryophyte and lichen assemblages, although calcicole ferns, including Maidenhair Spleenwort (*Asplenium trichomanes*) and Black Spleenwort (*A. adiantum-nigrum*), are typically present, alongside a suite of other characteristic vascular plants of calcareous habitats.

There are no rare bryophytes specifically associated with calcareous scree, although some rare bryophytes, such as *Didymodon maximus*, which is listed on the Flora (Protection) Order, 2022, may occur in this habitat. While the presence of arctic-alpine species, such as Northern Rock-cress (*Cardaminopsis petraea*), Purple Saxifrage (*Saxifraga oppositifolia*), Holly-fern (*Polystichum lonchitis*) and Green Spleenwort (*Asplenium viride*), indicates high-quality examples of the habitat, their presence is not deemed an essential requisite.

The only medium-influence pressure identified as impacting on calcareous scree is overgrazing, with all other pressures rated as being of low influence. Climate change is identified as an increasing threat, through more frequent temperature and precipitation extremes and more frequent or more prolonged droughts. The Overall Status is *Inadequate* with a stable trend, unchanged since the 2019 assessment.

Rory Hodd



OVERALL STATUS: INADEQUATE

8210 CALCAREOUS ROCKY SLOPES

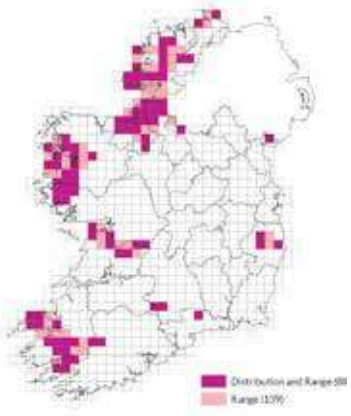
Calcareous rocky slopes habitat is defined as vegetation occurring in crevices, cracks and overhangs of rock ('chasmophytic' vegetation) where there is a calcareous influence. The bedrock can be strongly basic limestone, as well as sandstone or other siliceous rocks, where base-rich water is flushed out of localised bands of rock with higher base content. This habitat also occurs on rocks of metamorphic origin, for example mica schist and Connemara marble. 8210 habitat is limited to a broadly upland context and excludes areas of rockface vegetated with heath, grassland or tall herbs.

The key characteristic indicator species of this habitat are calcicole fern and saxifrage species, including the ferns Green Spleenwort (*Asplenium viride*), Maidenhair Spleenwort (*A. trichomanes*), Holly-fern (*Polystichum lonchitis*) and Brittle Bladder-fern (*Cystopteris fragilis*), and the saxifrages Purple Saxifrage (*Saxifraga oppositifolia*) and Yellow Saxifrage (*S. aizoides*). Saxicolous bryophytes are also an important component of this habitat, with characteristic species including *Tortella tortuosa, Neckera crispa* and *Orthothecium rufescens*. Although not currently on the list of indicator species, the mosses *Amphidium mougeotii* and *Anoectangium aestivum* are strongly indicative of this habitat where the substrate is primarily siliceous.

A range of rare and protected vascular plant and bryophyte species are restricted, or almost restricted, to this habitat in Ireland including Alpine Saxifrage (*Micranthes nivalis)*, Northern Rock-cress (*Cardaminopsis petraea)*, and the bryophytes *Encalypta rhaptocarpa*, *Myurella julacea* and *Gymnomitrion coralloides*. The presence of arctic-alpine species is not an essential requisite, but they are an indicator of high-quality examples of the habitat.

Pressures on the habitat are associated with overgrazing, agricultural activities generating air pollution, and the non-native invasive plant New Zealand Willowherb (*Epilobium brunnescens*). Climate change is identified as an increasing threat, through more frequent temperature and precipitation extremes and more frequent or more prolonged droughts. The Overall Status is assessed as *Inadequate* with a stable trend. This result is unchanged since the previous assessment in 2019.

Rory Hodd



OVERALL STATUS: INADEQUATE

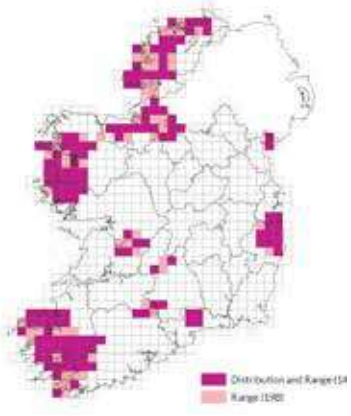
8220 SILICEOUS ROCKY SLOPES

Siliceous rocky slopes habitat in an Irish upland context comprises vertical or near vertical exposures of siliceous bedrock with clefts, crevices, fissures, and overhangs that support chasmophytic vegetation (i.e., vegetation in crevices). While there is no strict lower altitudinal threshold, this habitat is interpreted as referring to examples of chasmophytic vegetation occurring in a broadly upland landscape context. The vegetation is characterised by calcifuge ferns such as Broad Buckler-fern (*Dryopteris dilatata*) and Wilson's Filmy-fern (*Hymenophyllum wilsonii*), saxifrages (especially St. Patrick's-cabbage (*Saxifraga spathularis*) in the west and south) and saxicolous bryophytes (e.g. *Isothecium myosuroides* and *Diplophyllum albicans*) that require moist, shaded, infertile microhabitats.

This is a highly important habitat for bryophytes, with upland siliceous rocks supporting many rare and threatened species. Areas of heath, grassland or tall herb communities growing on rock faces or ledges are not included in 8220 habitat and while the presence of arctic-alpine species indicates high-quality examples of the habitat, they are not deemed an essential requisite.

The only medium-impact pressure recorded for this habitat is the non-native invasive plant New Zealand Willowherb (*Epilobium brunnescens*). All other impacts have been assessed as low influence. Climate change is identified as an increasing threat, through more frequent temperature and precipitation extremes and more frequent or more prolonged droughts. The Overall Status is assessed as *Inadequate* with a stable trend. This result is unchanged since the previous assessment in 2019.

Rory Hodd



OVERALL STATUS: INADEQUATE

8240 LIMESTONE PAVEMENT*

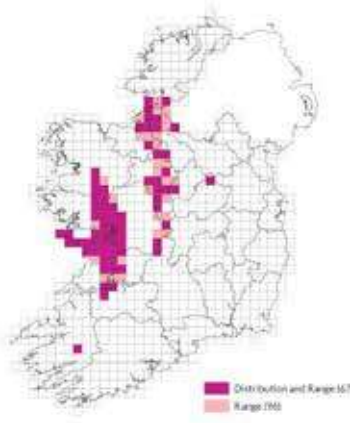
Limestone pavement is a priority EU Annex I habitat. The structure of limestone pavement habitat typically consists of blocks of rock, known as clints, separated by fissures or grikes. Sometimes due to weathering this structure is less defined, especially in the 'shattered' variant of pavement. Limestone pavement can occur as areas of exposed rock with very little vegetation or in association with grassland, heath, scrub, or woodland communities.

The main vascular plant species associated with limestone pavement habitat include scattered low-growing woody species such as Hazel (*Corylus avellana*), Ivy (*Hedera helix*), Holly (*Ilex aquifolium*), Burnet Rose (*Rosa spinosissima*) and Bramble (*Rubus fruticosus*), and herbaceous species such as Blue Moor-grass (*Sesleria caerulea*), Wood Sage (*Teucrium scorodonia*), Wall Lettuce (*Mycelis muralis*), Herb-Robert (*Geranium robertianum*), Carline Thistle (*Carlina vulgaris*) and Glaucous Sedge (*Carex flacca*). A suite of calcicole ferns are also usually found, including Wall-rue (*Asplenium ruta-muraria*), Rustyback (*Asplenium ceterach*) and, in the deeper grikes, the shade-loving Hart's-tongue (*Asplenium scolopendrium*). Characteristic bryophytes are *Ctenidium molluscum*, *Tortella tortuosa* and *Neckera crispa*.

The wooded variant of limestone pavement has been recorded in areas of Hazel woodland with a low canopy of at least 3 m and minimal soil depth. Under canopy, the surface of the limestone pavement is sometimes completely covered by bryophytes such as *Eurhynchium striatum, Neckera crispa* and *Thamnobryum alopecurum*.

The Overall Status is assessed as *Inadequate* due to continuing area losses associated with conversion to agricultural land and housing construction, as well as scrub encroachment caused by undergrazing. The trend is stable. This is unchanged since the 2019 assessment.

Jim Martin



OVERALL STATUS: INADEQUATE

8310 CAVES

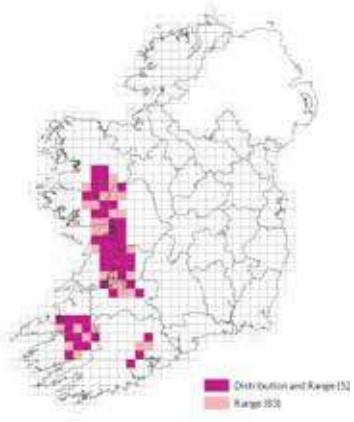
There is little evidence that Irish caves support much in the way of specialised or endemic fauna. However, the Lesser Horseshoe Bat (*Rhinolophus hipposideros*), which is listed on Annex II of the Habitats Directive, occurs in caves in Ireland. Consequently, in practice, this EU habitat is confined in Ireland to caves which are not used for tourism and host important numbers of Lesser Horseshoe Bat.

The Lesser Horseshoe Bat is mainly restricted to six western counties: Mayo, Galway, Clare, Limerick, Kerry and Cork. It requires cool, stable temperatures and minimal disturbance for winter hibernation and suitable caves are selected where available. Lesser Horseshoe Bats may also turn up in caves at other times of year, although not in significant numbers.

Although individual caves may be subject to disturbance (e.g. dumping, vandalism) and winter flooding can cause mortalities of bats in certain caves, no significant pressures or threats have been identified for this habitat nationally. Most of the important cave sites are protected as SACs. Many of the vulnerable bat caves are already protected from disturbance through grilling. Regular monitoring is underway to identify further vulnerable cave sites and where necessary these will also be grilled.

Therefore, despite an overall assessment of Inadequate for the typical species (Lesser Horseshoe Bat), the Overall Status of the cave habitat has been assessed as *Favourable*, as it has been over the last three reporting periods. The trend is improving, which is a change from the last reporting period. This is due to the expansion in range of the Lesser Horseshoe Bat.

F. Greenaway



OVERALL STATUS: FAVOURABLE

8330 SEA CAVES

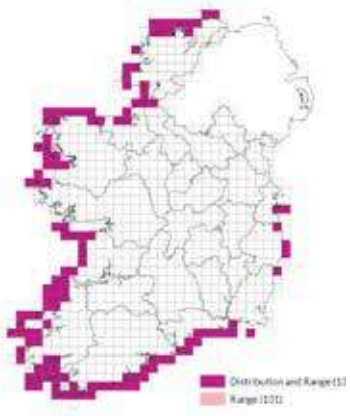
In Ireland, sea caves are defined as caves which are fully submerged below sea level, or which have an intertidal component to them. The entrances of sea caves usually occur on sea cliff faces, with the cave extending both above and below sea level. A number of sea caves are known to be completely submerged, others form tunnels or caverns. Some sea caves, such as Poll na bPéist, Inis Mór, Co. Galway, have openings both below sea level and on the surface.

In Ireland, sea caves present a marked difference from the surrounding reef habitat due to their different physical characteristics such as inclination, wave surge, scour, and shade. These can change rapidly from the cave entrance to the inner parts of the cave, leading to a marked zonation in the communities present. Where a bank of boulders or other hard substrate is present at the back of a cave and where the area is not continually submerged, it may be used as a haul-out area by Grey Seals.

Sea caves appear to be extensive around the coast of Ireland. The west coast of Ireland has a varied geology that includes large areas of limestone bedrock, which is particularly suitable to the formation of sea caves. Sea caves are also known to occur on the south and north coasts of Ireland, and to a lesser degree in the east. However, their distribution along the south-east coast appears to be limited due to geological factors.

There are no signficant pressures impacting on this habitat, and the Overall Status is assessed as *Favourable*. This is the same assessment as in the last three reporting periods.

MERC



OVERALL STATUS: FAVOURABLE

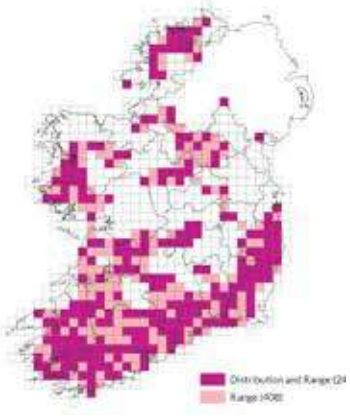
91A0 OLD OAK WOODLAND

Old oak woodland is characterised by a number of diverse elements coming together in a fully functioning system. The soil is usually acidic, often a podzol, brown earth or grey-brown podzol, and generally well drained. This supports a characteristic flora. In areas with high rainfall a western oceanic subtype occurs that is rich in bryophytes, lichens and filmy ferns. A drier, comparatively species-poor subtype occurs on less rocky terrain. A third, more base-rich subtype is also found, differing from the previous two in the greater diversity of tree and herb species.

Well-developed old oak woods are multi-layered, having a canopy, understorey, shrub, dwarf shrub, field and ground layers. Sessile Oak (*Quercus petraea*) or the hybrid *Quercus* x *rosacea* should make up much of the canopy, with birches (*Betula* spp.) and Rowan (*Sorbus aucuparia*) also present. Holly (*Ilex aquifolium*) and Hazel (*Corylus avellana*) are generally frequent in the shrub layer. A dwarf shrub layer of low woody species such as Bilberry (*Vaccinium myrtillus*) or Ling (*Calluna vulgaris*) often occurs. A field layer of ferns such as Hard-fern (*Blechnum spicant*), polypodies (*Polypodium* spp.) and buckler-ferns (*Dryopteris* spp.), and flowering plants such as Great Wood-rush (*Luzula sylvatica*) and Wood-sorrel (*Oxalis acetosella*) are typical. Bluebell (*Hyacinthoides non-scripta*) may be present on more nutrient-rich soils. The ground (bryophyte) layer is usually well developed, consisting of a diverse range of mosses, including *Rhytidiadelphus* spp., *Dicranum* spp., *Polytrichum formosum, Loeskeobryum brevirostre, Mnium hornum*, *Plagiothecium undulatum, Pseudotaxiphyllum elegans,* and liverworts such as *Diplophyllum albicans, Saccogyna viticulosa* and *Scapania* spp. Other liverwort species, such as *Calypogeia* spp., *Frullania* spp. *Plagiochila* spp., *Lepidozia* spp. and *Bazzania trilobata*, may also occur, particularly in western Sessile Oak woodlands where epiphytes are typically abundant.

Historical habitat loss has occurred and still continues, although at a very low level. However, the greatest on-going pressures on these woods come from invasive non-native species such as *Rhododendron ponticum*, Cherry Laurel (*Prunus laurocerasus*) and Beech (*Fagus sylvatica*), and overgrazing by deer. The Overall Status assessment is *Bad* with a deteriorating trend, unchanged since the 2019 report.

Orla Daly



OVERALL STATUS: BAD

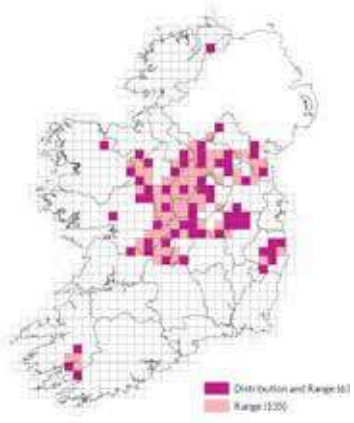
91D0 BOG WOODLAND*

Bog woodland occurs in three distinct habitats in Ireland: on intact raised bogs, where it is associated with low-flow flushes on the high bog; on cutover bog, where it occurs in association with a weak groundwater influence; and within Sessile Oak woodlands in association with nutrient-poor flushes. They are mostly found in the midlands, the mid-west, the drumlin belt of the north midlands and in upland valleys. Bog woodlands are dominated by Downy Birch (*Betula pubescens*), with small amounts of willow, mostly Eared Willow (*Salix aurita*) or Grey Willow (*Salix cinerea*). Locally, there may be small amounts of Scots Pine (*Pinus sylvestris*), especially on raised bogs. The dwarf shrub and field layers may be poorly to well developed. Dwarf shrub species can include Ling (*Calluna vulgaris*), Bilberry (*Vaccinium myrtillus*) and Cranberry (*Vaccinium oxycoccos*). Field layer species can include Purple Moor-grass (*Molinia caerulea*), Soft Rush (*Juncus effusus*) and ferns (e.g. *Dryopteris* spp.). The bryophyte layer has a characteristic luxuriant growth of *Sphagnum* species. *Polytrichum commune* and *Aulacomnium palustre* are also typical.

Bog woodlands are closely linked to precise hydrological conditions that are required for both their initiation and maintenance. These conditions are characteristically restricted to small areas, and consequently the area of individual bog woodlands is typically small. The long-term dynamics of bog woodlands is still poorly understood. Bog woodlands on raised bog and within Sessile Oak woodlands are considered more or less permanent, provided hydrology remains stable, whereas bog woodlands on cutover may represent a more transient community that gradually reverts to raised bog or dries out to become another woodland type.

A number of pressures have been identified in the current reporting period, including invasive species, overgrazing by deer, expansion of Bracken (*Pteridium aquilinum*) due to drying out, drainage and damage from burning. The Overall Status assessment is *Bad* with a deteriorating trend. This change from the Favourable assessment in 2019 is due to genuine change and the use of a different method when assessing grazing.

Fionnuala O'Neill



OVERALL STATUS: BAD

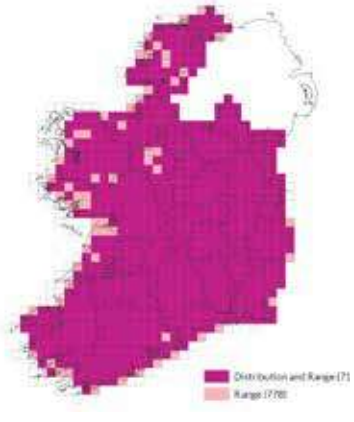
91E0 ALLUVIAL WOODLAND*

Two classes of this habitat exist in Ireland, both occurring on heavy soils that are periodically inundated by the rise of water levels. The more common type is that of the riparian forests of Ash (*Fraxinus excelsior*) and Alder (*Alnus glutinosa*) (*Alno-Padion*) of temperate and Boreal Europe lowland and hill watercourses. The other type is the gallery forests of tall willows (*Salix* spp.) (*Salicion albae*) that occur alongside lowland river channels and occasionally on river islands, where the tree roots are almost continuously submerged. These distinctive woodlands are dominated by archaeophyte willows, such as White Willow (*Salix alba*), Osier (*S. viminalis*) and Almond Willow (*S. triandra*), sometimes accompanied by the native Grey Willow (*S. cinerea*), but Alder should be rare. In addition to these two classes, the interpretation of the habitat for Ireland has been broadened to include lakeside wet woodland: Alder carr (*Alnion glutinosae*) dominated by Alder, and Willow carr (*Salicion cinereae*) dominated by Grey Willow.

The typical canopy species in alluvial woodland are willows, Ash and Alder, and one or more of these should comprise the majority of the canopy. Birches (*Betula* spp.) and Hawthorn (*Crataegus monogyna*) are frequently found, with other tree species such as Pedunculate Oak (*Quercus robur*) and Wych Elm (*Ulmus glabra*) occurring on better-drained soils. A luxuriant and diverse herb layer is characteristic of all variations of the habitat, with typical plants including Reed Canary-grass (*Phalaris arundinacea*), Meadowsweet (*Filipendula ulmaria*), Water Mint (*Mentha aquatica*), Remote Sedge (*Carex remota*), Gypsywort (*Lycopus europaeus*), Yellow Iris (*Iris pseudacorus*) and Common Nettle (*Urtica dioica*). Vernal species such as Lesser Celandine (*Ficaria verna*) and Wood Anemone (*Anemone nemorosa*) may also occur. The bryophyte layer contains robust pleurocarps such as *Thamnobryum alopecurum, Climacium dendroides* and *Calliergonella cuspidata*.

The main pressures are invasive plant species, notably Himalayan Balsam (*Impatiens glandulifera*), overgrazing by deer, the fungal disease Ash dieback, and hydrological pressures such as drainage and modification of hydrological flow. The Overall Status assessment is *Bad* with a deteriorating trend, unchanged since the 2019 report.

Orla Daly



OVERALL STATUS: BAD

91J0 YEW WOODLAND*

Yew woodland is a highly restricted habitat type in Ireland, only occurring at a limited number of sites in the south-west of the country, predominantly on shallow soils over limestone pavement or outcrops. The canopy of this woodland is typically dominated by Yew (*Taxus baccata*), with other canopy species including Ash (*Fraxinus excelsior*) and the introduced Beech (*Fagus sylvatica*). Hazel (*Corylus avellana*) and Holly (*Ilex aquifolium*) are components of the shrub layer, although typically occurring in small quantities. The woodland's dense evergreen canopy can restrict regeneration, which is typically limited or absent.

The field layer is characteristically both species-poor and limited in cover, with the most frequent and abundant species being Ivy (*Hedera helix sensu lato*), which is locally dominant, False Brome (*Brachypodium sylvaticum*), Common Dog-violet (*Viola riviniana*) and ferns, in particular Hart's-tongue (*Asplenium scolopendrium*). The rocky woodland floor can often support an extensive carpet of bryophytes, dominated by a few robust pleurocarpous mosses including *Thamnobryum alopecurum* and *Isothecium myosuroides*. In east Galway (Kylagowan), Yew woodland with Sessile Oak (*Quercus petraea*) and Holly occurs on podzols over acidic tills, and the associated field layer is typical of the Annex I 91A0 old oak woodland habitat. Yew occurs as the dominant species in the sub-canopy within this woodland. Yew is fairly common throughout the woodlands and plantations in the vicinity.

The main pressures on this habitat are overgrazing by deer, invasive plant species (including Sycamore (*Acer pseudoplatanus*), *Rhododendron ponticum* and Cherry Laurel (*Prunus laurocerasus*)), and Ash dieback disease. The Overall Status assessment is *Bad* with a stable trend, unchanged since the 2019 report.

Orla Daly

OVERALL STATUS: BAD

SPECIES

Sphagnum moss: Fernando Fernandez

6985 KILLARNEY FERN *(Vandenboschia speciosa)*

ANNEX II, IV

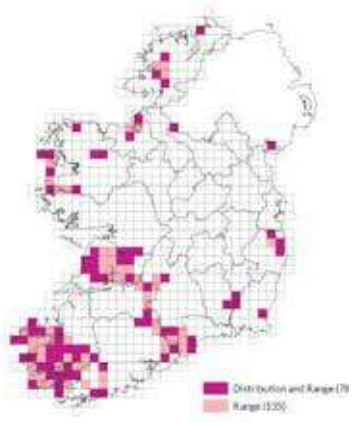
The Killarney Fern (*Vandenboschia speciosa*) is a large-sized, evergreen, perennial filmy fern in the family Hymenophyllaceae. It is restricted to damp, shady and humid habitats and is extremely sensitive to desiccation. It has a typical fern two-stage life cycle, the fern frond stage is known as the sporophyte and the moss-like stage is the gametophyte, which, in the case of *V. speciosa* gametophytes, consists of a filamentous structure (rather than the more usual heart-shaped fern prothallus) which becomes interwoven to form felted mats or wefts. Both the sporophyte and gametophyte stages are capable of asexual reproduction by means of rhizomes (in the former) and gemmae (in the latter). Gametophyte colonies can persist and reproduce in the absence of sporophytes.

In Ireland, when the sporophyte and gametophyte generations occur together they occupy similar habitats in dripping caves, cliffs, crevices and gullies by waterfalls, crevices in woodland, and occasionally the floor of damp woodland; all deeply shaded humid habitats. Sporophyte colonies, however, are more limited in their distribution in Ireland than gametophyte colonies. Niches that gametophytes can occupy are not always suitable for the growth of sporophytes, e.g. shallow crevices in otherwise open habitats that provide adequate shade for gametophytes, but not for the larger sporophytes.

The pressures identified are generally local issues and none are considered to be impacting on the long-term viability of the species or its habitat. The problem of invasive non-native species, identified at a number of sites, is difficult to manage as they often provide essential cover to *V. speciosa* colonies.

The Overall Status of the species continues to be *Favourable*, as it has been over the last three assessments.

Emer Ní Dhúill



OVERALL STATUS: FAVOURABLE

1528 MARSH SAXIFRAGE *(Saxifraga hirculus)*

ANNEX II, IV

Marsh Saxifrage (*Saxifraga hirculus*) is a herbaceous perennial, which, in Ireland, grows only in mineral flushes in mainly lowland blanket bog. The species is now restricted to a small area of North Mayo and Sligo, having been lost from a number of sites in the Midlands of the country due to peat extraction and drainage by the early 20th Century.

It is a distinctive species when in flower, with bright yellow petals that have orange spots near the base. Flowering stems can grow up to 35 cm and can bear up to seven flowers, but typically there are two to three flowers per stem. The leaves are oblong, arranged alternately along short stems. Reproduction occurs both sexually, by insect pollination, and asexually by clonal spread via runners, with the runners decaying over time, so that the clonal plants grow independently. The seeds can only travel short distances, so dispersal is generally limited to within the flush in which the parent plant occurs.

This species requires an open habitat to thrive, as it is a weak competitor. Therefore, an appropriate grazing regime and intact hydrology are key to its survival. Moderate levels of grazing are necessary to keep the habitat sufficiently open, but grazing levels that are too high are detrimental to the species' survival. A water table close to the surface is essential, as is water movement. Drainage for peat cutting and other activities is highly damaging to the habitat of *S. hirculus*.

Saxifraga hirculus is listed on the Flora (Protection) Order, 2022 (S.I. No. 235/2022), and is assessed as Near Threatened on the Irish vascular plant red list.

Undergrazing or lack of grazing, drainage and changes in precipitation due to climate change were identified as having a potential impact on Marsh Saxifrage locally. However, there is no evidence of any major pressures currently impacting this species nationally, and therefore the Overall Status is assessed as *Favourable*, as it has been for the last three monitoring periods, and the trend remains stable.

Rory Hodd

OVERALL STATUS: FAVOURABLE

1833 SLENDER NAIAD *(Najas flexilis)*

ANNEX II, IV

The Slender Naiad (*Najas flexilis*) is a fragile, annual plant that grows at depth in clear lowland lakes. It has a restricted distribution in Europe and Asia, with the core of its European range being Ireland and Scotland. It is rare and declining in most countries. The Slender Naiad occurs in 55 lakes in counties Clare, Donegal, Galway, Kerry and Mayo, with most sites found near the west coast. It is a glacial relict species that does not readily colonise new sites, rather it has occupied the same lakes throughout the Holocene.

The Slender Naiad has exacting environmental requirements that include clear water, moderate alkalinity and circum-neutral pH. It is typically found in habitat 3130, and is highly sensitive to environmental change, particularly to reduction in the amount of light reaching the lake bed. Wastewaters, agriculture and forestry increase the loads of dissolved and particulate organic matter and nutrients and are the significant pressures impacting on the species in Ireland. Continuation and intensification of agricultural and forestry uses on peat and peaty soils are a particular concern.

Slender Naiad is considered to have gone extinct in six lakes, three of these extinctions having occurred since the Directive came into force. The species has also suffered recent population collapse owing to eutrophication at Lough Leane, which formerly held the largest population in Ireland and, likely, in Europe.

The Overall Status of Slender Naiad is assessed as *Bad* with a deteriorating trend, which is a change in status from Inadequate in 2019. The deterioration in status is due to habitat degradation and population decline. Effective catchment management is needed to restore the Slender Naiad to favourable status.

Cilian Roden

OVERALL STATUS: BAD

6216 SHINING SICKLE MOSS *(Hamatocaulis vernicosus)*

ANNEX II

Shining Sickle Moss, or Slender Green Feather-moss (*Hamatocaulis vernicosus*) is a perennial pleurocarpous moss with neatly hooked shoot tips and branches held at around 90° to the stem. Its longitudinally pleated leaves taper gradually from a broad base and are strongly curved from the middle. The leaf bases are often distinctively tinged red, with redness often concentrated in a patch at the top of the stem where it bends over. This species is dioecious (male and female reproductive organs occur on separate plants). Sporophytes are very rare across its global distribution and have never been recorded in Ireland. As specialised asexual propagules are unknown, reproduction and spread must occur by fragmentation.

Hamatocaulis vernicosus has a circumboreal distribution and is widespread across Europe, although it is listed as Vulnerable on the European red list of bryophytes, as many populations have been lost due to destruction of wetland habitats. It is currently known from 16 localities in Ireland, five of which have been discovered since the last reporting period. These populations are scattered across Ireland, with large populations in the lowlands, and smaller more scattered populations in the uplands.

The favoured habitat of *Hamatocaulis vernicosus* is transition mires, intermediate fens and flushes where there is an influence of mineral-rich groundwater. It does not occur in strongly calcareous habitats, preferring sites with a neutral to mildly basic pH.

Although its population has almost certainly declined in historic times, due to loss of intact peatlands, recent surveys indicate that there continues to be sufficient good quality habitat to support the long-term survival of the species. Although undergrazing and possible impacts from climate change have been recorded in the current monitoring period, there are no significant pressures currently impacting the species on a national scale. Therefore the Overall Status is assessed as *Favourable*, as it has been for the last three assessments, and the trend remains stable.

Rory Hodd.

OVERALL STATUS: FAVOURABLE

1395 PETALWORT *(Petalophyllum ralfsii)*

ANNEX II

Petalwort (*Petalophyllum ralfsii*) is a thallose liverwort that is a pioneer species of damp and compacted bare sand, and of short turf in coastal areas. It grows mainly in base-rich dune slacks and machair, where inundation occurs during the winter.

The species forms small thalli, typically less than 1 cm across, that resemble a miniature lettuce, due to the presence of erect, parallel lamellae on the upper surface of the thallus. During the summer, the above-ground parts of the plants often die back and the plant persists as underground tubers. Thalli are often solitary, but can also grow in mats consisting of many individuals. This is a dioicous species (male and female parts are borne on separate plants) and sporophytes are produced in spring and early summer. It is thought that, if environmental conditions become unsuitable for the species, spores can persist in the soil until conditions once again become suitable for the production of new plants. No specialised asexual propagules are known, but plants can reproduce clonally.

The distribution of *Petalophyllum ralfsii* in Europe is Mediterranean-Atlantic, and Ireland has one of the largest populations of this species in Europe. Within Ireland, most populations occur on the west coast, with one extant population known from the east coast. Human disturbance and high levels of grazing are beneficial to this species, as they maintain a short turf and open, compacted sand, enabling the species to persist. However, overgrazing by livestock can lead to eutrophication and poaching which is damaging to the species, and climate change and coastal erosion are recognised as potential threats in the future.

The Overall Status of *Petalophyllum ralfsii* remains *Favourable* with a stable overall trend.

Christina Campbell

OVERALL STATUS: FAVOURABLE

1376 MAËRL *(Lithothamnion corallioides)*

ANNEX V **OVERALL STATUS: BAD**

1377 MAËRL *(Phymatolithon calcareum)*

ANNEX V

Lithothamnion corallioides and *Phymatolithon calcareum* are Annex V species of calcified red seaweed and two of a number of species collectively known as Maërl. These slow-growing species live freely over mud, sand or gravel substrates. Morphology is variable but frequently presents as branched nodules. Differentiation in the field can be difficult but *Phymatolithon calcareum* may be slightly larger than *Lithothamnion corallioides* and may form a more pronounced stag-horn morphotype. Individuals may be 4-7 cm across and, whilst alive, are usually pink or brownish in colour but appear a blanched white when dead. Maërl species in Ireland are considered habitat-forming species and are often frequently incorrectly thought of as coral because of the calcareous bodies and broad similarity in shape.

The distribution of Maërl species is influenced by temperature, salinity and light penetration. Although slow-growing, and only growing when temperatures exceed 12-13°C, where abundant they can form an extensive covering of the underlying substrate. Species are limited by the penetration of light to the substrate and are usually found within a depth of less than 20 m, occasionally 30 m, but always below the lowest astronomical tide. In Ireland, more than 85% of Maërl habitat is recorded within those bays sheltered to some extent from large swell waves on the Atlantic coast, from Roaringwater Bay in Cork to Mulroy Bay in Donegal.

The fauna within Maërl beds is very diverse, and a number of rare species occur, including the rare filamentous red alga *Spyridia filamentosa*, a number of rare anemones, *Edwardsia claparedii*, *Scolanthus callimorphus*, *Mesacmaea mitchellii* and *Aureliana heterocera*, and the possibly endemic epiphytic algae *Gelidiella calcicola*.

The Overall Status of Maërl remains *Bad* with a deteriorating trend, as in 2019, due to the deterioration in the quality of the Maërl beds caused by the deposition of pseudofaeces and/or extensive algal cover on the beds, the presence of negative indicator species such as the opportunistic ascidian *Ascidiella aspersa,* and the presence of the invasive alien species *Sargassum muticum.*

MERC

OVERALL STATUS: BAD

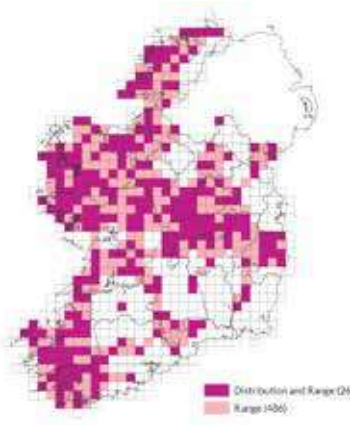
1400 WHITE CUSHION MOSS *(Leucobryum glaucum)*

ANNEX V

White Cushion Moss (*Leucobryum glaucum*) is a densely tufted moss, forming glaucous green cushions which can extend to 1 m across and to 15 cm high. The plant can hold water like a sponge. Male and female parts are on separate plants and this species rarely produces sporophytes in Ireland. It grows in acidic mires, including wet heath, raised and blanket bog, and is widely distributed throughout Ireland. The current taxonomic concept of *Leucobryum glaucum s.str.* follows recent molecular and morphological research. Deep and extensive hummocks of *Leucobryum glaucum* plants of open moorland and heath are likely to remain as *L. glaucum*, albeit in the new, more narrowly defined sense. However, smaller plants of *Leucobryum* in open habitats and others in shaded habitats could be either *L. glaucum* or *L. albidum*. At present the distribution of *L. glaucum s.str.* is incompletely known, but will probably not be too different from that given in the 2014 Atlas of British and Irish brophytes.

Although some of the habitats in which the species occurs are impacted by pressures, there is enough habitat of sufficient quality to support the species and there is no evidence that pressures are operating to compromise the status of this species. Therefore the Overall Status of this species has been assessed as *Favourable*, as in the previous assessment, with a stable trend.

Neil Lockhart



OVERALL STATUS: FAVOURABLE =

1409 *SPHAGNUM* SPECIES *(Sphagnum* spp.*)*

ANNEX V

Sphagnum mosses are the key peat-forming species in most acid bogs, including raised bogs and blanket bogs, and can occur in a variety of other wetland habitats such as wet heaths, wet woodland, transition mires and alkaline fens. These mosses usually form carpets or hummocks made up of vertically growing shoots and can hold up to 20 times their own dry weight in water. Their morphology depends on the wetness and exposure of the habitat but all require high rainfall to survive. There are 33 *Sphagnum* species recorded from Ireland out of a total of c. 55 known species recorded in Europe.

Collection of *Sphagnum* spp. is unlikely to pose a conservation problem. However, although this genus occurs in many widespread habitats, the condition of these habitats is considered to be inadequate due to pressures such as peat extraction, drainage and eutrophication and as a result the taxon's future prospects are rated as Inadequate. The Overall Status for the group is thus *Inadequate*, as in the last three monitoring periods, and the trend remains stable.

Robert Thompson

OVERALL STATUS: INADEQUATE

1413 *LYCOPODIUM* GROUP *(Lycopodium* spp.*)*

ANNEX V

Clubmosses (family Lycopodiaceae) are an ancient group of vascular plants that, like ferns, produce spores rather than seeds. In Ireland four species of Clubmoss are included under the *Lycopodium* species group (code 1413): *Diphasiastrum alpinum* (Alpine Clubmoss), *Huperzia selago* (Fir Clubmoss), *Lycopodium clavatum* (Stag's-horn Clubmoss) and *Lycopodiella inundata* (Marsh Clubmoss). The first three occur on upland heaths, bogs and rocky areas, while *Lycopodiella inundata* is a lowland species, found on lake margins and on open patches on peaty soil in heathland, flushes and bog. *Huperzia selago* is the most widespread and frequently occurring of the four. *Diphasiastrum alpinum* and *Lycopodium clavatum* are much less common and are largely restricted to high mountain sites. *Lycopodiella inundata* is the rarest of the four species. There is no evidence of the exploitation or commercial collecting of any of these species in Ireland.

Excessive grazing has been identified as a negative pressure on habitats for this group nationally, particularly on lower-altitude sites for *Huperzia selago*. The Overall Status of *Lycopodium* spp. is assessed as *Inadequate*, based on unfavourable assessments for the Habitat for the species and Future prospects parameters for *Huperzia selago* and *Lycopodium clavatum*. *Lycopodium clavatum* also received an unfavourable assessment for Population. The overall trend in conservation status is stable. This assessment result is unchanged from 2019.

Mike Wyse Jackson

OVERALL STATUS: INADEQUATE

1378 *CLADONIA* *(Cladina* morphotype*)*

ANNEX V

The former genus *Cladina* is no longer recognised as a taxonomically valid unit, even as a subgenus, consisting as it does of at least two unrelated groups, with a similar morphology derived by convergent evolution, and it is more useful to refer to the group here as the Reindeer Lichens. Currently there are four species of Reindeer Lichen confirmed from Ireland: *Cladonia arbuscula*, *C. ciliata*, *C. portentosa* and *C. rangiferina*. *Cladonia portentosa* and *C. ciliata* are the commonest and most widespread of the four in Ireland. A fifth species, *C. azorica*, has also been recorded in Ireland, from two locations but recent research has questioned its taxonomic standing and further research is required.

Reindeer Lichens, collectively, are found on low-productivity acid soils, predominantly on drier soils but extending on to drier bog peats. They are poor competitors with vascular plants, particularly grasses, and require habitats where vascular plant vegetation is naturally supressed and low, or set back by periodic fires or by grazing. In Ireland they occur in a wide range of habitats, including dry heaths, wet heaths, alpine and subalpine heaths, raised bogs, blanket bogs, siliceous screes, rocky slopes, fixed coastal dunes, dune heaths, mature vegetated shingle and on rocks, including in old Oak woodland.

No evidence of the exploitation/commercial collecting in Ireland of any of the Reindeer Lichen species has been found. The Overall Status of this taxon is *Inadequate* due to pressures on the habitats in which it occurs. The overall trend has been assessed as stable as there is still likely to be sufficient habitat to support populations of these species. This assessment is unchanged since the previous reporting period.

Mike Wyse Jackson

OVERALL STATUS: INADEQUATE

1013 GEYER'S WHORL SNAIL *(Vertigo geyeri)*

ANNEX II

Vertigo geyeri is one of eight species of whorl snail (genus *Vertigo*) present in Ireland. The whorl snails are among the smallest of the Irish land molluscs and *V. geyeri* is less than 2 mm tall. *V. geyeri* is consistent in where it lives, within the saturated and decaying roots of small sedges, particularly Long-stalked Yellow Sedge (*Carex lepidocarpa*) and Common Yellow-sedge (*C. demissa*), and associated fen mosses (e.g. *Scorpidium revolvens* and *Campylium stellatum*). It is stringent in its requirement for saturated water conditions in calcareous, groundwater-fed flushes. This microhabitat is generally found in mosaics of suitable patches that are often limited in size to a few square metres within wider fen habitats, which in Ireland can themselves fall within wider site habitats as diverse as raised bog laggs, transition mires, lake shores, hill or mountain slopes, and wetlands associated with coastal dunes and machair. It requires an openness of habitat that prevents succession by shade-loving plants and more competitive shade-loving snails. There is a general requirement for stable conditions and *V. geyeri* is particularly sensitive to changes in hydrology. Within its macro-habitat, *V. geyeri* needs constancy of hydrological conditions, but with enough variation to provide refugia for the meteorological extremes that the habitat must endure.

Vertigo geyeri is found locally in calcareous fens in central Ireland and more widely in western coastal counties from Galway to Donegal. *V. geyeri* is considered to be under threat in Ireland and was assessed as Vulnerable on the Irish Red List.

The Overall Status of *V. geyeri* is *Bad* and deteriorating, the same result as in 2019. This constitutes a continued decline for the species including a contraction in its range. The main pressures acting on the species include undergrazing, the drying out of suitable habitat (possibly due to climate change-related changes in rainfall patterns), and drainage.

Roy Anderson

OVERALL STATUS: BAD

1014 NARROW-MOUTHED WHORL SNAIL *(Vertigo angustior)*

ANNEX II

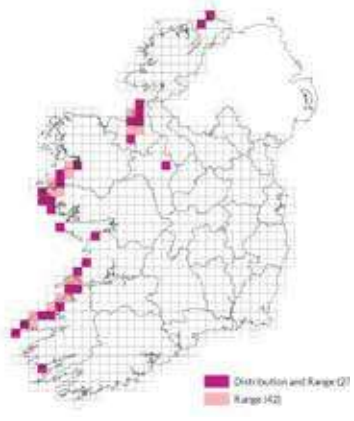
Vertigo angustior is one of eight species of whorl snail present in Ireland. The whorl snails are amongst the smallest of the Irish land molluscs and *V. angustior* grows up to 2 mm tall. The shells of *V. angustior* are yellowish-brown with fine vertical raised lines (striations). The mouth of the shell is on the left when viewed from the front, as the shell is sinistrally coiled, and has five teeth.

The Irish distribution of *V. angustior* is primarily western, mainly found on Atlantic-facing dune systems from Kerry to Donegal, though there are some inland sites. Habitats occupied by *V. angustior* include dunes, damp grassland, fen and marsh, salt marsh and floodplain. While *V. angustior* may be found in a wide range of habitat types, the specific micro-conditions required by the species are rare, and a lot of habitat that is "almost correct" is devoid of the snail, while other sites have an appropriate ecotone restricted to a narrow band only a few metres wide.

V. angustior is considered to be under threat in Ireland and Europe and has been assessed as Vulnerable on the Irish and European Red Lists.

The Overall Status of *V. angustior* is *Bad* and deteriorating. This is a change from the Inadequate deteriorating assessment of 2019, and constitutes a continued decline for the species including a constriction in its range. The main pressures acting on the species include the drying out of otherwise suitable habitat (possibly due to climate change-related changes in rainfall patterns), and inappropriate grazing levels. Lesser pressures include trampling and coastal erosion.

Roy Anderson



OVERALL STATUS: BAD

1016 DESMOULIN'S WHORL SNAIL *(Vertigo moulinsiana)*

ANNEX II

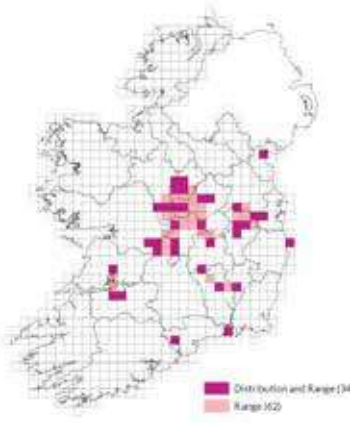
Vertigo moulinsiana is the largest of all the *Vertigo* species, growing to between 2.2 and 2.7 mm in height. All whorl snails favour damp or wet habitats, where they live mostly in moss, leaves and decaying vegetation. They feed on bacterial films and decaying vegetation. *V. moulinsiana* lives on living and dead stems and leaves of tall wetland plants. It has a requirement for tall structured vegetation containing tall riparian grasses and sedges, particularly Reed Sweet-grass (*Glyceria maxima*), Common Reed (*Phragmites australis*), Greater Pond-sedge (*Carex riparia*) and Great Fen-sedge (*Cladium mariscus*).

Sites are usually at the upper end of a hydroseral succession and unmanaged, allowing the build-up of litter. As well as the tall vegetation structure of the habitats, *V. moulinsiana* requires a stable hydrology with the water table at, or slightly above, the ground surface for much of the year and very low-amplitude seasonal flooding. It climbs tall vegetation in the summer and autumn, but in drought conditions aestivates on the lower leaves of plants. In winter it descends to the litter level and becomes less active.

Populations *of V. moulinsiana* are found widely in central and southern Ireland. It is found mainly in calcareous, lowland wetlands, especially swamps, fens and marshes bordering rivers, canals, lakes and ponds. *V. moulinsiana* is considered to be under threat in Ireland and Europe and was assessed as Endangered on the Irish Red List.

The Overall Status of *V. moulinsiana* is assessed as *Inadequate* and deteriorating, unchanged from the 2019 assessment. The main pressures are associated with natural succession resulting in species composition change and drying out of the habitat, including drying out as a result of drainage. The sites are mainly unmanaged because of their natural wetness, so grazing and mowing are less significant impacts on a national scale, though they do occur on some sites.

John Brophy



OVERALL STATUS: INADEQUATE

1024 KERRY SLUG *(Geomalacus maculosus)*

ANNEX II, IV

Geomalacus is a genus of slugs found only in Spain, Portugal and Ireland. This species, *Geomalacus maculosus*, remains the only *Geomalacus* species found outside the Iberian Peninsula. Kerry Slug individuals vary in colour from black with white spots to brown with cream spots. The black form is found in open habitat and the brown form in woodland. This colour variation is related to the amount of dark pigment in their bodies; animals living in open habitat produce more dark pigment in response to increased insolation.

The Kerry Slug occurs in two main habitats: woodland, and blanket bog/wet heathland. It is found on trees in woodland and on boulders in the open habitats, and feeds on mosses, lichens and liverworts. It only occurs on acidic geology, mainly on Devonian Old Red Sandstone in Ireland, although it was recently observed on granite at a locality in Connemara where the species is considered introduced.

Kerry Slugs emerge to feed in very damp and humid conditions, on very cloudy warm damp days either during or after rain, or at dawn, dusk and during the night if it is not too cold or dry. In a 2011 study, the number of slugs seen in open habitats was correlated to the amount of previous rainfall, with fewest seen when conditions were dry. Studies and evidence from environmental impact assessments of potential windfarm sites have shown that Kerry Slug can be abundant on conifer trees. The species will also recolonise boulder habitat when the wood is clearfelled.

There are no significant pressures on Kerry Slug, and the Overall Status is *Favourable* and improving, driven in part by the large populations in conifer plantations. This is the same result as in 2019.

Roy Anderson

OVERALL STATUS: FAVOURABLE

1029 FRESHWATER PEARL MUSSEL *(Margaritifera margaritifera)*

ANNEX II, V

The Freshwater Pearl Mussel is a large, long-lived, bivalve mollusc found in clean, fast-flowing rivers. Individuals can grow to very large sizes relative to other freshwater molluscs, slowly building up thick calcareous shells in rivers with relatively soft water and low levels of calcium. In natural conditions, individual mussels can live to over a hundred years of age in Ireland. Following genetic research, the pearl mussel population in the River Nore (formerly *M. durrovensis*, species code 1990) is included within the reporting for the *Margaritifera margaritifera* taxon (species code 1029).

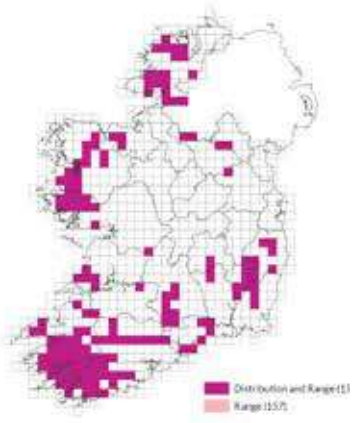
The Freshwater Pearl Mussel has a complex life cycle. Mussels mature between 7 and 15 years of age, and have a prolonged fertile period lasting into old age. The species produces glochidial larvae that use a temporary salmonid host, typically Atlantic Salmon and Sea Trout in Ireland, but also Brown Trout. Juvenile mussels occupy interstitial habitats in the river bed for 5 years or more.

The Freshwater Pearl Mussel is critically endangered in Ireland and across Europe as a result of habitat deterioration: a combination of hydrological and morphological changes, sedimentation and enrichment. Riverbeds have become so clogged with silt, algae and rooted plants that young mussels can no longer survive. In many rivers, adult mussels have become stressed and are prematurely dying owing to habitat deterioration.

The pressures impacting on the species come from a wide variety of sources (e.g. forestry, farming, pollution from urban wastewater, and development activities), often quite removed from the habitat of the species. The species also suffers direct impacts from in-stream works such as channelisation, bridge repairs/construction and recreational fishery structures. Flow changes, caused by activities such as land drainage, have been highlighted as an important contributor to the species' demise. Ensuring the long-term future of the Freshwater Pearl Mussel requires significant, integrated catchment management to restore the natural hydrological regime and to reduce losses of sediment and nutrients from all indirect sources.

The Overall Status of the species remains *Bad* with a deteriorating trend, as in 2019.

Evelyn Moorkens



OVERALL STATUS: BAD

1092 WHITE-CLAWED CRAYFISH *(Austropotamobius pallipes)*

ANNEX II, V

The White-clawed Crayfish (*Austropotamobius pallipes*) is the largest freshwater arthropod found in Ireland. There is good evidence that the Irish population is an introduced one from a French population dating from around 1680 and, in support of this, the White-clawed Crayfish of France, UK and Ireland have been found to be genetically rather uniform.

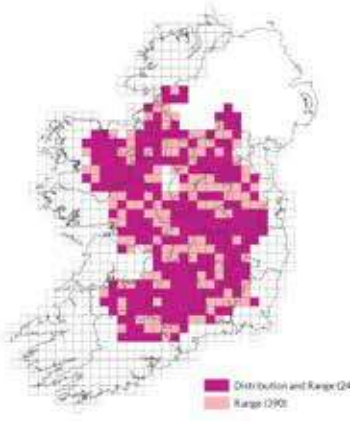
In Ireland, White-clawed Crayfish utilises a broad spectrum of habitats extending from smallest streams and drains to large rivers and medium-sized lakes wherever there is sufficient lime. The distribution in Ireland reflects this need for lime as it is widespread in central Ireland but absent from areas with acidic geology such as Kerry and west Cork, the west of Galway and Mayo, and most of Donegal.

The White-clawed Crayfish is generally associated with good-quality waters, but this is not necessarily the case in Ireland where it can occur in water of lower quality. It is now generally considered as a keystone species rather than as a bioindicator, because of its traditional importance and its large size, longevity and dominant position in the ecosystem.

White-clawed Crayfish faces an existential threat from twin impacts of non-indigenous crayfish species (NICS) and Crayfish Plague, which is a water-borne disease specific to freshwater crayfish caused by the oomycete *Aphanomyces astaci*. NICS impact the White-clawed Crayfish through direct predation and competition but also act as carriers of Crayfish Plague.

The Overall Status of the species is *Bad* with a deteriorating trend, unchanged from the 2019 assessment. The *Bad* status is due to population decline and poor future prospects for the species due to the presence of the Crayfish Plague organism across seventeen catchments.

Brian Nelson



OVERALL STATUS: BAD

1065 MARSH FRITILLARY *(Euphydryas aurinia)*

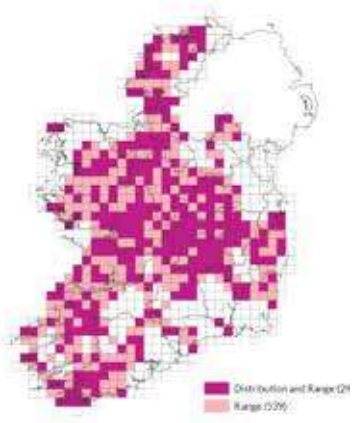
ANNEX II

The Marsh Fritillary (*Euphydryas aurinia*) is a butterfly with chequered wings marked in brown, orange, black and white. The adults have a short flight period of 4-6 weeks in May and June. Most Marsh Fritillary are sedentary, rarely dispersing beyond 750 m, although long-range dispersal over longer distances of 5 to 20 km can occur allowing colonisation and functioning of metapopulations. The larval stage is the longest part of the annual lifecycle, lasting nine months. From August until October the brown-black spiny caterpillars feed together on Devil's-bit Scabious (*Succisa pratensis*) leaves, protected inside a silken web. During the winter they hibernate together in a small web hidden within the vegetation. The caterpillars emerge on sunny days in February or early March to feed, basking on exposed dead grass or leaf litter. As their feeding requirements increase, they separate into smaller and smaller groups, eventually becoming solitary feeders. The larvae pupate in late April, with adults emerging two to three weeks later.

Marsh Fritillary requires a low, open sward, ideally 25 cm or less, with abundant foodplant. The quality and quantity of the food plant is an important determinant of population size. However, the adults also require access to nectar supplies and areas of taller vegetation which provide shelter and perches. Colonies have been recorded on sand dunes, fens, cutover raised bogs, blanket bogs, wet heaths, unimproved wet, neutral or calcareous grasslands, calcareous and coastal heaths. These sites are maintained by a variety of management, accidental or deliberate, including grazing and burning. Most sites are in lowland situations below 200 m, but it has been recorded up to 350 m and perhaps higher in recent years. Colonies also exist on exposed coastal headlands and small offshore islands which indicates a tolerance of exposed conditions.

The Overall Status of Marsh Fritillary is *Favourable*, which represents a genuine improvement since the Inadequate assessment reported in 2019. The change is because of an improvement in the future prospects for range, population and habitat for the species. Threats and pressures do exist but are not considered to be severe or extensive. The overall trend is improving.

Brian Nelson



OVERALL STATUS: FAVOURABLE ▲

1095 SEA LAMPREY *(Petromyzon marinus)*

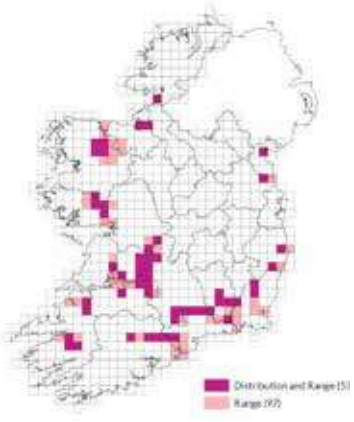
ANNEX II

The life cycle of the Sea Lamprey (*Petromyzon marinus*) contains a freshwater phase followed by a marine phase. Adult Sea Lamprey at sea are external parasites on host fish or marine mammals and grow in length from 60 to 100 cm before migrating in spring into freshwater to excavate redds or spawning nests in gravelled areas of large rivers. They are a notable parasite on basking shark and have been frequently observed attached. Upriver migration occurs at a time of generally falling water levels and substantial spawning activity has been recorded in gravelled areas downstream of large weirs in the major Irish SAC rivers. Sea Lamprey spawning has also been recorded in the far upper reaches of river systems where there are no barriers to upstream migration, such as the Laune in Co. Kerry. Substantial areas of gravel suitable for spawning have been recorded in SAC main-stem rivers but low utilisation of these areas by spawning Sea Lamprey has been recorded, both upstream and downstream of barriers to migration.

Egg laying follows nest excavation and the resulting larvae or 'ammocoetes' hatch out within days. These swim or drift downstream to areas of fine sediment into which they can burrow. The larva is a filter feeder and retains its burrowing habit in fine-grained sediment over a period of years. Transformation to the young adult stage occurs in late summer and the juvenile Sea Lamprey migrate downriver to estuarine waters and the open sea in late autumn-winter.

The Sea Lamprey is listed in the most recent Irish Red Data Book as Near Threatened. Pressures on Sea Lamprey include barriers to upstream migration (e.g. weirs), which limit access to spawning beds and juvenile habitat; changes in precipitation due to climate change; and impacts from fishing on prey species availability. The Overall Status of this species is assessed as *Bad*, as in the last two assessments, but there is a change in trend from stable to deteriorating.

Eddie Dunne



OVERALL STATUS: BAD ▼

1096 BROOK LAMPREY *(Lampetra planeri)*

ANNEX II

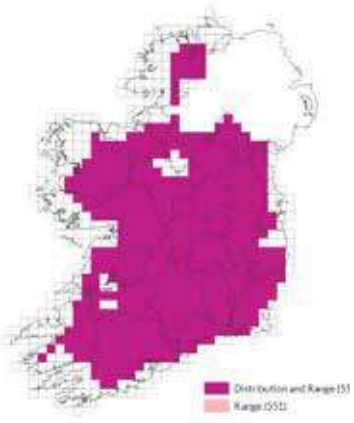
The Brook Lamprey (*Lampetra planeri*) is the smallest of the three lampreys recorded in Ireland, typically reaching no more than 15-18 cm in length. Unlike the Sea lamprey and River Lamprey, the Brook Lamprey is non-parasitic and non-migratory as an adult, living its entire life in freshwater. Adults spawn in spring, excavating shallow nests in relatively small-sized gravels in areas of reduced flow. After hatching, the larvae ('ammocoetes') drift or swim downstream to areas of riverbed or margins with fine silt deposits. They burrow into this substrate and live as filter feeders over a period of years before transforming into young adult fish. The young adults overwinter before migrating short distances upstream to gravelled areas where they spawn. The adult fish die after spawning.

The majority of records for Brook Lamprey are for the larval life stage of *Lampetra* sp., in addition to a small number of adult and post-metamorphic juvenile (macrophthalmia) records. While the sampling methodology for larval lamprey is robust, the reliability of the data is not guaranteed. It is not possible to distinguish between the larvae of Brook Lamprey and River Lamprey and it is therefore likely that a proportion of records in the distribution map are of River Lamprey. Larval records upstream of substantial barriers on many river systems are more likely to be Brook Lamprey than River Lamprey, as the latter is a migratory species and its upstream passage can be impeded or prevented by major barriers.

Due to the widespread distribution of Brook Lamprey, while several pressures have been identified, these pressures are often indirect, usually acting in combination, and deemed as having low influence. Their effects are typically restricted to specific catchments and hence act on a minority of the population.

The Overall Status remains *Favourable*, as it has been for the last three reporting periods.

Eddie Dunne



OVERALL STATUS: FAVOURABLE

1099 RIVER LAMPREY *(Lampetra fluviatilis)*

ANNEX II, V

The River Lamprey (*Lampetra fluviatilis*) breeds in freshwater rivers and streams. Adults spawn in spring, excavating shallow nests in riverine sections comprising fine gravels and small stones. After hatching, the larvae or 'ammocoetes' drift or swim downstream to areas of riverbed or margins with fine silt deposits. They burrow into this bed material where they live as filter feeders over a period of years before transforming into young adult fish and migrating downriver to estuarine and marine habitats. As adults they are parasitic, attaching to and feeding on larger fish in coastal waters. They can grow up to 25-30 cm at maturity, at which stage they return to freshwater habitats to spawn, attracted by pheromones exuded by their larvae within the system. The adult fish die after spawning.

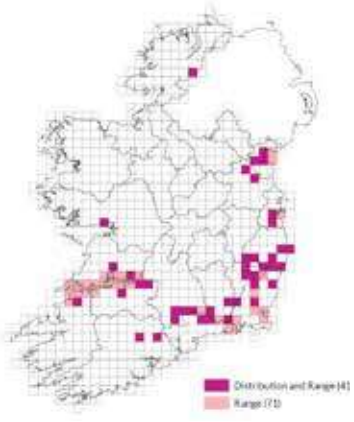
River and Brook Lamprey are indistinguishable as larvae. The mature adult forms are, however, clearly distinguishable based on body size. River and brook Lampreys are considered by many in the same context as the brown trout / sea trout pairing, with a similar absence of genetic discriminators.

The inability to distinguish between River and Brook Lamprey larvae, and the challenges associated with sampling for adult River Lamprey, meant that an evaluation of their actual range and population size was unknown in the previous reporting period. Records for adult River Lamprey, though difficult to obtain, are considered more appropriate for making a true assessment of this species. A targeted sampling programme for adult River Lamprey was instigated for the current reporting cycle.

Habitat quality was considered as deteriorating due to a range of prevailing pressures and future threats including barriers to migration, increases in river discharge due to several factors including climate change, nutrient pollution due to anthropogenic activities, and impacts at sea such as commercial fishing that may impact on prey or host species.

The Overall Status assessment for River Lamprey has changed from Unknown to *Inadequate* with more accurate data recorded in this reporting period.

Sean Rooney



OVERALL STATUS: INADEQUATE

5046 KILLARNEY SHAD *(Alosa killarnensis)*

ANNEX II, V

The Killarney Shad (*Alosa killarnensis*) is unique to Ireland and is only recorded in Lough Leane in the Killarney National Park SAC. It is listed in the Irish Red Data Book as 'Vulnerable'. Anecdotal reports and observations indicate that the species spawns within Lough Leane along shallow gravelled shores and on gravel shoals adjoining the various islands. The adult fish live in shoals in the lake, feeding on zooplankton. Thus, the full life-cycle is undertaken within the lake. The species is considered to derive from ancestral post-glacial populations that became isolated in the lake. Lough Leane has unimpeded connectivity to the transitional waters of Castlemaine Harbour via the River Laune, but has never been found outside Lough Leane.

The continual presence of adult fish in successive fish surveys indicates an on-going successful spawning effort. The quality of the habitat is considered good on the basis of water quality and physical habitat requirements of the species. Lough Leane is unique among Irish lakes in that its fish community contains a predominance of native species and an absence of Pike, a significant predator, and of widespread introductions – the Roach or Dace. However, Bream and Rudd x Bream hybrids were recorded in Lough Leane for the first time in the most recent survey (2024). Bream has the potential to quickly alter both the physico-chemistry and community composition of limnic systems, mostly through indirect bottom-up effects.

Lough Leane has been subject to considerable pressure, primarily due to nutrient enrichment. Tourism in Killarney leads to a very substantial, transient increase in human population over several months each year with a consequent pressure on water supply and the local wastewater treatment works. The Killarney Shad population appears to have survived impacts of eutrophication in the 1970s and early 1980s. However, the potential for adverse impact on Lough Leane from anthropogenic eutrophication, particularly in combination with reduced summer water levels, remains.

The entire range of the Killarney Shad is protected within Killarney National Park. The Overall Status is assessed as *Favourable*, as it has been in the last three assessments, and the trend remains stable.

Emma Morrissey

OVERALL STATUS: FAVOURABLE

1103 TWAITE SHAD *(Alosa fallax)*

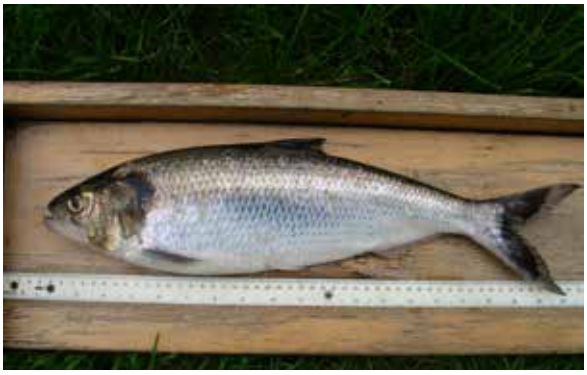
ANNEX II, V

Twaite Shad (*Alosa fallax*) is a member the herring family (*Clupeidae*). Its range extends from Iceland (at its northern-most limit) south to Morocco, east to Scandinavia and the Baltic Sea and it occurs throughout the Mediterranean as far east as Turkey.

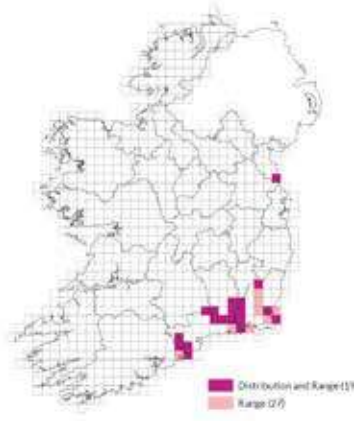
The species spends most of its life in estuaries and coastal waters but it returns to freshwaters to spawn during April to July. Twaite Shad appears to exhibit natal homing and the species is iteroparous, with spawners from previous years often representing over 50% of the spawning run. Spawning occurs in main-stem rivers with a moderate gradient and the substrate of the spawning grounds is dominated by cobbles and boulders with a high percent cover of algae, mosses and aquatic plants. The species matures at 2-9 years, with the majority of females maturing at age 4-5 years and the males one year earlier. Spawning takes place at night and eggs and sperm are broadcast into the water column. The majority of fertilised eggs sink to the channel bed and remain in crevices until they hatch 3-5 days later. Juveniles can reach up to 100 mm at the end of the first year and limited knowledge indicates that Irish Twaite Shad may live in estuarine waters for at least two full years prior to going to sea.

In Ireland, there are four spawning populations which occur in the Barrow, Nore, Suir and Munster Blackwater rivers, all of which are SACs for this species. Twaite Shad can migrate long distances into freshwaters but, in Ireland, they spawn in transitional waters at the upper limits of tidal influence.

Numbers of Twaite Shad have declined across its range, with the main causes attributed to dam construction, pollution, overexploitation and habitat destruction. The combined influence of deteriorating water quality, the challenges of climate change and the hydrological and physico-chemical impacts of weirs have implications for the conservation status of this species. The Overall Status remains *Bad*, and the overall trend is now deteriorating, a change from the stable trend reported in 2019.



William Roche



OVERALL STATUS: BAD

5076 POLLAN *(Coregonus pollan)*

ANNEX V

Pollan (*Coregonus pollan*) is a species of the whitefish or Coregonidae group unique to the island of Ireland. The species is found in three large lakes on the River Shannon – Lough Derg, Lough Ree and Lough Allen – as well as Lough Erne and Lough Neagh in Northern Ireland. With the exception of Lough Neagh, these lakes are characterised by significant areas of deep water where the fish retreats during warm weather. The Coregonidae have a circumpolar distribution and the Irish populations are at the southern extremes of the group's geographical range. The majority of Coregonid species are diadromous, spending part of the life cycle in freshwater and part in the marine. The Irish populations differ in being entirely freshwater in habit.

The Pollan feeds on a mix of plankton, insect larvae and some benthic food items. They may make diurnal feeding movements up and down the water column. Netting surveys showed Pollan to be distributed throughout the water column in overnight sampling in July and September in all three Shannon lakes. However, similar sampling effort in February recorded a virtual absence of the species from the open water. Spawning is thought to occur on gravelled areas in the shallow exposed lake shores in the December-January period. Visual surveys on Lough Ree and Lough Allen have indicated the presence of extensive areas of suitable spawning grounds – exposed shorelines around headlands and islands with shallow-water littoral beds of gravels.

Pollan once constituted a significant proportion of fish biomass in the Shannon lakes; however, that is no longer the case. The extent and intensity of the pressures impacting on the biology and ecology of this species are poorly understood and more investigative work is required. The low numbers of Pollan recorded in Loughs Ree and Derg are a concern and the Overall Status is assessed as *Bad* with a stable trend, as in 2019.

Emma Morrissey

OVERALL STATUS: BAD

1106 ATLANTIC SALMON *(Salmo salar)*

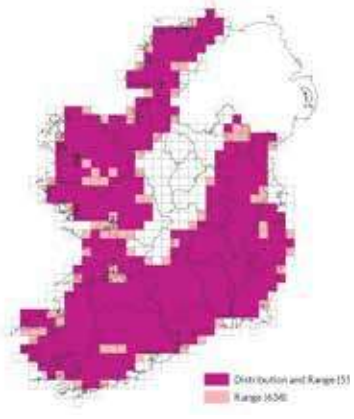
ANNEX II, V

The Atlantic Salmon (*Salmo salar*) is an anadromous species indigenous to the North Atlantic. In freshwater it is found in an arc from northern Portugal in the east, to Connecticut River, New England, United States in the west. The Irish population generally comprises fish that spend two years (small numbers spend one or three years) as sub-adults in freshwater before going to sea as smolts. The majority of fish spend one winter at sea before returning to their natal rivers, mainly during the summer, as grilse. Smaller numbers spend two winters at sea, returning mainly in spring, hence 'spring' salmon. A small proportion of the adult population returns to the sea post-spawning (known at this spent stage as a kelt) and can return to spawn again.

Large potential habitat areas capable of supporting this species on the largest rivers in the country, including the Shannon, Erne and Lee, have been removed from the species' range due to the presence of impassable barriers associated with hydroelectric schemes, preventing use of upstream habitat. In addition, population abundance in general has decreased for this reporting period. However, the area of occupied habitat by Salmon is currently considered sufficient for long-term survival, and the trend in habitat area occupied has not changed since previous reporting periods. The quality of occupied habitat varies enormously between river systems and it is currently unknown whether the habitat quality is sufficient for the long-term survival of Salmon in all occupied habitat areas.

A substantial number of habitat threats and pressures impact Salmon, including aquaculture, declining quality of water and habitat, and physical barriers to migration, including from hydroelectric schemes. Although the protection for this species is in freshwater, there are also marine pressures that are influencing the population viability. The Overall Status is assessed as *Bad* and deteriorating, a decline from Inadequate and stable in the last assessment.

Mike Brown



OVERALL STATUS: BAD

6284 NATTERJACK TOAD *(Epidalea calamita)*

ANNEX IV

The Natterjack Toad (*Epidalea calamita*) is widespread across continental Europe but lives at the edge of its climatic range in Ireland. It is one of only three native amphibians found here and is confined to a small number of coastal sites around the Dingle and Iveragh peninsulas in West Kerry, with one translocated population in Wexford.

The toad is the last of our amphibians to emerge from hibernation, normally appearing at the very end of March or early April. Males take up residence in traditional breeding ponds where, in the evenings, they call to females. Mating pairs form and eggs are laid in strings. In warm weather the resulting tadpoles can develop quickly and emerge onto land within 8-10 weeks. The toad is adapted to temporary water bodies; while dry years lead to mass mortalities of tadpoles due to pond desiccation, good years can see large numbers of strings laid and thousands of juveniles emerge successfully. Consequently, significant population fluctuations can be apparent between years.

Natterjacks do best in warm, open grassy habitat such as dunes and coastal grasslands. They are most active at night and will forage until late autumn. Toads feed on terrestrial invertebrates such as spiders and beetles. As nights get colder, Natterjacks retreat to frost-free refuges (e.g. under piles of logs/stones, in sandy rabbit burrows) where they will hibernate over winter.

Poor water quality is the most common pressure on the species, followed by lack of grassland management and predation of tadpoles and eggs by invertebrates. Also of concern are ponds becoming overgrown with emergent vegetation, making them unsuitable for breeding. Invasive species – New Zealand Pigmyweed (*Crassula helmsii*) and Sea-buckthorn (*Hippophae rhamnoides*) can also cause problems for the toad.

Historical losses in range and population have been recorded, leading to small isolated meta-populations and the risk of further decline. The Overall Status of the species is *Bad*, with a stable trend, as reported in the previous monitoring period.

NPWS

OVERALL STATUS: BAD

1213 COMMON FROG *(Rana temporaria)*

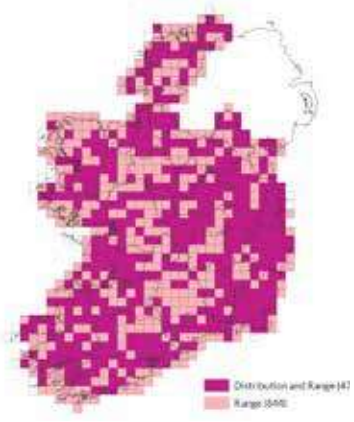
ANNEX V

Common Frog (*Rana temporaria*) is one of only three amphibians native to Ireland. It is a widespread and very abundant species throughout the country, occurring in a broad range of habitats from uplands to urban gardens.

Adults congregate to spawn in ponds, marshes and ditches in the spring. Eggs develop into tadpoles as water temperature rises and, following metamorphosis, young froglets emerge onto land in early summer. These young animals are particularly vulnerable to predation, but adult frogs are also an important prey item for several predators including otters and herons. Young frogs spend 2-3 years on land, feeding on terrestrial invertebrates, before returning to freshwater to breed. Life expectancy of 3-4 years would be typical.

The Common Frog is a widespread and very abundant species in Ireland. It is found throughout the country, has a broad habitat niche and is adaptable to changes in land practices. The species has colonised garden ponds in urban areas and drainage ditches in agricultural areas. It appears largely unaffected in Ireland by pollution and disturbance. The most recent national survey estimated the population at over 150 million adults, making it one of the most numerous vertebrates in the country. Given the widespread, abundant and adaptable nature of the frog, there are no significant pressures currently impacting on the conservation status of this species. Overall Status is considered to be *Favourable*, with a stable trend.

Joan O'Neill



OVERALL STATUS: FAVOURABLE

1223 LEATHERBACK TURTLE *(Dermochelys coriacea)*

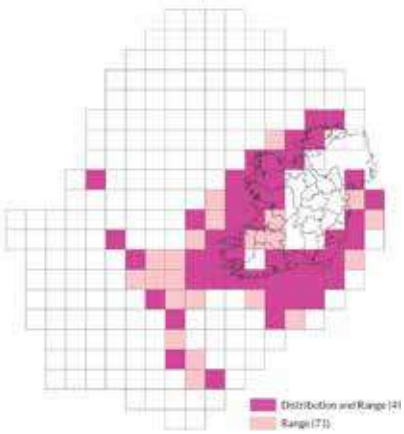
ANNEX IV

The Leatherback Turtle (*Dermochelys coriacea*) is the most widely distributed living reptile species, being found in all oceans except the Southern Ocean. Within the North Atlantic its range extends from the tropics to the high latitudes of Newfoundland right across to Europe's north-westerly fringe. It is a widely roaming species, with individuals making extensive pan-oceanic movements. Breeding is confined to warm tropical regions because of thermal constraints on egg incubation, but the species has many unique anatomical and physiological adaptations that permit it, unlike other marine turtles, to forage seasonally into cooler temperate waters. Consequently, Leatherback populations have a very dynamic range. During the summer months their range is at its greatest extent, with individuals located throughout the North Atlantic, whereas during the winter months their range is restricted to areas where the sea surface temperature is >15 °C.

Recent studies have shown that, after nesting in the tropics, the majority of North Atlantic Leatherbacks head north towards cooler temperate waters. Some of these individuals head towards the North-East Atlantic and Irish waters where they forage on jellyfish for the summer months before turning south again in the autumn as water temperatures decline.

There are significant difficulties associated with reporting on this species. Despite previous studies and more recent, vast surveys of the Irish off-shore, as well as work underway elsewhere in the NE and NW Atlantic and in the Caribbean, the population ecology, range and habitat utilisation of this species in the North Atlantic are not fully understood. Although there is evidence of significant declines of leatherbacks in the Pacific, there are some indications that the Atlantic populations may be faring better, with recent surveys suggesting that numbers of females may be increasing at some nesting beaches. Nonetheless, mortalities of nesting adults and juveniles is a cause for concern in some areas, and fishing causes further mortality during the animal's trans-Atlantic migrations. The Overall Status of this species is considered *Unknown*.

Ferdia Marnell



OVERALL STATUS: UNKNOWN

1303 LESSER HORSESHOE BAT *(Rhinolophus hipposideros)*

ANNEX II, IV

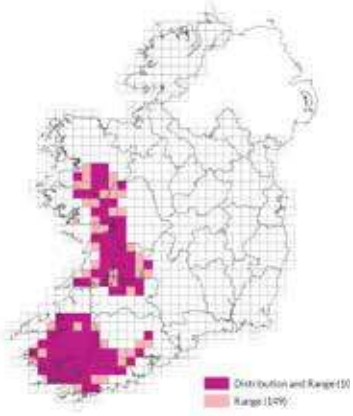
The Lesser Horseshoe Bat (*Rhinolophus hipposideros*) is widely distributed through western, central and southern Europe, as well as northern Africa and the Arabian Peninsula. Its range extends as far east as Uzbekistan. Ireland represents the most north-westerly limit of the species' distribution and here it is largely confined to six west coast counties: Mayo, Galway, Clare, Limerick, Cork and Kerry.

Lesser Horseshoe Bats are faithful to their roosts and will return to the same sites each year. Summer roosts are often in the attics of old or derelict buildings. Hibernation sites are typically in caves, souterrains, cellars and icehouses. Lesser Horseshoes rely on linear landscape features (e.g. treelines, stone walls and hedgerows) to navigate and commute from roosts to feeding areas and seldom fly out in the open. The bats forage on flying insects predominantly in deciduous woodland and riparian vegetation normally within a few kilometres of their roosts.

Significant range expansion and positive short-term and long-term population trends provide grounds for genuine optimism about the future prospects of this species. Our understanding of roosting requirements continues to improve and investment continues in roost and habitat enhancement. A significant proportion of this bat's summer and winter roosts are protected within SACs. Additionally there is a robust licensing system in place supported and underpinned by a strong planning system. The implementation of, and stakeholder engagement with, the Species Action Plan provides further encouragement.

Overall, the trend is considered to be improving. However, until the distribution gap is bridged in West Limerick/North Kerry, the species' Range, and therefore the Overall Status assessment, remain *Inadequate*.

Sinead Biggane



OVERALL STATUS: INADEQUATE

1309 COMMON PIPISTRELLE *(Pipistrellus pipistrellus)*

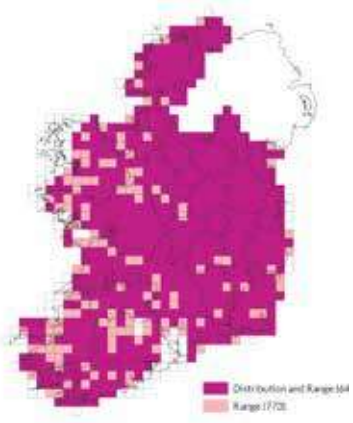
ANNEX IV

The Common Pipistrelle (*Pipistrellus pipistrellus*) is one of Ireland's smallest mammals. It is widespread throughout the country and commonly encountered during bat surveys, although it may be less common or even absent from some parts of the far west. It is a habitat generalist, foraging in woodland, riparian habitats and parkland, along linear features in farmland, and in towns and cities. Some association with broadleaved woodland and riparian habitats at a local scale have been identified, while mixed forestry may be more important at a wider scale in the landscape. Only areas of bog, marsh and heath appear to be avoided.

Maternity roosts of this species are often in buildings, typically in the attics of dwelling houses, although it is occasionally found roosting under bridges and in trees. Bats normally disperse in autumn and hibernate over winter. This species has rarely been found hibernating in Ireland, but the available records for bats in winter are from modern dwelling houses.

This species has a very wide distribution across the island including some off-shore islands and there is no evidence of any decline in Range or in Habitat. The most recent estimates suggest a population size in the order to 2-4 million animals, making it one of the most common mammals in Ireland. Ongoing car-based bat monitoring indicates that the population is increasing. Furthermore, there is no indication of any major pressures currently impacting the population and Future prospects are considered good. Overall, the species is assessed as *Favourable* and the overall trend is demonstrating an on-going increase.

Frank Greenaway



OVERALL STATUS: FAVOURABLE

5009 SOPRANO PIPISTRELLE *(Pipistrellus pygmaeus)*

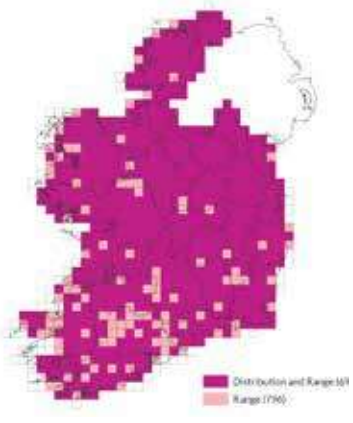
ANNEX IV

The Soprano Pipistrelle (*Pipistrellus pygmaeus*) is present across much of central Europe and into southern Scandinavia and Greece, but may be absent from parts of France and southern Italy. It is the most widespread bat species on the island of Ireland, occurring in all counties including the extreme north, west and south. It is the second most commonly encountered species in the national bat monitoring programme, although its abundance is variable across the island, with no particular north-south or east-west pattern apparent.

Summer roosts are usually in buildings, including modern suburban houses, old abandoned mansions, churches, amenity buildings and farm sheds. Bat boxes are also used. Soprano Pipistrelles normally roost in very confined spaces, such as behind window sashes, under tiles and weather-boards, behind fascia and soffits, and within the cavities of flat roofs. Roosts of >1,500 individuals are known. The species is thought to hibernate in buildings and trees, but has seldom been recorded in winter. Although this bat is known to forage in a broad range of habitats, it shows some preference for aquatic habitats – riparian woodland, rivers and lakes.

The Soprano Pipistrelle is the most widespread bat species on the island of Ireland. Recent estimates for this species suggest a population size in the order of 1.2-2.7 million animals. There are no indications of any major pressures currently impacting populations, and numbers appear to be increasing. The Overall Status assessment is *Favourable* with an improving trend, unchanged from the previous assessment.

Frank Greenaway



OVERALL STATUS: FAVOURABLE

1317 NATHUSIUS' PIPISTRELLE *(Pipistrellus nathusii)*

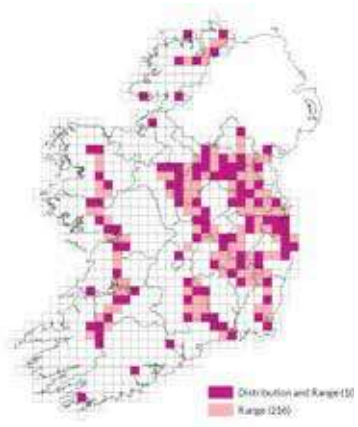
ANNEX IV

The Nathusius' Pipistrelle (*Pipistrellus nathusii*) was recognised as a resident bat species on the island of Ireland following the discovery in 1997 of a maternity colony of 150 bats in Co. Antrim, Northern Ireland. Up to then it was described as a migrant species in Ireland (and Britain) based on a number of autumn and spring records during the 1980s and 1990s. The first bat detector record in Northern Ireland was made in Derry in August 1996, with further detector records from the Republic of Ireland in 1997 and 1998.

This pipistrelle is typically a migrant species, found in eastern Europe in summertime and in south-western Europe in the winter. Ireland and the UK appear to lie in a transitional region, with resident bats being supplemented during winter by the migratory individuals returning from the north-east of the species range. To date, despite extensive survey work and an increasing number of roosts identified in the Republic of Ireland, there has been no maternity roost recorded, nor any confirmed hibernation records for the species. Winter roosts for the species in Europe tend to occur in tree holes, wood piles, crevices in buildings and cliffs.

It is not clear what pressures or threats may impact on this species in the Republic of Ireland. Elsewhere in its European range, mortalities at wind farms are a significant concern, particularly during periods of migration. For now, no pressures are considered significant but wind farms are listed as a potential threat. Although the species' range in the Republic of Ireland has steadily increased over the last 15 years, and population modelling suggests that its numbers are also increasing, it has not been possible to establish favourable reference values for either of these parameters. Therefore, while significant areas of suitable habitat remain to be exploited, and future prospects are generally good, the Overall Status assessment remains *Unknown*, as it has been for the last two reporting periods.

Frank Greenaway



OVERALL STATUS: UNKNOWN

1322 NATTERER'S BAT *(Myotis nattereri)*

ANNEX IV

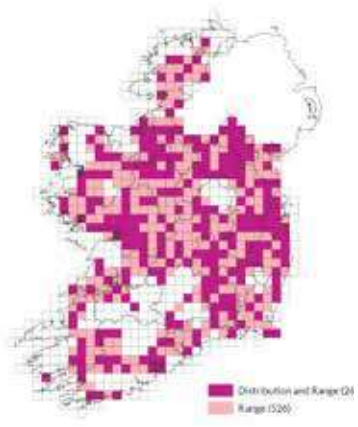
The Natterer's Bat (*Myotis nattereri*) is widespread across Europe and is found from Portugal and north-west Africa to the Urals and the near East. It is widely distributed in Ireland, though records are relatively scarce.

Summer roosts are normally in old stone buildings or masonry bridges. Usually only small numbers of bats are present, often hidden in narrow spaces where they are difficult to locate. A few larger roosts (>50 bats) have been found in Church of Ireland churches. A number of important autumnal swarming sites have been identified. This species is seldom recorded in winter, but occasionally individuals have been observed in bridges, mines and caves. Detector records have been limited due to the difficulty of distinguishing the *Myotis* species, but, more recently, improved bat ID technology is allowing detector records to be distinguished and confirmed more reliably.

This bat gleans most of its prey (spiders, beetles, caterpillars, moths) from foliage, rather than catching it in the air. Woodland habitats, river corridors and pastures appear to be favoured for foraging.

Pressures impacting on Natterer's bats can be divided into those affecting roosts and those reducing the quality or availability of their foraging habitat, although their impact is considered to be low. A monitoring scheme has been set up and is being gradually expanded nationwide. It will be several years before Population trend can be calculated and in the meantime the trend and therefore future prospects of this parameter are unknown. Nonetheless, the Overall Status for the species remains *Favourable*, as in the last three assessments.

Frank Greenaway



OVERALL STATUS: FAVOURABLE

1314 DAUBENTON'S BAT *(Myotis daubentonii)*

ANNEX IV

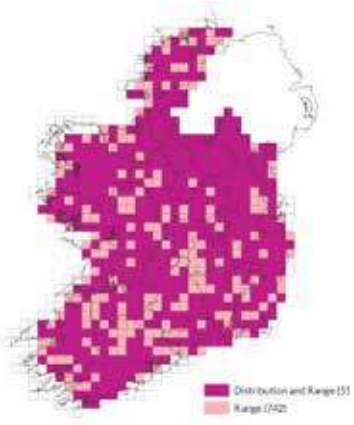
The Daubenton's Bat (*Myotis daubentonii*) is found throughout Ireland. It forages over water and is particularly associated with slow-moving rivers and with lakes. It favours waterways with riparian vegetation, particularly broadleaf woodlands, and is positively associated with good water quality and invertebrate diversity. It is less likely to be present where there are street lights or flood lights. It also tends to avoid areas of peatland and is negatively associated with increasing altitudes. This species forages over the surface of water bodies, gaffing aquatic insects such as non-biting midges, caddis-flies and mayflies with its large feet.

The majority of roosts known for this species are in masonry bridges and stone buildings such as castles and ruins. Confirmed hibernacula for the species are extremely rare in Ireland. Several cave locations have been confirmed as autumnal swarming sites for the species, but it is unknown whether these sites also function as hibernation roosts.

Recent estimates for this species suggest a population size in the order of 55,000-77,000 individuals. Ongoing monitoring indicates a relatively stable trend. There is no evidence of decline in suitable habitat. Although some pressures/threats have been noted, there is no indication of any major pressures currently impacting on the species and future prospects are considered good. Overall, the species is assessed as *Favourable*.

Over the previous reporting period, the trend in Population was considered to be increasing, but the current Population trend is considered to be stable in the long term, resulting in an Overall conservation trend of stable.

Frank Greenaway



OVERALL STATUS: FAVOURABLE

1330 WHISKERED BAT *(Myotis mystacinus)*

ANNEX IV

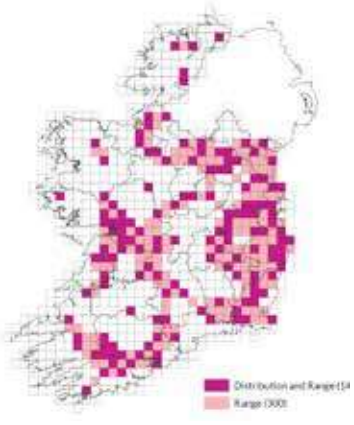
The Whiskered Bat (*Myotis mystacinus*) is widespread across much of Europe although it is absent from northern Scotland and northern Scandinavia. There are records from throughout Ireland, from Donegal to Wexford, but the species is not common and its distribution is dispersed and disjunct.

Summer roosts are normally in old stone buildings. Usually only small numbers of bats are present, although a couple of larger roosts are known. This species often roosts between rafters and felt and in other narrow spaces where they are difficult to locate. Bridge roosts are also known. A number of important autumnal swarming sites have been identified, and small numbers of wintering animals have been recorded in caves. Detector records have been limited due to the difficulty of distinguishing the *Myotis* species, but, more recently, improved bat ID technology is allowing detector records to be distinguished and confirmed more reliably.

This bat is a woodland specialist, foraging selectively in broadleaved and mixed woodland as well as riparian corridors. In Ireland, farmland pasture and wet grassland is also used for foraging.

Pressures impacting on Whiskered Bats can be divided into those affecting roosts and those reducing the quality or availability of their foraging habitat, although their impact is considered to be low. A monitoring scheme has been set up and is being gradually expanded nationwide. It will be several years before Population trend can be calculated and in the meantime the trend and therefore future prospects of this parameter are unknown. Nonetheless, the Overall Status for the species remains *Favourable*, as in the last three assessments.

Frank Greenaway



OVERALL STATUS: FAVOURABLE

1326 BROWN LONG-EARED BAT *(Plecotus auritus)*

ANNEX IV

The Brown Long-eared Bat (*Plecotus auritus*) is widely distributed in Ireland and across Europe. Its slow flight limits the distance that this species can travel and studies have found that almost all bats will forage within 1.5 km of the roost. However, its manoeuvrability means that it can access cluttered habitats, and flightless arthropod prey make up a large proportion of its diet, confirming the importance of gleaning as a foraging strategy for the species. Habitat suitability modelling indicates that the Brown Long-eared Bat selects areas with broadleaf woodland and riparian habitats on a local scale, while the presence of mixed woodland at a wider landscape level is also important. It can cope with low levels of urbanisation, but wetlands such as bog, marsh and heath are generally avoided.

Brown Long-eared Bats rely heavily on man-made structures for roosting. Most of the roosts recorded in Ireland are in buildings, with very small numbers in bridges, trees and bat boxes, although the natural summer roost of this species across Europe is tree holes. This species shows a high degree of roost fidelity and will often use traditional roosts for generations. While the species has been found in a range of building types, from old mills to bungalows, churches or large mansions typically support the largest numbers.

There is a dedicated and robust monitoring scheme in place for this species since 2007. Recent estimates put the Irish population of Brown Long-eared Bats at 65,000-*c.*100,000 animals. There is no indication of any major pressures currently impacting the population and Future prospects are considered good.

Overall, the species is assessed as *Favourable*, as it has been over the last three reporting periods. The overall trend is deemed to be stable, a change from the increasing trend recorded in the last reporting period.

Frank Greenaway

OVERALL STATUS: FAVOURABLE

1331 LEISLER'S BAT *(Nyctalus leisleri)*

ANNEX IV

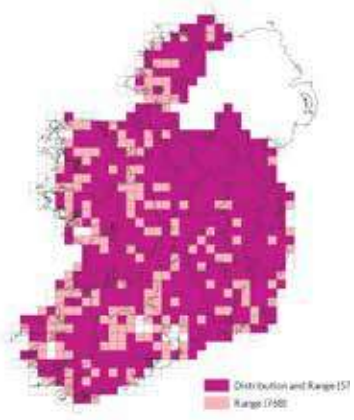
Leisler's Bat (*Nyctalus leisleri*) has been described as a 'typically Irish bat' due to its abundance in Ireland compared to the rest of Europe, where it is uncommon or absent. Its abundance in Ireland has been attributed to the absence of larger competing species, such as the closely related Noctule (*N. noctula*). On continental Europe, Leisler's Bat is considered a tree-dwelling species across most of its distribution. The majority of known roosts of this species in Ireland, however, have been found in buildings, although roost records from trees and bat boxes are also known.

Of all the Irish bat species, Leisler's have the most specific maternity roosting habitat requirements, selecting sites with adjacent woodland and freshwater and avoiding areas of arable land and coniferous woodland. Surveys and modelling of foraging preferences indicate that woodlands, riparian habitats and small amounts of urbanisation are favoured, while peatlands and areas of dense urbanisation are avoided.

Leisler's bat is widespread across Ireland, but monitoring indicates it is more abundant in the east and south of the country. The most recent estimates for this species suggest a population size of *c.*100,000-200,000 animals with monitoring over the last 20 years indicating an increasing trend. Two threats/pressures have been identified: threats from wind farms, and the loss of roosts associated with deliberate or accidental exclusion from houses. However, the true impacts of these pressures need to be investigated further.

The Overall Status of the species is assessed as *Favourable* and the overall trend is demonstrating an on-going increase.

Frank Greenaway



OVERALL STATUS: FAVOURABLE

1334 MOUNTAIN HARE *(Lepus timidus)*

ANNEX V

The Mountain Hare (*Lepus timidus*) is widely distributed across northern Europe and Asia, ranging from Ireland in the west to Japan in the east. In Ireland, *Lepus timidus* occurs as a distinct, endemic sub-species, *Lepus timidus hibernicus*, the Irish Hare. Genetics indicates that the Irish Hare's unique morphology and ecology is the result of adaptation due to the isolation from other Mountain Hare populations for at least 35,000-57,000 years. One of the notable differences between the Irish Hare and *Lepus timidus* in other regions is that the former does not undergo complete winter whitening.

The Irish Hare is the only native hare in Ireland and while a number of introductions of the Brown Hare (*Lepus europaeus*) are known from the nineteenth century, this latter species is currently only known from isolated populations in Northern Ireland.

The Irish Hare is found throughout the country from coastal habitats to upland heath and bog. Diet in all these habitats tends to be dominated by grass species, but can also include herbs and shrubby species. Leverets can be born at any time of year but peak breeding in spring is typical, with a second litter later in the summer under suitable conditions. The species can show significant inter-annual fluctuations in population, making it difficult to estimate trends. Density estimates stratified by habitat show that hares are more abundant in lowland, farmland habitat, while upland areas support lower densities of this species. As a result, changes in agricultural practices can have a significant impact on hare populations.

The range for this species covers nearly the entire landmass of Ireland including some off-shore islands. Despite natural inter-annual fluctuations in population density, the animal is widespread and in places abundant. Agricultural intensification is leading to some reduction in habitat quality and a number of related threats have been identified, but the hare has a broad habitat niche, so the impacts of these changes on habitat extent and quality are taken as unknown.

Overall the animal is considered to remain in *Favourable* status with a stable trend.

Mike Brown

OVERALL STATUS: FAVOURABLE

1355 OTTER *(Lutra lutra)*

ANNEX II, IV

Ireland continues to remain a stronghold for the Eurasian Otter (*Lutra lutra*). Five national surveys have been conducted to date. The first in 1980/81 found signs of Otter throughout the country, at 88% of sites surveyed. There have been some declines since then, but the most recent survey (2023/24) indicates that the population has stabilised overall and that the species remains widespread.

Otters have two basic requirements: aquatic prey and safe refuges where they can rest. In Ireland, Otter populations are found along rivers, lakes and coasts, where fish and other prey are abundant, and where the bank-side habitat offers plenty of cover. The Otter is an opportunistic predator with a broad and varied diet. In coastal areas fish, crabs and molluscs are eaten. In freshwater areas a variety of fish from sticklebacks to salmon and eels will be taken, while crayfish and frogs can be important locally or seasonally.

A total of 44 SACs have been designated for the Otter comprising extensive stretches of river channels and coastline (including off-shore islands) as well as lakes and blanket bog systems. The main threats to the Otter include water pollution, habitat disturbance and accidental deaths (road traffic).

The otter remains widespread across Ireland and its population appears to be relatively stable. There are some concerns about declining water quality nationally as well as ongoing pressures on riparian habitats through drainage works and riparian scrub/woodland clearance, but it is not clear how these changes might impact on Otter.

The Overall Status assessment remains *Favourable*, and the trend is taken as stable, a change from the improving trend recorded in 2019.

Eddie Dunne

OVERALL STATUS: FAVOURABLE

1357 PINE MARTEN *(Martes martes)*

ANNEX V

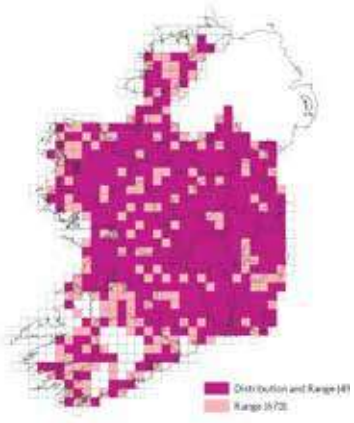
The Pine Marten (*Martes martes*) is a medium-sized arboreal carnivore, typically inhabiting forested ecosystems or landscapes with substantial woodland or scrub. It is an opportunistic feeder on small mammals, berries, nuts, frogs, lizards, birds and invertebrates.

Pine Martens do not produce young until their third year, with females giving birth to 2-4 cubs thereafter, every one or two years. Pine Martens maintain territories and typically occur in low densities. Young animals disperse to find their own territories and the mortality at this stage may be high. Adults in productive habitats may live for 5 or 6 years.

The Pine Marten was formerly widespread in Ireland but declined in the 17th century with the deforestation of the country. Pine Martens suffered further in the 19th and early 20th centuries due to persecution by gamekeepers and trappers. However, the species is now undergoing a phase of re-colonisation. It has greatly increased its range in recent decades and although its population is still low, it is rising. The animal's resurgence is largely attributed to the banning of strychnine and other poisons, the legal protection afforded the species since 1976 under the Wildlife Acts, and the steady increase in afforestation.

While some threats have been identified, none of them are considered sufficiently serious to undermine the continued recovery of the species. The Overall Status assessment of the Pine Marten remains *Favourable* with an improving trend, unchanged since the previous reporting period.

Mike Brown



OVERALL STATUS: FAVOURABLE

1364 GREY SEAL *(Halichoerus grypus)*

ANNEX II, V

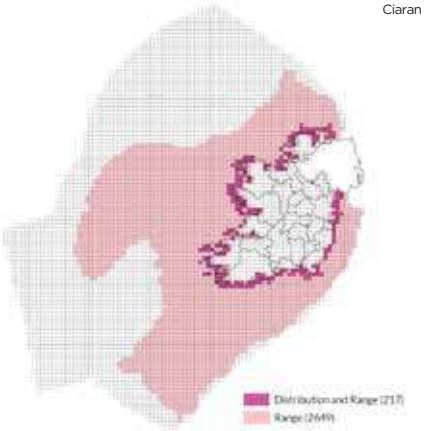
The Grey Seal (*Halichoerus grypus*) is the larger of the two seal species that commonly breed around Ireland and inhabit its inshore and offshore waters. Notable by a pronounced sexual dimorphism, adult males can measure 2.0-2.5 m in length and weigh up to 300 kg in comparison to adult females, which tend to be less than 2 m in length and weigh less than 180-190 kg. When the animal's head is clearly visible, Grey Seals can be identified by their characteristic long muzzle and comparatively straight or convex snout from forehead to nose. Fur colouration can be highly variable in juveniles and adults of both sexes, ranging from a slate-grey dorsal surface and a lighter, mottled ventral surface to uniformly dark grey or brown with lighter blotches.

Grey Seals are primarily pelagic or demersal in their feeding habits and can be wide-ranging. They are only found in the Northern Hemisphere, mainly in cold temperate and sub-polar waters, in the North-East Atlantic from Iceland and Norway to the French coast. Those in Ireland are generally considered part of a larger population or meta-population that also inhabits adjacent jurisdictions (i.e. the UK and France at least).

Pressures on this species in Irish waters mainly involve commercial vessel-based activities such as impacts arising from geophysical seismic exploration or from local/regional prey removal by fisheries or bycatch in fisheries. Other possible impacts may occur from coastal tourism and localised human disturbance at haul-out sites. While the effect of these pressures may act on a temporary and/or regional scale, none is considered to be of sufficient magnitude to adversely impact on Grey Seal populations in Irish waters.

Given the current state of knowledge of the species' distribution, population, ecology and prevailing pressures, the Overall Status of the Grey Seal is *Favourable* with an improving trend, unchanged from 2019.

Ciaran O'Keeffe



OVERALL STATUS: FAVOURABLE

1365 HARBOUR SEAL *(Phoca vitulina)*

ANNEX II, V

The Harbour Seal (*Phoca vitulina*) is the smaller of two seal species that commonly breed around the coast of Ireland and inhabit its inshore and offshore waters. Unlike the larger Grey Seals, Harbour Seals do not show a very pronounced sexual dimorphism when mature. Adult males can measure up to 1.9 m in length and weigh between 70 kg and 150 kg, while adult females may be up to 1.7 m in length and weigh between 60 kg and 110 kg. At all ages, Harbour Seal fur colouration patterns can be highly variable, ranging from yellow-brown, tan or mid-brown to grey-black and with variable spotted, dappled or speckled markings along the body length.

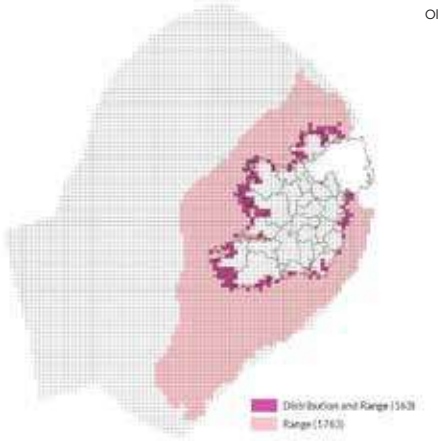
Harbour Seals are one of the most widespread species of pinniped, inhabiting the Northern Hemisphere from warm temperate and even subtropical waters to northern polar regions. Substantial declines and die-offs have been recorded both historically and recently in this species, including via viral disease in Europe and elsewhere.

In Ireland, Harbour Seals occur in estuarine, coastal and fully marine areas and also occupy regular haul-out sites about which animals breed, moult, rest and engage in social activity.

Pressures on this species in Irish waters mainly involve commercial vessel-based activities such as impacts arising from geophysical seismic exploration or from local/regional prey removal by fisheries or bycatch in fisheries. Other possible impacts may occur from coastal tourism and localised human disturbance at haul-out sites. While the effect of these pressures may act on a temporary and/or regional scale, none is considered to be of sufficient magnitude to adversely impact on Harbour Seal populations in Irish waters.

Given the current state of knowledge of the species' distribution, population, ecology and prevailing pressures, the Overall Status of the Harbour Seal is *Favourable* with a stable trend, unchanged from 2019.

Oliver Ó Cadhla



OVERALL STATUS: FAVOURABLE

1345 HUMPBACK WHALE *(Megaptera novaeangliae)*

ANNEX IV

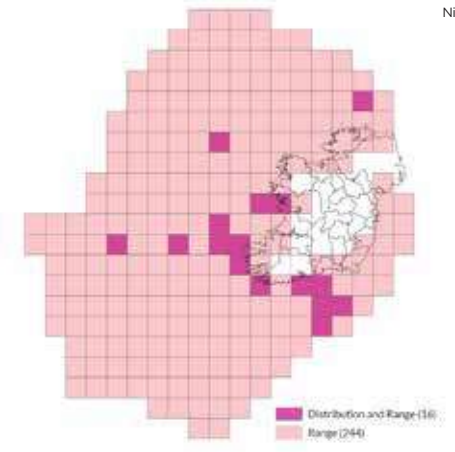
The Humpback Whale (*Megaptera novaeangliae*) is the fourth largest baleen whale species found in Ireland. It is readily identifiable at close range due to several diagnostic features including its characteristic low 'bushy' blow, a small irregularly-shaped dorsal fin, uniquely long, white and flexible pectoral fins, and white patterning on the underside of the tail flukes. Humpback Whales feed on small shoaling fish, krill and zooplankton, and they commonly move between cold, high-latitude feeding grounds in summer and warm tropical waters in winter, during which calving and mating occurs. Some identifiable individuals have repeatedly returned to forage off Ireland's south-west and south coasts in autumn/winter. Individuals have also been recorded in Iceland or Norway, underlining the species' tendency for long-range movement and migration.

Having been hunted intensively into the early 20th century, this species has seen some post-whaling recovery in parts of its range, yet records are uncommon in offshore Irish waters compared to more numerous whale species like Fin and Minke Whales. It is possible that Humpback Whales are under-recorded, e.g., due to difficulties in distinguishing them from other whales in the open sea; nevertheless, sightings off the Irish coast have increased substantially over the last two decades.

The species' natural range in Irish waters is a small component of its wider North Atlantic migratory range with the main known pressures relating to entanglement and ship strikes. Pressures on this species in Irish waters mainly involve commercial vessel-based activities such as impacts arising from geophysical seismic exploration or from local/regional prey removal by fisheries. While the effect of these pressures may act on a temporary and/or regional scale, none is considered to be of sufficient magnitude to adversely impact this species populations in Irish waters.

The Overall Status of Humpback Whale in Ireland is *Favourable* with a stable trend. This is a change from the 2019 assessment of Unknown and is due to the availability of more accurate data on the species.

Nicholas Massett



OVERALL STATUS: FAVOURABLE

1349 BOTTLENOSE DOLPHIN *(Tursiops truncatus)*

ANNEX II, IV

The Common Bottlenose Dolphin (*Tursiops truncatus)* is found throughout the world's tropical and temperate marine waters, though in the North-East Atlantic it is rarely recorded in the Baltic Sea or north of the Faroe Islands. Classified by the IUCN as a species of Least Concern, partly due to its global distribution and abundance, the Bottlenose Dolphin is regularly recorded in Irish coastal and offshore waters, while some communities show a level of residency in quite discrete coastal areas.

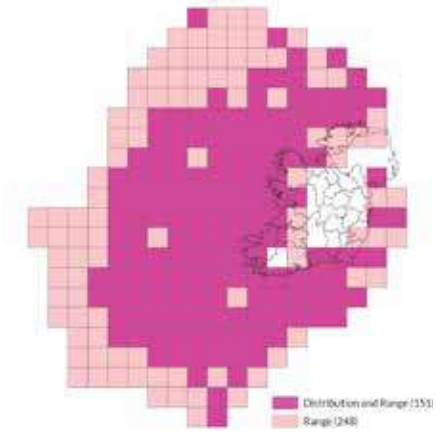
Bottlenose Dolphins are one of the most frequently recorded and familiar cetaceans occurring in Ireland. With adults averaging up to 3.0-3.8 m in length, they are quite readily identifiable, bearing a substantial curved grey dorsal fin, a short but pronounced rounded beak, and lacking an obvious pattern in their grey body colouration except for a paler ventral surface.

Genetic and/or ecological separation of coastal and offshore populations of Bottlenose Dolphins has been demonstrated in the western and eastern North Atlantic. Across European Atlantic waters, genetic analysis has identified five distinct coastal populations occupying the following regions: Shannon Estuary, west coast of Ireland, English Channel, Galicia coast, east coast of Scotland and Wales/west Scotland. In Irish waters three distinct populations occur: Atlantic pelagic, west coast, and Shannon.

Pressures on this species in Irish waters mainly involve commercial vessel-based activities such as impacts arising from geophysical seismic exploration or from local/regional prey removal by fisheries or bycatch in fisheries. While the effect of these pressures may act on a temporary and/or regional scale, none is considered to be of sufficient magnitude to adversely impact on populations of bottlenose dolphin in Irish waters.

The Overall Status of Common Bottlenose Dolphin in Ireland remains *Favourable*. This overall result is the same as the previous three assessments.

Machiel Oudejans



OVERALL STATUS: FAVOURABLE

1350 SHORT-BEAKED COMMON DOLPHIN *(Delphinus delphis)*

ANNEX IV

The Short-beaked Common Dolphin (*Delphinus delphis*) is one of the smallest dolphin species occurring in Irish waters, with adults averaging to just 1.7-2.0 m in length. Found throughout the world's oceans and in the North-East Atlantic from Norway to West Africa, it is classified by the IUCN as a species of Least Concern since its global distribution and abundance estimates indicate that it is well above thresholds for a threatened category.

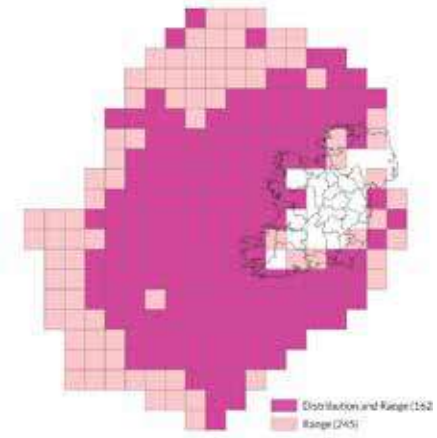
Short-beaked Common Dolphins are the most frequently recorded dolphin species in Irish waters, partly due to a tendency to closely approach moving vessels. They are quite readily identifiable when they break clear of the surface showing the species' characteristic pronounced beak, relatively tall curved dorsal fin and an extended horizontal 'hourglass' colour pattern on the flanks.

Although Short-beaked Common Dolphins are broadly pelagic in their population ecology and foraging ecology, and may conduct seasonal movements in some regions, separate breeding stocks and clear latitudinal patterns in movement by populations in the North-East Atlantic are not apparent.

The species' natural range in Irish waters is a small component of its wider North Atlantic range with movements occurring both within and outside the marine jurisdictions of many States in which the species may be subject to a range of pressures. The estimated level of Short-beaked Common Dolphin bycatch significantly exceeded the modelled threshold/removal limit in the North-East Atlantic Assessment Unit, which includes all of Ireland's EEZ. Pressures on this species in Irish waters mainly involve commercial vessel-based activities such as impacts arising from geophysical seismic exploration or from local/regional prey removal by fisheries or bycatch in fisheries.

The Overall Status of Short-beaked Common Dolphin in Ireland remains *Favourable*. This overall result is the same as the previous three assessments.

Gary Burrows



OVERALL STATUS: FAVOURABLE

1351 HARBOUR PORPOISE *(Phocoena phocoena)*

ANNEX II, IV

The Harbour Porpoise (*Phocoena phocoena)* is the smallest cetacean species occurring in Irish waters, with adults averaging just 1.4-1.8 m long. Inhabiting only the Northern Hemisphere, the species is mainly found in cold temperate and sub-polar waters, in the North-East Atlantic from Iceland and northern Norway to north-west Africa. Harbour Porpoises are the only cetaceans to regularly occur in the Baltic Sea, but they do not commonly occur in the Mediterranean. A reproductively isolated population occurs in the Black Sea. The population structure of Harbour Porpoise is currently under investigation, as some evidence of genetic differentiation from the North Atlantic population has been observed in western Greenland and the Baltic Sea.

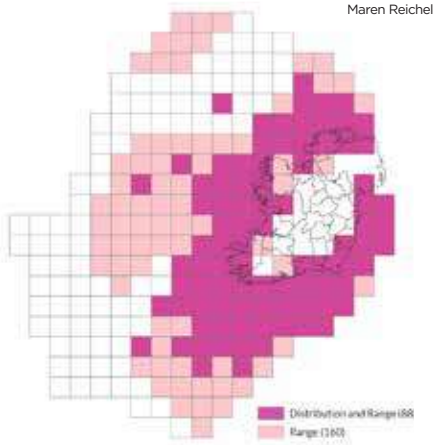
Classified by the IUCN as a species of Least Concern due to its wide occurrence and overall abundance estimates, the Harbour Porpoise is one of the most frequently recorded cetacean species in Irish waters but is recorded with greater difficulty offshore and in the open Atlantic due to its small size and inconspicuous nature.

Although Harbour Porpoises may conduct large scale and/or seasonal movements in some regions, distinct breeding populations, or stocks, and patterns in movement/ distribution by populations in western Europe are not well understood.

The species' natural range in Irish waters is a small component of its wider North Atlantic range with movements occurring both within and outside the marine jurisdictions of many States in which the species may be subject to a range of pressures. The estimated level of Harbour Porpoise bycatch significantly exceeded the modelled threshold/removal limit in the North-East Atlantic Assessment Unit, which includes all of Ireland. Pressures on this species in Irish waters mainly involve commercial vessel-based activities such as impacts arising from geophysical seismic exploration or from local/regional prey removal by fisheries or bycatch in fisheries.

The Overall Status of Harbour Porpoise in Ireland is *Inadequate* with a stable trend. This is a change from the T assessment recorded in 2019. The change is partly due to more accurate data and to less favourable future prospects, but also to unknown factors, with the population of Harbour Porpose recorded in this reporting period lower than in the last.

Maren Reichelt & Mick Baines



OVERALL STATUS: INADEQUATE

2027 KILLER WHALE *(Orcinus orca)*

ANNEX IV

The Killer Whale (*Orcinus orca*) is the largest of the dolphin family Delphinidae that occurs in Irish waters. Found mostly in temperate and sub-polar regions, its North Atlantic populations appear to range mainly from the Gulf of Mexico, north-west Africa and the Mediterranean, north to Greenland, Iceland and Norway.

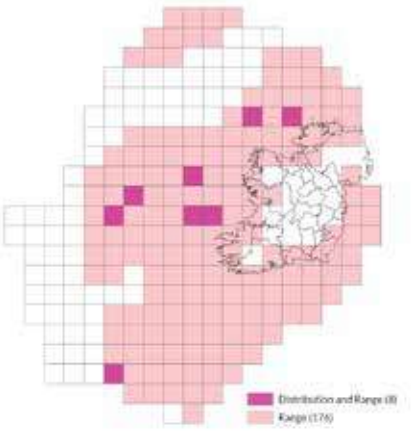
Killer Whales are classified by the IUCN as a Data Deficient species due to ongoing taxonomic uncertainties. With further research globally into their ecology and recognised subspecies, it is possible that distinct species may be established in the future. At least three genetically distinct populations have been identified in the North Atlantic so far; this is apparently linked to the distribution of their main prey species (i.e., herring, mackerel, tuna).

With adults reaching up to 6.5-9 m in length, their characteristic tall black dorsal fin and very distinctive white/near-white patches behind the eye and dorsal fin, Killer Whales are readily identifiable at sea. In Ireland, they are recorded annually in small numbers, and at least some of the whales photo-identified in Ireland are known from coastal Scotland.

The species' natural range in Irish waters is a small component of its wider range, with movements occurring both within and outside the marine jurisdictions of many States in which the species may be subject to a range of pressures. The main pressures thought to be acting on this species in Irish waters are considered to involve potential pollutant burdens from man-made Polychlorinated Biphenyl compounds (PCBs), plus other persistent organic pollutants (POPs), as well as impacts from commercial vessel-based activities such as geophysical seismic exploration and local/regional prey removal by fisheries.

The Overall Status of Killer Whale in Ireland remains *Unknown* due to limited ongoing information on the species' occurrence and population ecology in Irish waters. This overall result is the same as the previous three assessments.

Róisín Pinfield



OVERALL STATUS: UNKNOWN

2029 LONG-FINNED PILOT WHALE *(Globicephala melas)*

ANNEX IV

The Long-finned Pilot Whale (*Globicephala melas*) is one of the largest members of the dolphin family Delphinidae occurring in Ireland, with adults averaging up to 6 m long. Found in temperate and sub-polar regions, its North Atlantic populations range from Greenland, Iceland and the Barents Sea to the Tropic of Cancer, including the western and central Mediterranean Sea. In 2018, its IUCN status was revised to Least Concern due to abundance information and a low threat assessment for its populations.

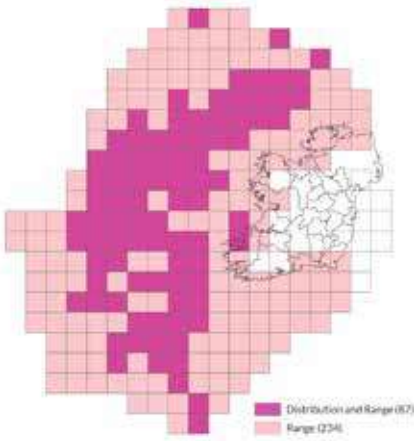
Long-finned Pilot Whales are frequently recorded in offshore Atlantic waters, usually over the continental shelf and slope, and deeper ocean basins. They are often found to associate with distinct bathymetric features, for example, underwater canyons and troughs. They are quite readily identifiable due to their body size and mainly black/dark grey colour, a notably broad-based dorsal fin and a bulbous melon (forehead) lacking an obvious beak.

This highly social and mainly squid-eating species is known to be deep-diving in its foraging ecology, and it may conduct seasonal inshore movements in some areas.

Pressures acting on this species in Irish waters mainly involve commercial vessel-based activities that occur primarily on a local or regional scale and/or on a temporary or intermittent basis, such as impacts arising from shipping movements or geophysical seismic exploration. Other pressures throughout the species' range include incidental mortality from fisheries, anthropogenic sound and contaminants.

Given the current knowledge of the species' population size, distribution, ecology and the prevailing pressures on the species, the Overall Status of Long-finned Pilot Whale in Ireland remains *Favourable*. This overall result is the same as in the previous three assessments.

Gary Burrows



OVERALL STATUS: FAVOURABLE

2030 RISSO'S DOLPHIN *(Grampus griseus)*

ANNEX IV

The Risso's dolphin (*Grampus griseus*) is one of the larger dolphins occurring in Irish waters, its adults averaging up to 4.0 m long. Found throughout the world's oceans and in the Atlantic from Norway to South Africa, it is classified by the IUCN as a species of Least Concern since its global range and abundance indicate that the species is well above the thresholds for a threatened category.

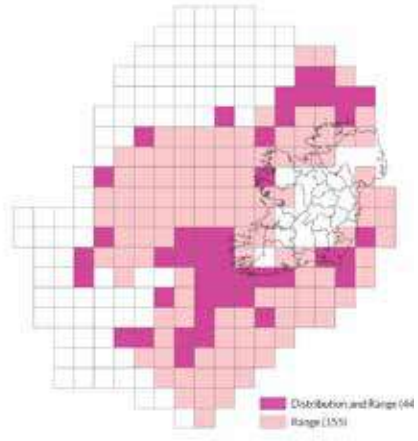
Risso's Dolphins have historically been one of the least frequently recorded dolphin species in Ireland, especially offshore. However, records have been growing, perhaps partly due to increased or improved surveillance. They are quite readily identifiable at sea, having an unusually tall dorsal fin, no noticeable beak and with many individuals showing scarred whitened backs, especially in front of the dorsal fin.

Although the species may conduct seasonal movements in some regions, separate breeding stocks and clear latitudinal patterns in movement by populations in the North Atlantic are not apparent.

Pressures on this species in Irish waters mainly involve commercial vessel-based activities such as impacts arising from geophysical seismic exploration or from local/regional prey removal by fisheries. Another potential pressure is the use of military sonars in the deeper ocean and adjacent continental margins which, while not employed by the Irish Naval Service, is known and documented to occur in the waters of Ireland's EEZ. None of these pressures are considered to adversely impact populations of the species in Irish waters.

Given the current knowledge of the species' population size, distribution, ecology and the prevailing pressures on the species, the Overall Status of Risso's Dolphin in Ireland is assessed as *Favourable* with a stable trend, unchanged from 2019.

Nicholas Massett



OVERALL STATUS: FAVOURABLE

2031 ATLANTIC WHITE-SIDED DOLPHIN *(Lagenorhynchus acutus)*

ANNEX IV

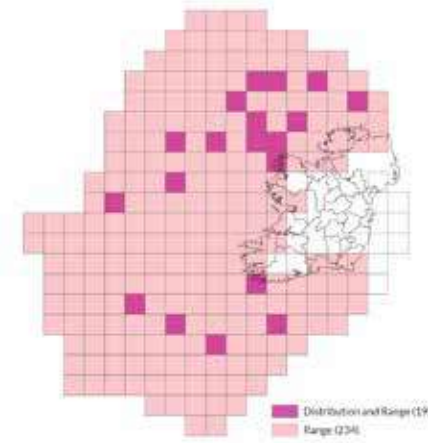
The Atlantic White-sided Dolphin is one of several medium-sized dolphin species occurring in Irish waters, its adults averaging c. 2.2-2.7 m in length. Like its close relative, the White-beaked Dolphin, it is confined to the North Atlantic and mainly found in cold temperate and sub-polar waters; in the east, from Iceland and northern Norway, to the Iberian Peninsula.

Classified by the IUCN as a species of Least Concern since its broad range and abundance estimates indicate that it is well above the thresholds for a threatened category, it is quite commonly recorded in Irish Atlantic waters but less so coastally. White-sided Dolphins can be difficult to distinguish at sea due to their small size, inconspicuous dorsal fin and black/dark grey dorsal colouration. They are more readily identified when breaking clear of the water, showing a characteristic short stubby beak, thick tail stock and horizontal white into sandy colour bands on the rear flanks of the body.

While it is known to feed mainly on small pelagic schooling fish and squid, this species' wider population ecology in the North-East Atlantic is not well understood.

Pressures acting on this species in Irish waters mainly involve commercial vessel-based activities such as impacts arising from geophysical seismic exploration and from local/regional prey removal by fisheries. None of these are considered to be having an adverse impact on the population in Irish waters. Given the current knowledge of the species' population size, distribution, ecology and the prevailing pressures on the species, the Overall Status of Atlantic White-sided Dolphin in Ireland remains *Favourable*. This overall result is the same as the previous three assessments.

Oliver Ó Cadhla



OVERALL STATUS: FAVOURABLE

2032 WHITE-BEAKED DOLPHIN *(Lagenorhynchus albirostris)*

ANNEX IV

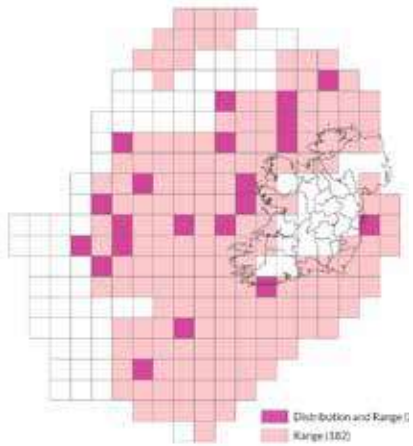
The White-beaked Dolphin (*Lagenorhynchus albirostris*) is one of several medium-sized dolphin species confined to the Northern Hemisphere, where it is predominantly found in cold temperate and sub-polar waters. In the North-East Atlantic, it occurs from Iceland and northern Norway south to the Bay of Biscay and Portugal.

Classified by the IUCN as a species of Least Concern since its broad North Atlantic range, abundance and status indicate that it is well above the thresholds for a threatened category, White-beaked Dolphins are regularly recorded in Irish offshore waters and coastally.

Although challenging to distinguish from other dolphin species at sea, White-beaked Dolphins are quite readily identifiable at close range via their characteristic short stub-like white/grey beak, conspicuously tall dorsal fin relative to body size, stocky appearance and large pale white-coloured bands or patches on the flanks of the body. Known to feed on a variety of small pelagic schooling fish, squid and crustaceans, White-beaked Dolphins do not currently demonstrate separate breeding stocks or clear patterns in movement in the eastern North Atlantic.

The main pressures acting on this species in Irish waters involve commercial shipping-based or vessel-based activities such as impacts arising from geophysical seismic exploration and from local/regional prey removal by fisheries. While the effect of these pressures may act on a temporary and/or regional scale, none is considered to be of sufficient magnitude to be causing an adverse impact on populations of White-beaked Dolphin in Irish waters. Given the current knowledge of the species' population size, distribution, ecology and the prevailing pressures on the species, the Overall Status of White-beaked Dolphin in Ireland remains *Favourable*. This overall result is the same as the previous three assessments.

Róisín Pinfield



OVERALL STATUS: FAVOURABLE

2034 STRIPED DOLPHIN *(Stenella coeruleoalba)*

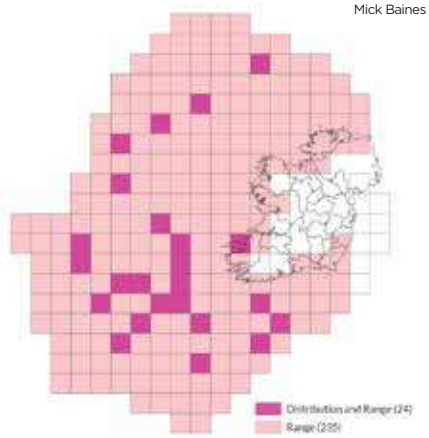
ANNEX IV

The Striped Dolphin (*Stenella coeruleoalba*) is one of the smallest dolphin species occurring in Ireland, its adults averaging just 1.8-2.5 m in length. It is found globally in tropical and warm temperate waters from the Faroe Islands to South Africa, with a notable prevalence in the Mediterranean. There are indications that such populations may be genetically distinct from those in the Atlantic.

Classified by the IUCN as a species of Least Concern due to its global distribution, abundance information and limited threats to populations in the open ocean, each year Striped Dolphins are recorded in small numbers in Irish waters. However, they can be difficult to distinguish at sea due to their size and traits that are shared with many dolphin species, particularly Short-beaked Common Dolphins. They are more easily identified at close range when their characteristic pale flanks and white ventral surface, and narrow grey/black stripes extending laterally from the eye, can be observed. Comparatively little is known of the species' population ecology or movements in the North Atlantic.

The main pressures acting on this species in Irish waters involve commercial shipping-based or vessel-based activities such as impacts arising from geophysical seismic exploration and from local/regional prey removal by fisheries. While the effect of these pressures may act on a temporary and/or regional scale, none is considered to be of sufficient magnitude to be causing an adverse impact on populations of Striped Dolphin in Irish waters. Given the current knowledge of the species' population size, distribution, ecology and the prevailing pressures on the species, the Overall Status of Striped Dolphin in Ireland remains *Favourable*. This overall result is the same as the previous three assessments.

Mick Baines & Maren Reichelt



OVERALL STATUS: FAVOURABLE

2035 CUVIER'S BEAKED WHALE *(Ziphius cavirostris)*

ANNEX IV

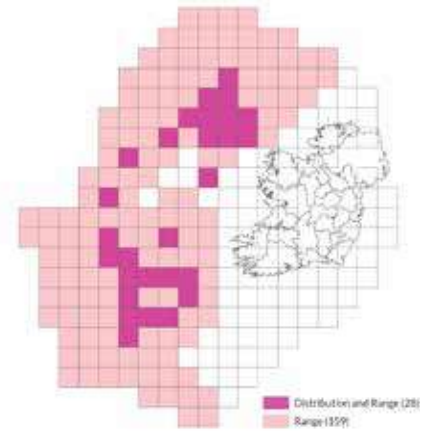
The Cuvier's Beaked Whale (*Ziphius cavirostris*) is a distinctive short-beaked toothed whale measuring up to 5.5-6.5 m in length and found in all of the world's oceans except polar regions. Its range in the eastern Atlantic extends from Iceland and Norway to waters off southern Africa. It is the only beaked whale species commonly occurring in the Mediterranean.

Cuvier's Beaked Whales can be difficult to identify in the open sea due, for example, to elusive or evasive behaviour in the presence of vessels and the absence of many features observable at long range. They may be identified more readily at close range due to their distinctive skin colouration/scarring, a short prominent blunt beak, a small curved dorsal fin about two-thirds of the way along the back, and the absence of a central notch in the tail flukes.

Live records of this species in Irish waters are infrequent, although it is the most frequently stranded beaked whale around Ireland. Knowledge of its population structure or seasonal movements remains limited due to the historical scarcity of data; however, information has improved since 2015.

Pressures acting on this species in Irish waters mainly involve commercial shipping-based or vessel-based activities such as impacts arising from geophysical seismic exploration and from local/regional prey removal by fisheries. Another potential pressure is the use of military sonars in the deeper ocean and adjacent continental margins which, while not employed by the Irish Naval Service, is known and documented to occur in the waters of Ireland's EEZ. None of these pressures are considered to be significantly impacting on populations of the species in Irish waters. Given the current knowledge of the species' population size, distribution, ecology and the prevailing pressures on the species, the Overall Status of Cuvier's Beaked Whale in Ireland is assessed as *Favourable*, unchanged from 2019.

Fleur Visser



OVERALL STATUS: FAVOURABLE

2038 SOWERBY'S BEAKED WHALE *(Mesoplodon bidens)*

ANNEX IV

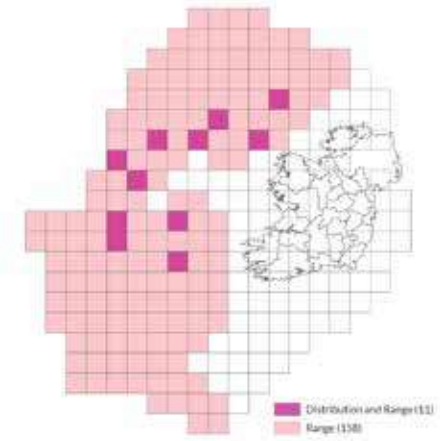
The Sowerby's Beaked Whale (*Mesoplodon bidens*) is a smaller member of the beaked whale family (Ziphiidae), averaging up to 5-6 m in adult body length. It is found only in the North Atlantic, where it occurs in temperate and sub-polar regions. One of at least three *Mesoplodon* species to occur in Ireland, its range in the eastern Atlantic extends from Iceland and Norway to the Azores and Canary Islands, and excludes the Mediterranean and Baltic Seas.

While it is classified by the IUCN as a Least Concern species whose population status and trends remain uncertain, Sowerby's Beaked Whales are quite readily identifiable in the field. This is due to their long slender beak which is often clearly visible when the animal surfaces, to the absence of a central notch in the tail flukes, and its skin colouration which tends to be dark grey on the dorsal surface and often contains elongated scarring on the flanks.

Live records in Irish waters are infrequent, with individuals occasionally stranding around the coast. Knowledge of population structure or movements remains limited due to the historical scarcity of data, but information has improved since 2015.

Pressures acting on this species in Irish waters mainly involve commercial shipping-based or vessel-based activities such as impacts arising from geophysical seismic exploration and from local/regional prey removal by fisheries. None of these pressures are considered to be of sufficient magnitude to adversely impact on population of Sowerby's beaked whale in Irish waters. Given the current knowledge of the species' population size, distribution, ecology and the prevailing pressures on the species, the Overall Status of Sowerby's Beaked Whale in Ireland is assessed as *Favourable*, unchanged from 2019.

Dave Cade



OVERALL STATUS: FAVOURABLE

2618 MINKE WHALE *(Balaenoptera acutorostrata)*

ANNEX IV

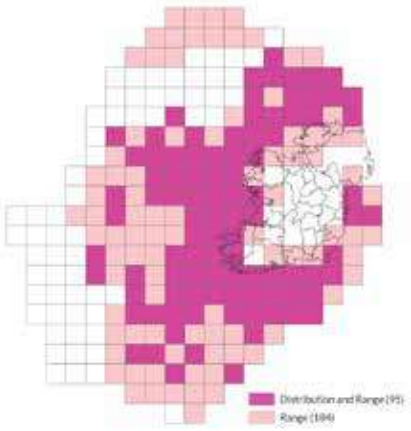
The Minke Whale (*Balaenoptera acutorostrata*) is the smallest baleen whale species occurring in Irish waters, with adults averaging to just 8.5 m in body length. Found only in the Northern Hemisphere, the species is recorded more frequently in Irish waters than its larger Baleanopterid relatives the Blue Whale, Fin Whale and Sei Whale, although this may be partly due to a greater tendency to occupy shallower coastal and continental shelf waters.

Minke Whales have been observed all around Ireland's coast and offshore in deep ocean basins, as well as over the continental shelf and slope. Known also to enter coastal bays or to be seen close to headlands, individual whales may approach slow-moving boats and other vessels. As well as their size difference and the absence of a distinct tall exhalation blow when surfacing, the species' characteristic pointed snout and broad white patches on the pectoral fins are striking and useful in its identification.

Minke Whales are thought to prey on small fish and swimming crustaceans and it is thought that they undertake some migratory movement to warmer waters in the winter. In Ireland, Minke Whales are seen in all seasons, though usually as single individuals or in loose associations of up to ten animals linked to localised feeding activity.

Pressures on this species in Irish waters mainly involve commercial shipping-based or vessel-based activities such as impacts arising from shipping movements, geophysical seismic exploration or from local/regional prey removal by fisheries. None of these pressures are considered to be of sufficient magnitude to adversely impact on populations of Minke Whale in Irish waters. Given the current knowledge of the species' population size, distribution, ecology and the prevailing pressures on the species, the Overall Status of the Minke Whale in Ireland is assessed as *Favourable*. This overall result is the same as the previous three assessments.

Colin Barnes



OVERALL STATUS: FAVOURABLE

2621 FIN WHALE *(Balaenoptera physalus)*

ANNEX IV

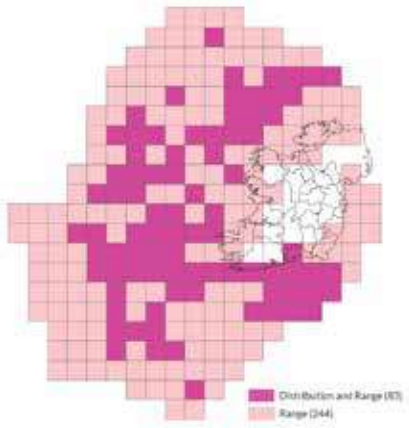
The Fin Whale (*Balaenoptera physalus*) is the second largest whale species in the world. It is the most frequently recorded large whale species in Irish waters, being seen more often than either of its close relatives of similar size, the Blue Whale and Sei Whale.

Once hunted intensively throughout the North Atlantic in the late 19th and early 20th centuries, Fin Whales are recorded in all Irish waters from deep ocean basins to continental slope and shelf areas, and even seasonally in inshore waters off the south-west, south and south-east coasts. Over the last 15-20 years, the annual occurrence of numerous whales off the Cork, Waterford and Wexford coasts has enabled a growing whale-watching industry and led to several ecological studies.

While Fin Whales can be difficult to distinguish at sea from other whales, their asymmetrical light grey to white skin pigmentation in the right jaw and head area is striking and useful for identification. Fin Whales are usually observed in small numbers of one to three individuals or in loose associations of up to twenty animals linked to localised feeding activity. This species preys mainly on small fish, swimming crustaceans and zooplankton, and though it is often considered to be a migratory species, Fin Whales are recorded in all seasons in Ireland.

Pressures acting on this species in Irish waters mainly involve commercial shipping-based or vessel-based activities such as shipping movements, geophysical seismic exploration or local/regional prey removal by fisheries. None of these are considered to be of sufficient magnitude to adversely impact on populations of Fin Whale in Irish waters. The Overall Status of Fin Whale in Ireland is assessed as *Favourable*, given the current knowledge of the species' distribution, ecology and prevailing pressures on the species. This overall result is the same as in the previous three assessments.

Róisín Pinfield



OVERALL STATUS: FAVOURABLE =

5020 BLUE WHALE *(Balaenoptera musculus)*

ANNEX IV

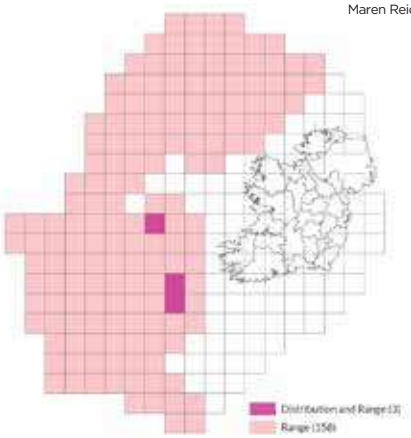
The Blue Whale (*Balaenoptera musculus*) is the world's largest animal species, measuring up to 30 m in length, but it remains one of the most rarely observed cetaceans in Irish waters. This is probably due to severe population depletion as a result of intensive hunting throughout its North Atlantic range, as well as a mainly oceanic and temporary occurrence.

Blue Whales commonly migrate between cold, high-latitude feeding grounds in summer and warm temperate or tropical waters in winter, during which calving and mating occurs. Individual Blue Whales can be identified at sea by their sheer body size and other diagnostic features, including a characteristically tall column-shaped blow often extending more than 10 m high, a very small triangular dorsal fin, and blue-grey skin colouration with lighter-coloured blotches or patches.

The species feeds on swimming crustaceans and zooplankton in oceanic, continental slope and even shelf waters. Records from Ireland remain limited, usually consisting of one to two animals in deep waters far off the west and south-west coasts. While information on the species' true occurrence and ecology remains patchy, there is some growing evidence of animals migrating through Irish waters in the autumn and early winter, and also of active foraging during such transits.

Pressures acting on this species in Irish waters mainly involve commercial shipping-based or vessel-based activities such as impacts arising from shipping movements or geophysical seismic exploration. None of these are considered to be of sufficient magnitude to adversly impact on populations of Blue Whale in Irish waters. The Overall Status of the Blue Whale continues to be *Unknown* due to limitations in information on its occurrence and population ecology in Ireland's extensive marine waters. This overall result is the same as in the previous three assessments.

Maren Reichelt & Mick Baines



OVERALL STATUS: UNKNOWN

2624 SPERM WHALE *(Physeter macrocephalus)*

ANNEX IV

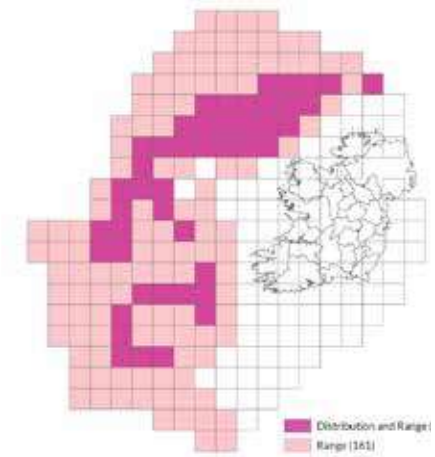
The Sperm Whale (*Physeter macrocephalus*) is the largest toothed cetacean occurring in Irish waters. Mature males measure up to 16-18 m in body length while females are smaller (c. 10-12 m). This familiar deep-diving species is widely found from equatorial to polar regions and has been regularly recorded during oceanic surveys to the west of Ireland.

Sperm Whales are quite readily identified due to their body size, their notably blunt forehead and low, bushy exhalation blow, and their characteristic low, bump-like dorsal fin that can be difficult to observe at sea. Some populations are known to make seasonal movements but clear latitudinal migrations are not commonly described. However, the segregation of adults is well described, with only males occupying cold temperate and sub-polar latitudes. Records of females or calves stranding in Ireland are rare.

Ireland is one of a few EU member states inhabited by this predominantly squid-eating species, which remains classified as Vulnerable due to numbers being reduced by industrial hunting on a wide spatial and temporal scale.

Pressures acting on this species in Irish waters mainly involve commercial shipping-based or vessel-based activities such as impacts arising from shipping movements or geophysical seismic exploration. None of these are considered to be of sufficient magnitude to adversely impact on populations of Sperm Whale in Irish waters. The Overall Status of Sperm Whale is assessed as *Favourable* given the current knowledge of the species' population size, distribution, ecology and prevailing pressures on the species. This overall result is the same as in 2019.

William Hunt



OVERALL STATUS: FAVOURABLE

5033 NORTHERN BOTTLENOSE WHALE *(Hyperoodon ampullatus)*

ANNEX IV

The Northern Bottlenose Whale (*Hyperoodon ampullatus*) is the largest of the beaked whale family (Ziphiidae) occurring in Ireland, its adults averaging up to 7-9 m long. It is found only in the North Atlantic, mainly in temperate and sub-polar regions; in the east, its range stretches from Greenland and northern Norway to the Azores and north-west Africa but excluding the Mediterranean and Baltic Seas.

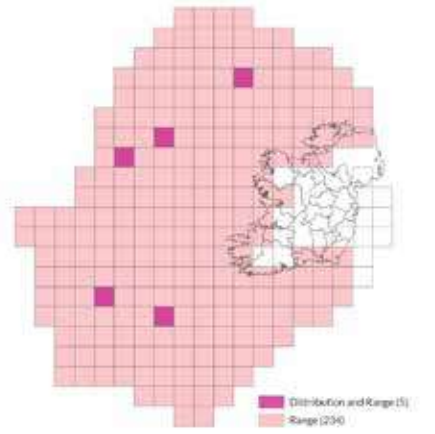
It is classified by the IUCN as a Data Deficient species whose population status and trends remain uncertain after depletion through intensive whaling. Northern Bottlenose Whales have a large, long, robust body with a small, triangular, hooked dorsal fin located about two-thirds down their back. They have a distinct bulbous melon (forehead) and prominent but short rounded beak.

Northern Bottlenose Whales are generally found in deep oceanic habitats. Records from Irish waters have been infrequent and sporadic with the occasional coastal occurrence. It is one of the most frequently sighted and stranded species of beaked whale in Irish waters. Knowledge of this deep-diving species' population structure, breeding habits and movements remains very limited due to the historical scarcity of data, but information has improved somewhat since 2015.

Pressures acting on this species in Irish waters mainly involve commercial shipping-based or vessel-based activities such as impacts arising from geophysical seismic exploration and from shipping movements. Another potential pressure is the use of military sonars in the deeper ocean and adjacent continental margins which, while not employed by the Irish Naval Service, is known and documented to occur in the waters of Ireland's EEZ. None of these pressures are considered to adversely impact populations of the species in Irish waters.

The Overall Status of the Northern Bottlenose Whale is *Unknown*, as it was for the last three assessments, due to limited ongoing information on the species' occurrence and population ecology in Irish waters.

Eilidh Siegal



OVERALL STATUS: UNKNOWN

2619 SEI WHALE *(Balaenoptera borealis)*

ANNEX IV

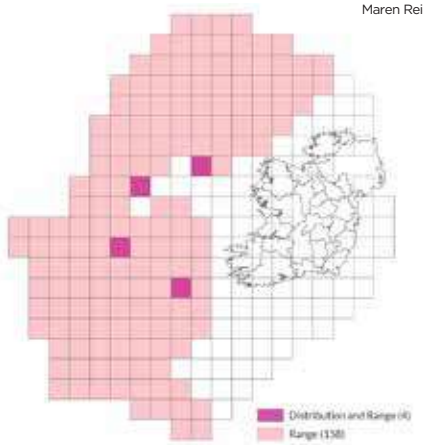
The Sei Whale (*Balaenoptera borealis*) is the third largest whale species found in Ireland but is one of the least frequently recorded. In addition to severe population depletion as a result of hunting, an apparently oceanic occurrence may partly explain why records remain low compared to more coastally-occurring species such as the Fin and Humpback Whale. It is also possible that the species is somewhat under-recorded due to difficulties in distinguishing it from other large whales.

Sei Whales are believed to commonly move between cold high-latitude feeding grounds in summer and warm temperate or tropical waters in winter, during which calving and mating occurs. The sparse nature of Irish records makes its seasonal occurrence and distribution unclear. Individual whales are only readily identifiable in good sea conditions or within close range where diagnostic features, including its surfacing behaviour, characteristic upright and comparatively tall dorsal fin, and the absence of asymmetrical skin colouration can be observed.

Sei Whales feed mainly on small shoaling fish, swimming crustaceans and zooplankton in oceanic, continental slope and shelf waters. Having been intensively hunted into the mid-late 20th century, there is little sign of any recovery in North-East Atlantic populations.

Pressures acting on this species in Irish waters mainly involve commercial shipping-based or vessel-based activities such as impacts arising from shipping movements or geophysical seismic exploration. None of these are of sufficient magnitude to adversely impact on populations of Sei Whale in Irish waters. The Overall Status of the Sei Whale in Ireland remains *Unknown*. This result is the same as in the previous three assessments due to limited ongoing information on the species' occurrence and population ecology in Irish waters.

Maren Reichelt & Mick Baines



OVERALL STATUS: UNKNOWN

VAGRANT SPECIES

1348 NORTHERN RIGHT WHALE *(Eubalaena glacialis)*

ANNEX IV

The Northern Right Whale (*Eubalaena glacialis*) is one of six species of cetacean (i.e., whales, dolphins and porpoises) that have been very rarely recorded in Irish waters and are therefore termed vagrant species. Distinctive by its V-shaped exhalation blow, the complete absence of a dorsal fin and the presence of white encrusted lumps on the head area known as "callosities", this slow-swimming baleen whale species was once hunted intensively throughout its North Atlantic range, including off the north-west of Ireland in the early 1900s.

Little is known about the occurrence or ecology of this species in the North-East Atlantic, while remnant populations inhabiting North American waters remain extremely vulnerable to ongoing human impacts and potential extinction.

The Overall Status of Northern Right Whale is considered to be *Unknown* since only one live record has been confirmed from Irish waters in recent decades. In the last 50 years, sightings have occurred very occasionally off the European continental shelf and in the mid-Atlantic.

2028 FALSE KILLER WHALE *(Pseudorca crassidens)*

ANNEX IV

False Killer Whale (*Pseudorca crassidens*) is one of six species of cetacean (i.e., whales, dolphins and porpoises) that have been very rarely recorded in Irish waters and are therefore termed vagrant species. Distinctive by its resemblance to the larger, stockier Killer Whale, particularly due to its length and the shape of its dorsal fin, this species is completely black in colouration and slenderer in appearance, with a more rounded or blunt head-shape also notable.

Little is known about the occurrence or ecology of this species in the North-East Atlantic but it is assumed to be a tropical, sub-tropical and warm temperate deep-water species that feeds on fish and squid and which very occasionally occurs in offshore Irish waters. In the last 50 years, rare sightings have occurred off the European continental shelf and in the mid-Atlantic, while only a few sporadic live records have been confirmed from Irish waters in the last 15-25 years.

The Overall Status of the False Killer Whale is considered to be *Unknown* due to the rarity of sighting and/or stranding records.

2037 TRUE'S BEAKED WHALE *(Mesoplodon mirus)*

ANNEX IV

True's Beaked Whale (*Mesoplodon mirus*) is one of six species of cetacean (i.e., whales, dolphins and porpoises) that have been very rarely recorded in Irish waters and are therefore termed vagrant species. Difficult to identify in the open ocean, like many beaked whale species its presence and identifying features can be elusive in the field. True's Beaked Whales are also tricky to separate from their close relative the Gervais' Beaked Whale, but both are identifiable by a distinct medium-sized beak, and adult male True's Beaked Whales have two prominent teeth at the tip of the lower jaw.

Little is known about the occurrence or ecology of this species in the North-East Atlantic but it is assumed to be a deep-water species that feeds on squid and possibly fish, and which, according to stranding records, occasionally occurs off the west or south-west of Ireland.

The Overall Status of True's Beaked Whale is considered to be *Unknown*.

2622 PYGMY SPERM WHALE *(Kogia breviceps)*

ANNEX IV

Pygmy Sperm Whale (*Kogia breviceps*) is one of six species of cetacean (i.e., whales, dolphins and porpoises) that have been very rarely recorded in Irish waters and are therefore termed vagrant species. It is distinctive by its small size (up to 3.5 m in length) and blunt head shape containing a pale 'false gill' line between the eyes and the pectoral fins. Also, unlike cetaceans of similar size, its small dorsal fin is located about two-thirds of the way along its back.

Little is known about the population distribution or ecology of this species in the North-East Atlantic but it is considered to be a deep-water species that feeds on squid and octopus, and which may occasionally occur in offshore Irish waters. Since only one live record has emerged so far from oceanic waters very far from shore, most information on the species in Ireland has come from the isolated and rare stranding of individual animals.

The Overall Status of the Pygmy Sperm Whale is considered to be *Unknown* since no live records of this species have been confirmed from Irish waters in recent decades.

5029 BELUGA / WHITE WHALE *(Delphinapterus leucas)*

ANNEX IV

Beluga or White Whale (*Delphinapterus leucas*) is one of six species of cetacean (i.e., whales, dolphins and porpoises) that have been very rarely recorded in Irish waters and are therefore termed vagrant species. A large dolphin species that is very distinctive due to its completely white/ivory skin colouration, its rounded bulbous melon (forehead) and the absence of a dorsal fin, it is not easily confused with other cetacean species.

Little is known about the occurrence or ecology of this species in the North-East Atlantic. It is normally a polar or sub-polar species found in Arctic regions where it feeds on fish and crustaceans. Prior to the Directive's introduction, just two live records had been confirmed from Ireland, one from County Mayo and another from County Cork. Three live sighting records were recorded in 2015, with one sighting record comprising three individuals, far offshore during an aerial survey in December 2015.

The Overall Status of the Beluga or White Whale is considered to be *Unknown* due to the rarity of sighting and/or stranding records.

5034 GERVAIS' BEAKED WHALE *(Mesoplodon europaeus)*

ANNEX IV

Gervais' Beaked Whale (*Mesoplodon europaeus*) is one of six species of cetacean (i.e., whales, dolphins and porpoises) that have been very rarely recorded in Irish waters and are therefore termed vagrant species. Difficult to identify in the open ocean, like many beaked whale species its presence and identifying features can be elusive in the field. Gervais' Beaked Whale is also tricky to separate from its close relative, the True's Beaked Whale, but both are identifiable by a distinct medium-sized beak, and adult male Gervais' Beaked Whales have two prominent teeth positioned about a quarter of the way back along the lower jaw.

Little is known about the occurrence or ecology of this species in the North-East Atlantic but it is assumed to be a warm temperate or sub-tropical deep-water species that feeds on squid and possibly fish. Only one record is available from Ireland so far, that being from a stranding in County Sligo.

The Overall Status of Gervais' Beaked Whale is considered to be *Unknown*.

1102 ALLIS SHAD (ALOSA ALOSA)

ANNEX II, V

The Allis Shad (*Alosa alosa*) is a large member of the herring family. It spends much of its life in coastal waters and individuals have been collected off the south-east coast. Like other anadromous herring species, Allis Shad enters freshwater to breed, with long migrations upstream reported, particularly in larger continental rivers in Europe. Maturity is reached after four to five years and broadcast spawning is undertaken in larger rivers. There is some evidence of Allis Shad entering Irish rivers, with one fish recorded some 40 km from the sea on the Slaney. Nonetheless, only a small number of Allis Shad have ever been recovered in Irish fresh water and while there is an established breeding population of Twaite Shad in south-eastern Irish rivers, the only evidence of breeding by Allis Shad is the presence of Allis-Twaite hybrids. It is closely related to this species and can only be distinguished by the number of gill-rakers present. No juvenile Allis Shad have been found during survey work of Irish river systems. Overall, it would appear that the Allis Shad is an opportunistic spawner in Irish waters, if at all. Until evidence of an established breeding population is found, Allis Shad is considered a vagrant.

1320 BRANDT'S BAT *(Myotis brandtii)*

ANNEX IV

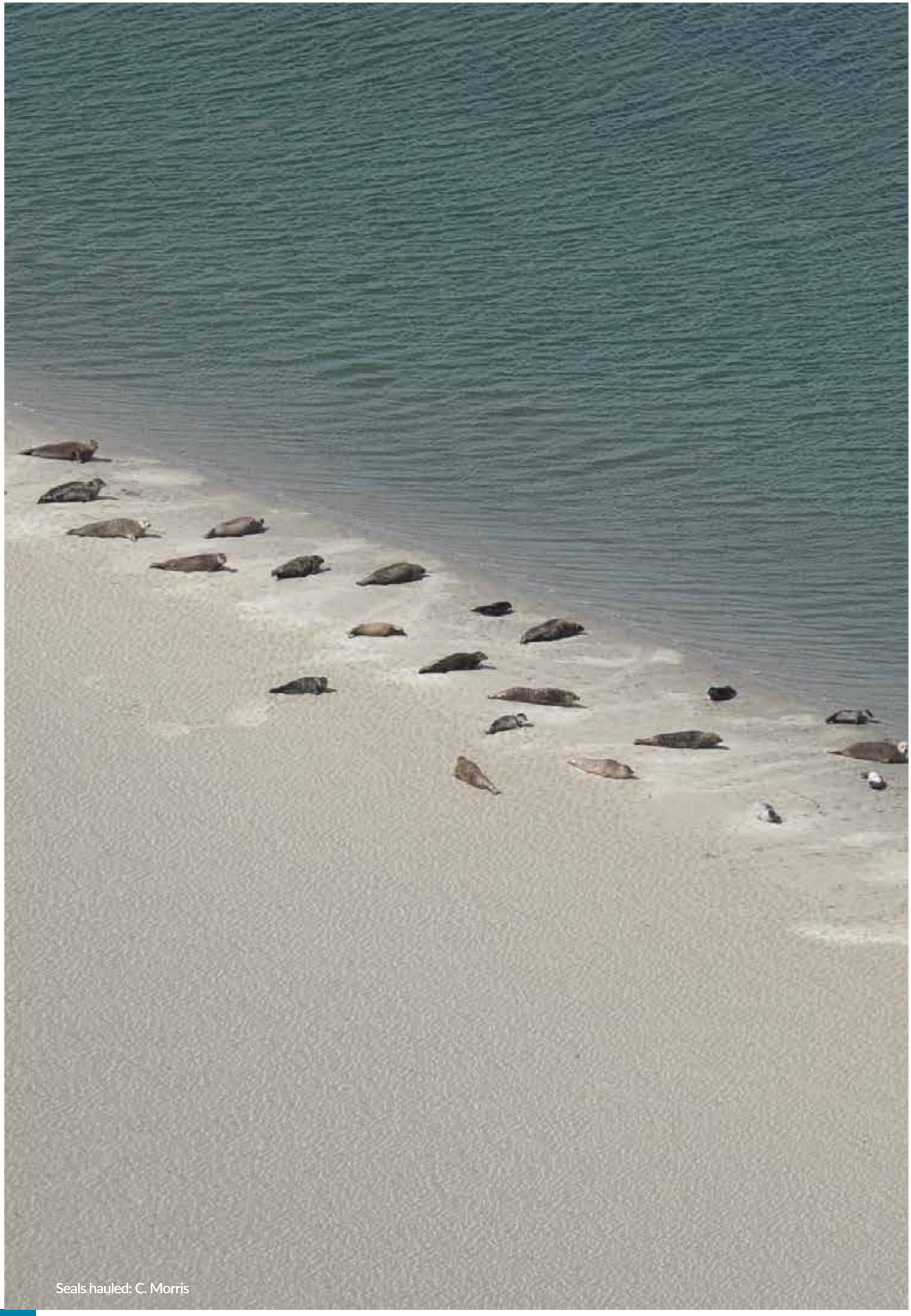
Brandt's Bat (*Myotis brandtii*) is a cryptic species, requiring genetic determination to separate it from the Whiskered Bat (*M. mystacinus*). Following the initial confirmation of a specimen of Brandt's Bat in Wicklow in 2006, further records were expected. However, extensive survey work at potential roosts and swarming sites since then has failed to locate any. The species is now considered a vagrant and was not assessed in the current report.

1304 GREATER HORSESHOE BAT *(Rhinolophus ferrumequinum)*

A single Greater Horseshoe Bat (*Rhinolophus ferrumequinum*) was recorded in the winter of 2012-2013 in south-east Ireland. There have been no verified records since then. The species is considered a vagrant and was not assessed in the current report.

RESULTS

Alluvial Woodland: Orla Daly



Seals hauled: C. Morris

RESULTS

HABITAT OVERALL ASSESSMENTS

The overall status of habitats as depicted in Figure 1a is that 90% of habitats are in Unfavourable (i.e. Inadequate and Bad) status, with 51% of habitats demonstrating ongoing deteriorating trends (Figure 1b).

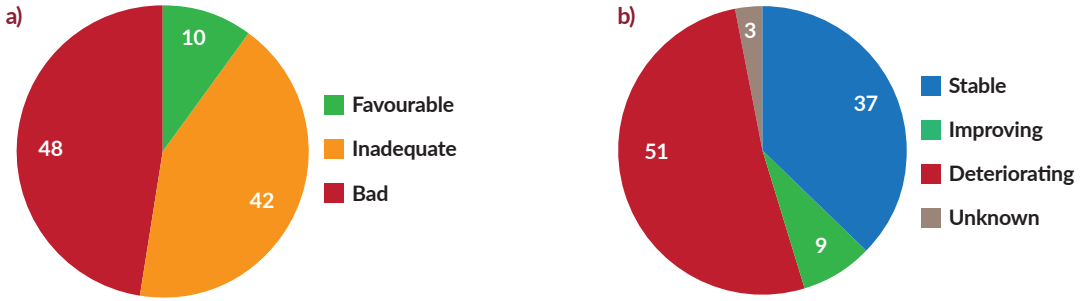


Figure 1: a) Percentage of habitats in Favourable, Unfavourable-Inadequate or Unfavourable-Bad status b) Percentage of habitats with Stable, Improving or Deteriorating trends. *n*=59

An overview of the results of the 59 individual habitat assessments for 2025 is presented in Table 1. The overall assessment results for 2007, 2013, and 2019 are presented for comparison. Many of the changes from previous assessments are due to improved knowledge and dedicated surveys being undertaken e.g. marine habitats, improving trends due to some conservation measures e.g. Hay meadows, Active raised bogs, and Rynchosporion depressions, or changes in the thresholds for Structure and Functions e.g. Bog woodland. Therefore, the actual status (i.e. Favourable, Unfavourable-Inadequate or Unfavourable-Bad) of habitats has remained largely unchanged over time but with ongoing deteriorating trends still impacting half of all habitats, as illustrated in Figure 1b. Although some habitats had insufficient Range and Area when the Directive came into force (e.g. Active raised bog, Hay meadows and many woodland habitats), it is the Structure and Functions of the habitats that is driving the Overall Assessment results in many cases, with inadequate conservation measures in place to improve the Future Prospects. Deteriorating trends are particularly notable in marine, aquatic, grassland and woodland habitats.

Table 1: Assessment results by habitat for 2007, 2013, 2019 and 2025.

Code	Common name	2007 Overall status	2013 Overall status and operator	2019 Overall status and trend	2025 Overall status and trend	2025 Range	2025 Area	2025 Structure & Functions	2025 Future Prospects
1110	Sandbanks	Unfavourable-Inadequate	Favourable	Stable	Stable	Stable	Stable	Unknown	Favourable
1130	Estuaries	Unfavourable-Inadequate	Improving	Deteriorating	Unfavourable-Bad	Stable	Stable	Unfavourable-Bad	Unfavourable-Bad
1140	Tidal mudflats and sandflats	Unfavourable-Inadequate	Improving	Deteriorating	Unfavourable-Inadequate	Stable	Stable	Unfavourable-Inadequate	Unfavourable-Inadequate
1150	Lagoons*	Unfavourable-Bad	Unfavourable-Bad	Deteriorating	Deteriorating	Stable	Stable	Deteriorating	Unfavourable-Bad
1160	Large shallow inlets and bays	Unfavourable-Inadequate	Improving	Deteriorating	Deteriorating	Stable	Stable	Deteriorating	Unfavourable-Bad
1170	Reefs	Unfavourable-Inadequate	Deteriorating	Stable	Unfavourable-Bad	Stable	Stable	Unknown	Unfavourable-Bad
1180	Submarine structures made by leaking gases			Stable	Stable	Stable	Stable	Stable	Favourable
1210	Drift lines	Unfavourable-Inadequate	Deteriorating	Deteriorating	Unfavourable-Inadequate	Stable	Unfavourable-Inadequate	Stable	Unfavourable-Inadequate
1220	Vegetated shingle	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate	Deteriorating	Stable	Deteriorating	Unfavourable-Inadequate	Unfavourable-Inadequate
1230	Vegetated sea cliffs	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate	Stable	Stable	Unfavourable-Inadequate	Unfavourable-Inadequate
1310	*Salicornia mud*	Unfavourable-Inadequate	Deteriorating	Stable	Deteriorating	Deteriorating	Deteriorating	Deteriorating	Unfavourable-Bad
1330	Atlantic salt meadows	Unfavourable-Inadequate	Unfavourable-Inadequate	Deteriorating	Deteriorating	Stable	Deteriorating	Deteriorating	Unfavourable-Bad
1410	Mediterranean salt meadows	Unfavourable-Inadequate	Unfavourable-Inadequate	Deteriorating	Deteriorating	Stable	Deteriorating	Deteriorating	Unfavourable-Inadequate
1420	Halophilous scrub	Unfavourable-Bad	Deteriorating	Deteriorating	Unfavourable-Bad	Stable	Unfavourable-Bad	Unfavourable-Inadequate	Unfavourable-Bad
2110	Embryonic shifting dunes	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate	Deteriorating	Stable	Deteriorating	Unfavourable-Inadequate	Unfavourable-Inadequate
2120	Marram dunes (white dunes)	Unfavourable-Bad	Unfavourable-Inadequate	Unfavourable-Inadequate	Deteriorating	Stable	Deteriorating	Deteriorating	Unfavourable-Inadequate
2130	Fixed dunes (grey dunes)*	Unfavourable-Bad	Unfavourable-Bad	Deteriorating	Deteriorating	Stable	Deteriorating	Deteriorating	Unfavourable-Bad
2140	*Empetrum* dunes*	Unfavourable-Bad	Unfavourable-Inadequate	Stable	Stable	Stable	Stable	Stable	Favourable
2150	Dune heath*	Unfavourable-Bad	Unfavourable-Inadequate	Unfavourable-Inadequate	Deteriorating	Stable	Stable	Deteriorating	Unfavourable-Inadequate
2170	Dunes with Creeping Willow	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate	Deteriorating	Stable	Deteriorating	Unfavourable-Inadequate	Unfavourable-Inadequate
2190	Dune slacks	Unfavourable-Bad	Deteriorating	Deteriorating	Deteriorating	Stable	Deteriorating	Unfavourable-Inadequate	Unfavourable-Inadequate
21A0	Machair*	Unfavourable-Bad	Unfavourable-Bad	Unfavourable-Inadequate	Unfavourable-Inadequate	Stable	Deteriorating	Improving	Unfavourable-Inadequate
3110	Oligotrophic isoetid lake habitat	Unfavourable-Bad	Deteriorating	Unfavourable-Bad	Unknown	Stable	Stable	Unknown	Unfavourable-Inadequate
3130	Slender Naiad-type lakes	Unfavourable-Bad	Unfavourable-Inadequate	Deteriorating	Deteriorating	Stable	Stable	Deteriorating	Unfavourable-Bad
3140	Hard-water lakes	Unfavourable-Bad	Deteriorating	Deteriorating	Unfavourable-Bad	Stable	Stable	Unfavourable-Bad	Unfavourable-Bad
3150	Rich pondweed lake habitat	Unfavourable-Bad	Unfavourable-Inadequate	Unfavourable-Inadequate	Unknown	Stable	Stable	Unknown	Unfavourable-Inadequate
3160	Acid oligotrophic lakes	Unfavourable-Bad	Deteriorating	Unfavourable-Inadequate	Improving	Improving	Improving	Unfavourable-Inadequate	Unfavourable-Inadequate
3180	Turloughs*	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate	Stable	Stable	Unknown	Unfavourable-Inadequate
3260	Vegetation of flowing waters	Unfavourable-Bad	Deteriorating	Deteriorating	Deteriorating	Stable	Stable	Deteriorating	Unfavourable-Inadequate
3270	Chenopodion rubri	Favourable	Favourable	Stable	Deteriorating	Unknown	Deteriorating	Stable	Unknown

STATUS: Favourable Unfavourable-Inadequate Unfavourable-Bad Unknown

TREND: Improving Stable Deteriorating Unknown/Uncertain

Changes in assessment results may be due to a variety of factors, please read the full assessment reports for context.

Code	Common name	2007 Overall status	2013 Overall status and operator	2019 Overall status and trend	2025 Overall status and trend	2025 Range	2025 Area	2025 Structure & Functions	2025 Future Prospects
4010	Wet heaths	●	=	▼	▼	=	▼	=	●
4030	Dry heaths	●	=	=	▼	=	▼	×	●
4060	Alpine and subalpine heath	●	▲	▲	=	=	×	=	●
5130	Juniper scrub	●	=	=	=	=	=	=	●
6130	Calaminarian grasslands	●	=	▼	▼	▼	▼	=	●
6210	Orchid-rich calcareous grassland*	●	=	▼	▼	▼	▼	=	●
6230	Species-rich *Nardus* grassland*	●	▼	=	▼	=	▼	=	●
6410	*Molinia meadows*	●	▼	▼	▼	▼	▼	=	●
6430	Hydrophilous tall-herb swamp	●	=	▼	▼	▼	▼	▼	●
6510	Hay meadows	●	=	▼	▲	▲	▲	▲	●
7110	Raised bog (active)*	●	▼	▼	▲	=	▲	▲	●
7120	Degraded raised bogs	●	▼	▼	▲	=	▲	▲	●
7130	Blanket bog (active)*	●	▼	▼	▼	=	▼	=	●
7140	Transition mires	●	×	=	▼	=	▼	×	●
7150	Rhynchosporion depressions	●	▼	▼	▼	=	▼	=	●
7210	*Cladium fens**	●	×	=	▼	=	▼	×	●
7220	Petrifying springs*	●	=	▼	=	=	=	=	●
7230	Alkaline fens	●	×	▼	▼	=	▼	×	●
8110	Siliceous scree	●	▲	=	=	=	=	=	●
8120	Calcareous scree	●	=	=	=	=	=	=	●
8210	Calcareous rocky slopes	●	=	=	=	=	=	=	●
8220	Siliceous rocky slopes	●	=	=	=	=	=	=	●
8240	Limestone pavement*	●	=	=	=	=	▼	▲	●
8310	Caves	●	●	=	▲	▲	▲	=	●
8330	Sea caves	●	●	=	=	=	=	=	●
91A0	Old oak woodland	●	▲	▼	▼	=	▼	=	●
91D0	Bog woodland*	●	●	=	▼	=	=	▼	●
91E0	Alluvial woodland*	●	▲	▼	▼	=	▼	=	●
91J0	Yew woodland*	●	▲	=	=	=	=	=	●

STATUS: ● Favourable ● Unfavourable-Inadequate ● Unfavourable-Bad ● Unknown

TREND: ▲ Improving = Stable ▼ Deteriorating × Unknown/Uncertain

Changes in assessment results may be due to a variety of factors, please read the full assessment reports for context.

HABITAT PRESSURES/THREATS

The standardised list of pressures and threats is classified into 14 categories corresponding to the main sectoral drivers. These high-level categories are listed in Table 2 together with explanations or major subdivisions where appropriate.

Table 2: Standardised categories for pressures and threats.

	Pressure/Threat categories	Notes on sub-categories
PA	**Agriculture-related practices**	Includes land conversion, grazing, abandonment, burning, enrichment, drainage and associated pollution
PB	**Forestry-related practices**	Includes land conversion, grazing, forestry management practices such as clear felling, removal of dead wood, burning, enrichment, drainage and associated pollution
PC	**Extraction of resources (minerals, peat, non-renewable energy resources)**	Includes geotechnical surveying, peat extraction and pollution arising from extraction activities
PD	**Energy production processes and related infrastructure development**	Includes wind, electricity, oil and gas infrastructure and associated pollution
PE	**Development and operation of transport systems**	Includes road, paths, shipping lanes and associated light and noise pollution
PF	**Development, construction and use of residential, commercial, industrial and recreational infrastructure and areas**	Includes urbanisation, industrialisation, recreation and associated pollution
PG	**Extraction and cultivation of biological living resources (other than agriculture and forestry)**	Includes hunting, poisoning, fishing, aquaculture and pollution arising from aquaculture
PH	**Military action, public safety measures, and other human intrusions**	Includes vandalism and disturbance
PI	**Alien and problematic species**	Also includes diseases, pathogens and pests
PJ	**Climate change**	Includes temperature rise, drought, sea level rise and increased precipitation
PK	**Mixed source pollution**	Where the main driver of pollution is uncertain
PL	**Human-induced changes in water regimes**	Includes abstractions, landfill, modification of water flow
PM	**Geological events, natural processes and catastrophes**	Includes erosion, succession, competition, predation, storms, floods and fire
X	**Unknown pressures, no pressures and pressures from outside the Member State**	

Pressures are negatively-impacting activities that have taken place during the reporting period (i.e. 2019-2024); threats are negatively-impacting activities that are expected to continue over the next 12 years. A combined maximum of 10 Medium and/or High-influence pressures/threats per habitat or species have been listed, with a maximum of five of High influence.

Pressures and threats are recorded in 54 of the 59 habitats assessed. The most frequent pressures recorded in habitats relate to the agriculture category (Figure 2). 69% of habitats are impacted by pressures relating to agricultural practices, and the pressure is ranked as High importance in more than 50% of habitats (Figure 3). The most prevalent sub-category of agricultural pressures is "PA07 Intensive grazing or overgrazing by livestock" (Figure 4), which is recorded in 59% of habitats in which agricultural impacts are noted (41% of habitats overall), the next most frequent agricultural pressure being "PA22 Drainage for use as agricultural land", which is noted at 41% of habitats impacted by agriculture (29% of habitats overall). This is followed by "PA08 Extensive grazing or undergrazing by livestock" and "PA17 Agricultural activities generating pollution to surface or ground waters", both recorded in 39% of habitats impacted by agriculture (27% of habitats overall). Inappropriate grazing (either too much or too little) is recorded in 73% of all habitats where agricultural impacts are reported, and in 51% of habitats overall. The 16 habitats affected by pollution to surface or ground waters from agriculture include some marine, coastal, upland, fen, lake or other groundwater-dependent habitats. Quantitative analysis of the proportion of habitat exceeding Nitrogen deposition thresholds arising from "PA18 Agricultural activities generating air pollution" has highlighted Blanket Bog, Transition Mires, Rhynchosporion Depressions, Dry Heath, Alpine Heath and Wet Heath as particularly vulnerable to this type of pollution.

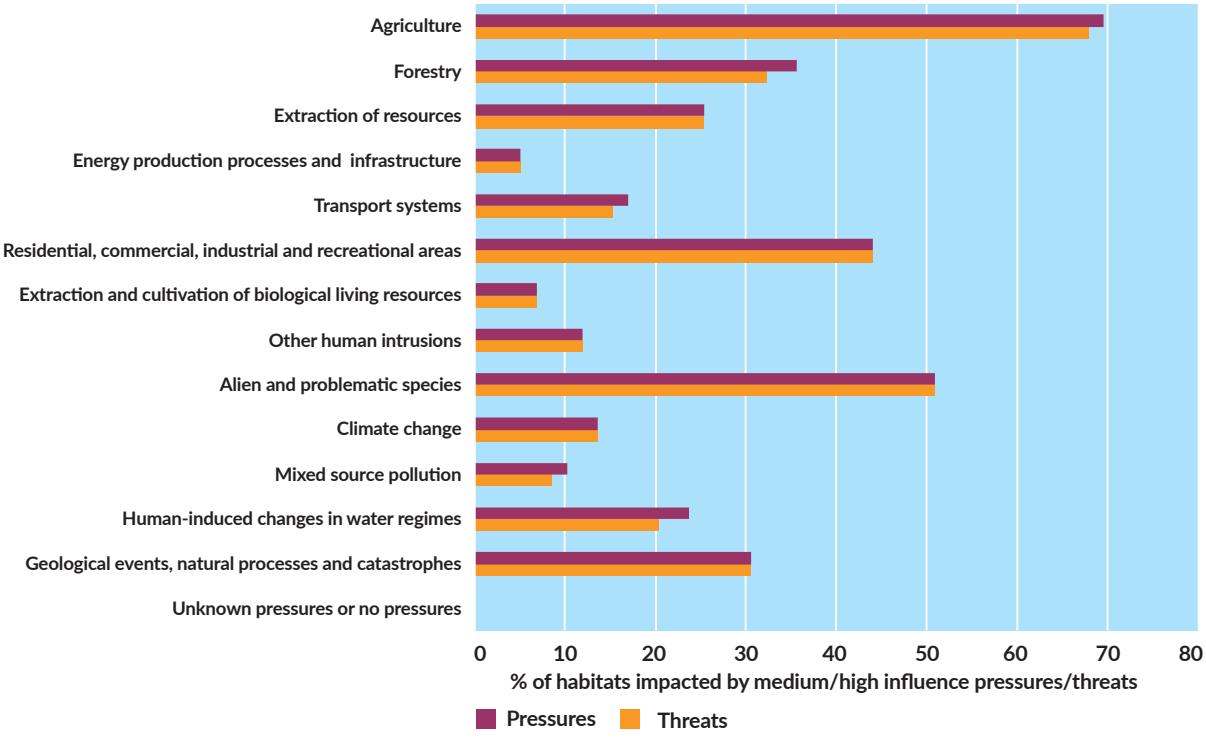


Figure 2: Percentage of habitats impacted by pressure/threat (combined medium and high influence pressures/threats)

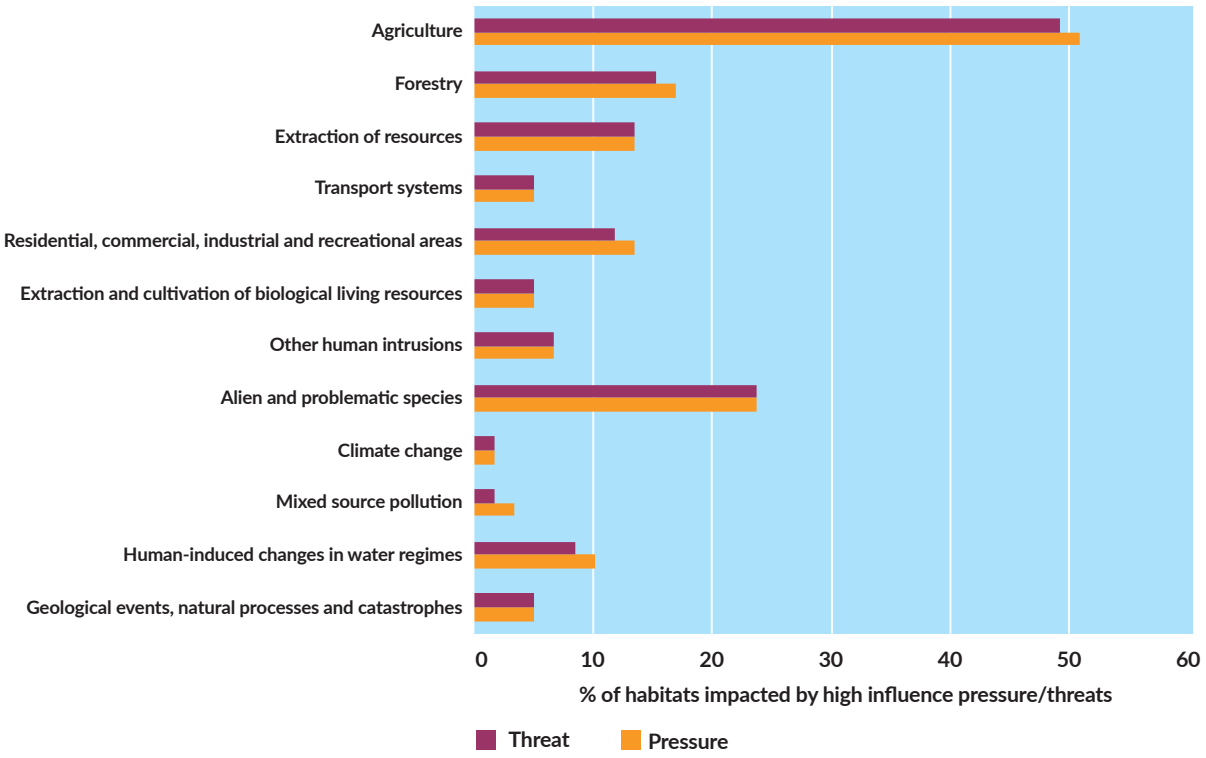


Figure 3: Percentage of habitats impacted by high influence pressure/threat

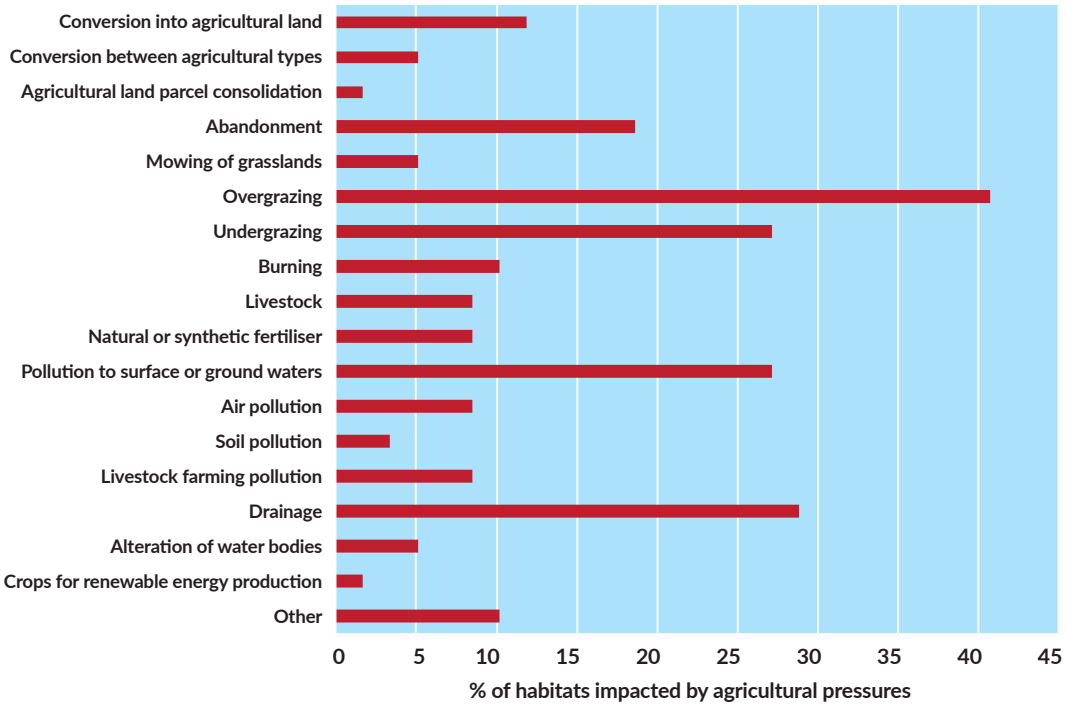


Figure 4: Percentage of habitats impacted by agricultural pressures (medium and high influence pressures combined). The names of pressures have been adapted from the standardised list

The next most frequent category of pressure to be recorded in habitats is "PI Alien and problematic species" (listed as a pressure in 51% of habitats), closely followed by "PF Development, construction and use of residential, commercial, industrial and recreational infrastructure and areas", a pressure in 44% of habitats (Figure 2). Additionally, alien and problematic species is the most common high-influence pressure after agriculture at 24% of habitats, while forestry-related high-influence pressures are third at 17% of all habitats. Both infrastructure and extraction of resources are recorded at 14% of all habitats (Figure 3). By far the most frequent impact associated with alien and problematic species is "PI02 Other invasive alien species (other than species of Union concern)", recorded in 25 habitats – of high-influence in 10 habitats and medium-influence in 15; problematic native species, particularly Bracken (*Pteridium aquilinum*), are a pressure in 13 habitats, high-influence in four habitats and medium-influence in nine. The alien species of note are Rhododendron (*Rhododendron ponticum*), Cherry Laurel (*Prunus laurocerasus*), Sea Buckthorn (*Hippophae rhamnoides*), Common Cord-grass (*Spartina anglica*), Canadian Waterweed (*Elodea canadensis*) and New Zealand Willowherb (*Epilobium brunnescens*); however the relative impact of each species is very different, with Rhododendron, for example, severely impacting the structure of many woodlands while the actual impact of New Zealand Willowherb on the functioning of upland rocky habitats is less clear. One factor of note regarding invasive alien species is that a wide range of habitats are affected: terrestrial and aquatic, freshwater and marine, rocky habitats, saltmarsh, grasslands and woodlands. The most frequent sub-category of pressure associated with category PF is "PF07 Sports, tourism and leisure activities" (e.g. hiking, walking), which is recorded in 31 of the 42 habitats in which this category was recorded. Not surprisingly, habitats affected include coastal habitats such as dunes, Machair and Sea Cliffs, as well as some types of heath and bog, all of which are usually located in areas popular with walkers and tourists.

"PF06 Deposition and treatment of waste/rubbish from built-up areas" and "PF07 Residential and commercial activities and structures generating pollution to surface or ground waters" are the next most frequent "PF" category impacts, occurring at 11 of the 42 habitats where category PF was recorded. These are followed by "PF15 Modification of coastline, estuary and coastal conditions for built-up areas" at nine of the 42 habitats; the majority of these are associated with coastal protection works.

The frequency of threats is similar to the frequency of pressures across all habitats, implying that there is no evidence that there will be any major decline in pressures over the next 12 years. For "PJ Climate change", which is listed equally as a pressure and threat, this highlights the impact it is currently having and also acknowledges the likely impact of climate change within the next 12 years on many of our more vulnerable habitats based on the recent increased frequency of extreme weather events. The sub-categories listed most frequently are "PJ03 Changes in precipitation regimes" and "PJ04 Sea-level rise", each noted at four of the eight habitats where climate change was recorded as a medium or high-influence pressure, and this was followed by "PJ01 Temperature changes and extremes" at three habitats.

HABITAT CONSERVATION MEASURES

Conservation measures are reported as being undertaken in 54 habitats, an increase of 18 habitats from the previous assessment. For 31 habitats the main purpose of the measures is to restore the habitat. For 20 of these habitats, the main purpose of the conservation measures is to maintain the Range, Area or Structure and Functions of the habitat, while for three the purpose of the measures is to increase the habitat area.

The conservation measures implemented are broadly in line with the main pressures noted. The measures listed most often relate to combating pressures associated with agriculture (n = 99). A total of 45 habitats have measures put in place for agriculture, and they are usually associated with implementation of agricultural schemes such as ACRES, EIP, GLAS or EU LIFE programmes. The primary agricultural conservation measure is "MA03 Maintain existing extensive practices and landscape features" (n = 23). The next measure is "MA05 Adapt mowing, grazing and other equivalent agricultural activities" (n = 20), followed by "MA10 Reduce/eliminate source pollution to surface and ground waters from agriculture" (n = 14) and "MA06 Stop mowing, grazing and other equivalent agricultural activities" (n = 11). The main habitat groups in which agricultural measures are being implemented are grasslands, coastal, lake, upland, heath and rocky habitats.

Control of problematic species is recorded as being implemented across 14 habitat types. These control measures are undertaken in equal frequency on alien invasive and problematic native species (mainly deer, Rhododendron and Bracken), despite the fact that most of the impacts recorded in this category are associated with invasive alien species. Habitats being remediated include Machair, dunes, upland grassland, Limestone Pavement, heaths, bogs, woodlands, Sea Cliffs, and rocky habitats.

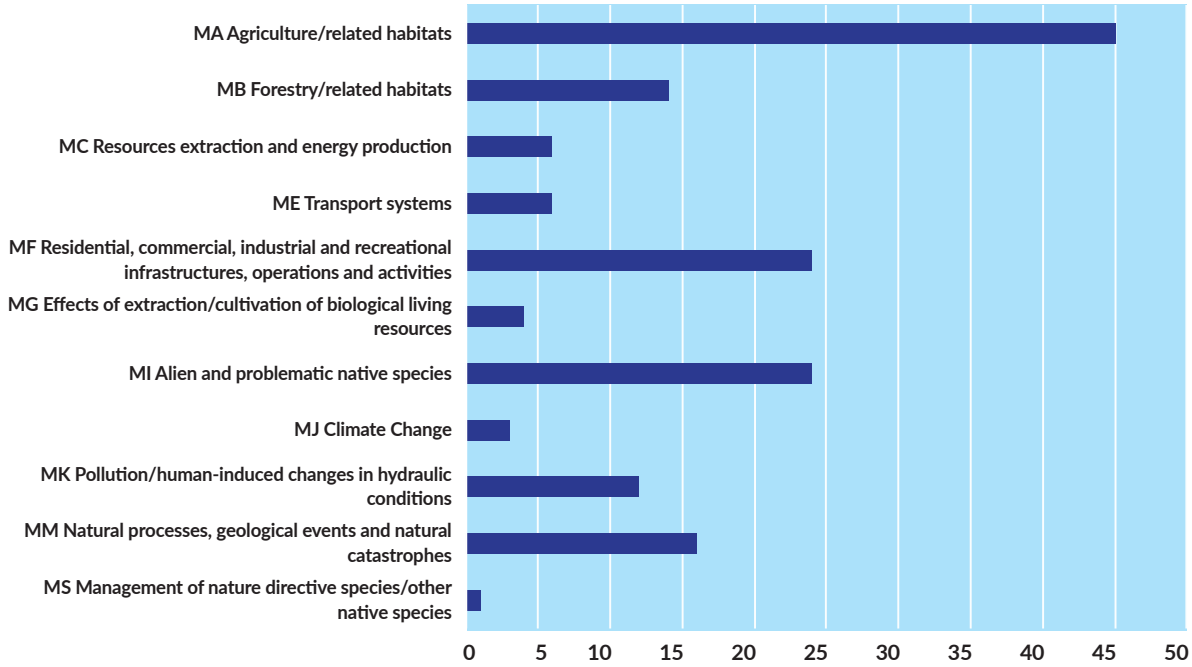


Figure 5: Number of habitats with associated measures in place

SPECIES ASSESSMENTS

Of the 69 Habitats Directive-listed species in Ireland, nine species have been described as vagrants. These include six cetacean species, Allis Shad (*Alosa alosa*), Brandt's Bat (*Myotis brandtii*), and Greater Horseshoe Bat (*Rhinolophus ferrumequinum*). The former two species have been assigned to this category since 2007 as there is no evidence of breeding populations of these species. Similarly, the Greater Horseshoe Bat was added this reporting round due to a non-breeding record from the winter of 2012-2013. The Nore Pearl Mussel (*Margaritifera durrovensis*) is no longer considered a separate species from the Freshwater Pearl Mussel.

The overall status of the remaining 60 species (including three species groups) as depicted in Figure 6a is that 58% of species are in Favourable status and 32% are in Unfavourable status (i.e. Inadequate and Bad), with 70% demonstrating stable or improving trends while 18% demonstrate ongoing deteriorating trends (Figure 6b).

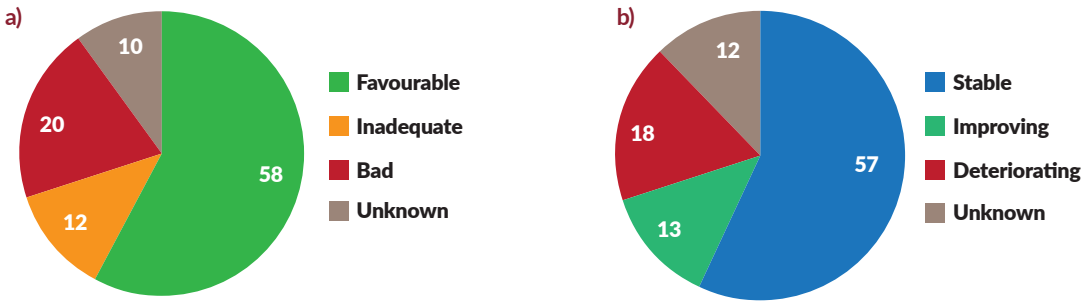


Figure 6: a) Percentage of species in Favourable, Inadequate or Bad status.
b) Percentage of species with Stable, Improving or Deteriorating trends. *n*=60

An overview of the results of the 69 individual species assessments for 2025 is presented in Table 3. The overall assessment results for 2007, 2013, and 2019 are presented for comparison.

Sligo/Leitrim. Deirdre Lynn

Table 3: Assessment results by species for 2007, 2013, 2019 and 2025.

Code	Species name	Annex	2007 Overall status	2013 Overall status and operator	2019 Overall status and trend	2025 Overall status and trend	2025 Range	2025 Population	2025 Habitat for the species	2025 Future Prospects
6985	Killarney Fern *(Vandenboschia speciosa)*	II, IV								
1528	Marsh Saxifrage *(Saxifraga hirculus)*	II, IV								
1833	Slender Naiad *(Najas flexilis)*	II, IV								
6216	Shining Sickle Moss *(Hamatocaulis vernicosus)*	II								
1395	Petalwort *(Petalophyllum ralfsii)*	II								
1376	Maërl *(Lithothamnion corallioides)*	V								
1377	Maërl *(Phymatholithon calcareum)*	V								
1400	White Cushion Moss *(Leucobryum glaucum)*	V								
1409	*Sphagnum* genus (*Sphagnum* spp.)	V								
1413	*Lycopodium* group (*Lycopodium* spp.)	V								
1378	*Cladonia* (*Cladina* morphotype) species (*Cladonia* (*Cladina*) subsp.)	V								
1013	Geyer's Whorl Snail *(Vertigo geyeri)*	II								
1014	Narrow-mouthed Whorl Snail *(Vertigo angustior)*	II								
1016	Desmoulin's Whorl Snail *(Vertigo moulinsiana)*	II								
1024	Kerry Slug *(Geomalacus maculosus)*	II, IV								
1029	Freshwater Pearl Mussel *(Margaritifera margaritifera)*	II, V								
1990	Nore Pearl Mussel *(Margaritifera durrovensis)*	II, V								
1092	White-clawed Crayfish *(Austropotamobius pallipes)*	II, V								
1065	Marsh Fritillary *(Euphydryas aurinia)*	II								
1095	Sea Lamprey *(Petromyzon marinus)*	II								
1096	Brook Lamprey *(Lampetra planeri)*	II								
1099	River Lamprey *(Lampetra fluviatilis)*	II, V								
5046	Killarney Shad *(Alosa killarnensis)*	II, V								
1103	Twaite Shad *(Alosa fallax)*	II, V								
5076	Pollan *(Coregonus pollan)*	V								
1106	Atlantic Salmon *(Salmo salar)*	II, V								
6284	Natterjack Toad *(Epidalea calamita)*	IV								
1213	Common Frog *(Rana temporaria)*	V								
1223	Leatherback Turtle *(Dermochelys coriacea)*	IV								
1303	Lesser Horseshoe Bat *(Rhinolophus hipposideros)*	II, IV								
1309	Common Pipistrelle *(Pipistrellus pipistrellus)*	IV								
5009	Soprano Pipistrelle *(Pipistrellus pygmaeus)*	IV								

STATUS: Favourable Unfavourable-Inadequate Unfavourable-Bad Unknown Vagrant

TREND: ▲ Improving = Stable ▼ Deteriorating × Unknown/Uncertain

Changes in assessment results may be due to a variety of factors, please read the full assessment reports for context.

Code	Species name	Annex	2007 Overall status	2013 Overall status and operator	2019 Overall status and trend	2025 Overall status and trend	2025 Range	2025 Population	2025 Habitat for the species	2025 Future Prospects
1317	Nathusius' Pipistrelle *(Pipistrellus nathusii)*	IV								
1322	Natterer's Bat *(Myotis nattereri)*	IV								
1314	Daubenton's Bat (*Myotis daubentonii)*	IV								
1330	Whiskered Bat *(Myotis mystacinus)*	IV								
1326	Brown Long-eared Bat *(Plecotus auritus)*	IV								
1331	Leisler's Bat *(Nyctalus leisleri)*	IV								
1334	Mountain Hare *(Lepus timidus)*	V								
1355	Otter *(Lutra lutra)*	II, IV								
1357	Pine Marten *(Martes martes)*	V								
1364	Grey Seal *(Halichoerus grypus)*	II, V								
1365	Harbour Seal *(Phoca vitulina)*	II, V								
1345	Humpback Whale *(Megaptera novaeangliae)*	IV								
1349	Common Bottlenose Dolphin (*Tursiops truncatus)*	II, IV								
1350	Short-beaked Common Dolphin (*Delphinus delphis)*	IV								
1351	Harbour Porpoise *(Phocoena phocoena)*	II, IV								
2027	Killer Whale (*Orcinus orca)*	IV								
2029	Long-finned Pilot Whale (*Globicephala melas)*	IV								
2030	Risso's Dolphin *(Grampus griseus)*	IV								
2031	White-sided Dolphin (*Lagenorhynchus acutus)*	IV								
2032	White-beaked Dolphin (*Lagenorhynchus albirostris)*	IV								
2034	Striped Dolphin *(Stenella coeruleoalba)*	IV								
2035	Cuvier's Beaked Whale *(Ziphius cavirostris)*	IV								
2038	Sowerby's Beaked Whale (*Mesoplodon bidens)*	IV								
2618	Minke Whale *(Balaenoptera acutorostrata)*	IV								
2621	Fin Whale *(Balaenoptera physalus)*	IV								
5020	Blue Whale *(Balaenoptera musculus)*	IV								
2624	Sperm Whale *(Physeter macrocephalus)*	IV								
5033	Northern Bottlenose Whale *(Hyperoodon ampullatus)*	IV								
2619	Sei Whale *(Balaenoptera borealis)*	IV								

STATUS: Favourable · Unfavourable-Inadequate · Unfavourable-Bad · Unknown · Vagrant

TREND: ▲ Improving · = Stable · ▼ Deteriorating · × Unknown/Uncertain

Changes in assessment results may be due to a variety of factors, please read the full assessment reports for context.

Table 3: Assessment results by species for 2007, 2013, 2019 and 2025.

Code	Species name	Annex	2007 Overall status	2013 Overall status and operator	2019 Overall status and trend	2025 Overall status and trend	2025 Range	2025 Population	2025 Habitat for the species	2025 Future Prospects
1348	Northern Right Whale *(Eubalaena glacialis)*	IV	●	●	●	●	●	●	●	●
2028	False Killer Whale *(Pseudorca crassidens)*	IV	●	●	●	●	●	●	●	●
2037	True's Beaked Whale *(Mesoplodon mirus)*	IV	●	●	●	●	●	●	●	●
2622	Pygmy Sperm Whale *(Kogia breviceps)*	IV	●	●	●	●	●	●	●	●
5029	Beluga/White Whale *(Delphinapterus leucas)*	IV	●	●	●	●	●	●	●	●
5034	Gervais' Beaked Whale *(Mesoplodon europaeus)*	IV	●	●	●	●	●	●	●	●
1102	Allis Shad *(Alosa alosa)*	II, V	●	●	●	●	●	●	●	●
1320	Brandt's Bat (*Myotis brandtii)*	IV	●	●	●	●	●	●	●	●
1304	Greater Horseshoe Bat *(Rhinolophus ferrumequinum)*	II, IV	●	●	●	●	●	●	●	●

STATUS: ● Favourable ● Unfavourable-Inadequate ● Unfavourable-Bad ● Unknown ● Vagrant

TREND: ▲ Improving = Stable ▼ Deteriorating ✕ Unknown/Uncertain

Changes in assessment results may be due to a variety of factors, please read the full assessment reports for context.

Many species remain in Favourable status. Population increases and Range expansion have been observed for several bat species, including the Lesser Horseshoe bat (*Rhinolophus hipposideros*), Marsh Fritillary (*Euphydryas aurinia*), Kerry Slug (*Geomalacus maculosus*) and Pine Marten (*Martes martes*). Ongoing declines are reported for a number of species including all whorl snails, Freshwater Pearl Mussel (*Margaritifera margaritifera*), Atlantic Salmon (*Salmo salar*), Slender Naiad (*Najas flexilis*) and Maërl species. Knowledge has improved for many whale species and all data point to Favourable status for all species, apart from Harbour Porpoise (*Phocoena phocoena*) where population has been assessed as Inadequate with a Stable trend. A re-assessment of River Lamprey (*Lampetra fluviatilis*) and Humpback Whale (*Megaptera novaeangliae*) due to improved knowledge has resulted in the move from Unknown assessments in 2019 to an Inadequate and Favourable assessment, respectively.

SPECIES PRESSURES/THREATS

The percentage of species impacted by Medium and High-importance pressures and threats is presented in Figure 7. Both pressures and threats are identified as impacting all 44 of the taxa assessed. Some impacts (pressures and threats) are specific to a particular species group. Most marine mammals, as well as Sea Lamprey (*Petromyzon marinus*), River Lamprey (*Lampetra fluviatilis*), Twaite Shad (*Alosa fallax*) and Maërl species, suffer impacts due to "PG01 Marine fish and shellfish harvesting causing reduction of species/prey populations and disturbance of species (professional)". Several fish species are affected by "PD02 Energy - Hydropower (dams, weirs, run-off the river and infrastructure)", primarily because these structures act as barriers to movement of the species, restricting the area available for spawning. All marine mammals are subject to a certain level of disturbance due to geotechnical marine surveys (pressure category "PC Extraction of resources"), although it should be noted that, in relation to seismic exploration, a robust regulatory and management regime is applied in order to avoid potentially significant impacts on marine mammals. Several marine mammal species are also affected by commercial shipping and transport, with "PE02 Shipping lanes and ferry lanes transport operations" affecting whale species in particular.

Impacts from agricultural activities, and to a lesser extent forestry, are reported as having a negative effect on a wide range of species, including fish, molluscs, terrestrial mammals and vascular plants. This is because of the wide sphere of influence of some of these activities which, though implemented at relatively local levels, may influence a much wider area, particularly if they affect groundwater supplies or nearby watercourses. Examples include drainage, fertiliser application and clear-felling. Unlike the Annex I habitats, inappropriate grazing is less of a problem for listed species in general, although undergrazing or abandonment are a significant problem for the whorl snails and Marsh Fritillary butterfly, whose habitats frequently occur in agricultural systems. The Agriculture category represents the highest percentage of High-importance pressures (Figure 8) relative to other categories, with the incidence predicted to increase over the next 12 years; this has been linked to the threat from fertiliser and pollution on selected fish species.

The issue of alien species is a cross-cutting one, as it is for habitats, but it is recorded as a pressure for species much less frequently; however, the impact is predicted to increase over the next 12 years. These invasive species are having a greater impact on freshwater or marine species, for example the White-clawed Crayfish (*Austropotamobius pallipes*) is impacted by the crayfish plague fungus (*Aphanomyces astaci*); Slender Naiad (*Najas flexilis*) is impacted by the Canadian Waterweed (*Elodea canadensis*); Twaite Shad and Pollan (*Coregonus pollan*) are impacted by the Asian Clam (*Corbicula fluminea*); Pollan is additionally impacted by Zebra Mussels (*Dreissena polymorpha*); Maërl species are impacted by the invasive alga Wireweed (*Sargassum muticum*); Natterjack Toad (*Epidalea calamita*) is impacted by the aquatic New Zealand Pygmyweed (*Crassula helmsii*). The only terrestrial invasive species noted were Sea Buckthorn (*Hippophae rhamnoides*) impacting Natterjack Toad and Rhododendron (*Rhododendron ponticum*) in woodlands reported as having a negative impact on the habitat of the Kerry Slug (*Geomalacus maculosus*).

In general, lower numbers of pressures and threats are reported for bat species than the other species groups, with no significant impacts noted for seven of the nine bat species assessed. Many bat populations are increasing, which may be partly linked with climate change and protection under Irish and EU legislation. The Lesser Horseshoe Bat, although increasing in both Population and Range, still has a notable disjunction between populations in the south-west and the western populations. The assessments indicated that climate change is predicted to have the greatest negative impact on fish species in the near future.

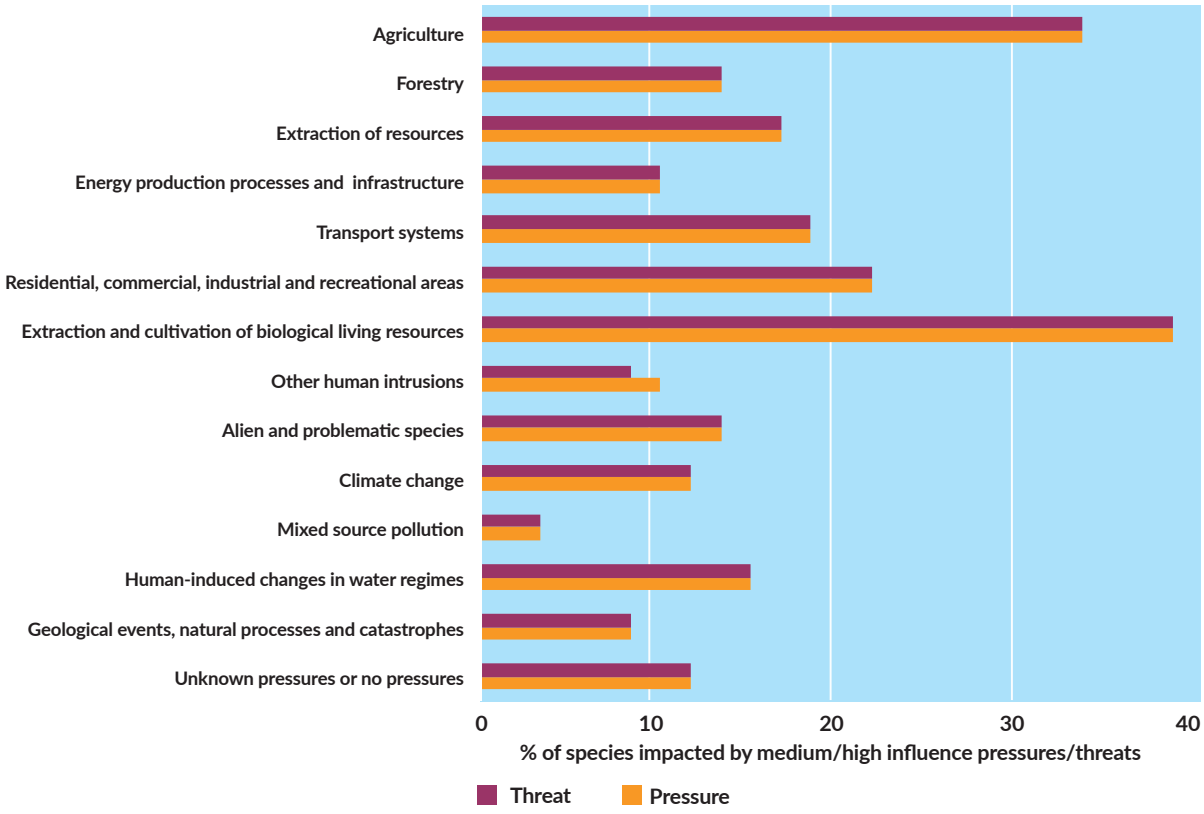


Figure 7: Percentage of species impacted by medium/high influence pressures/threats

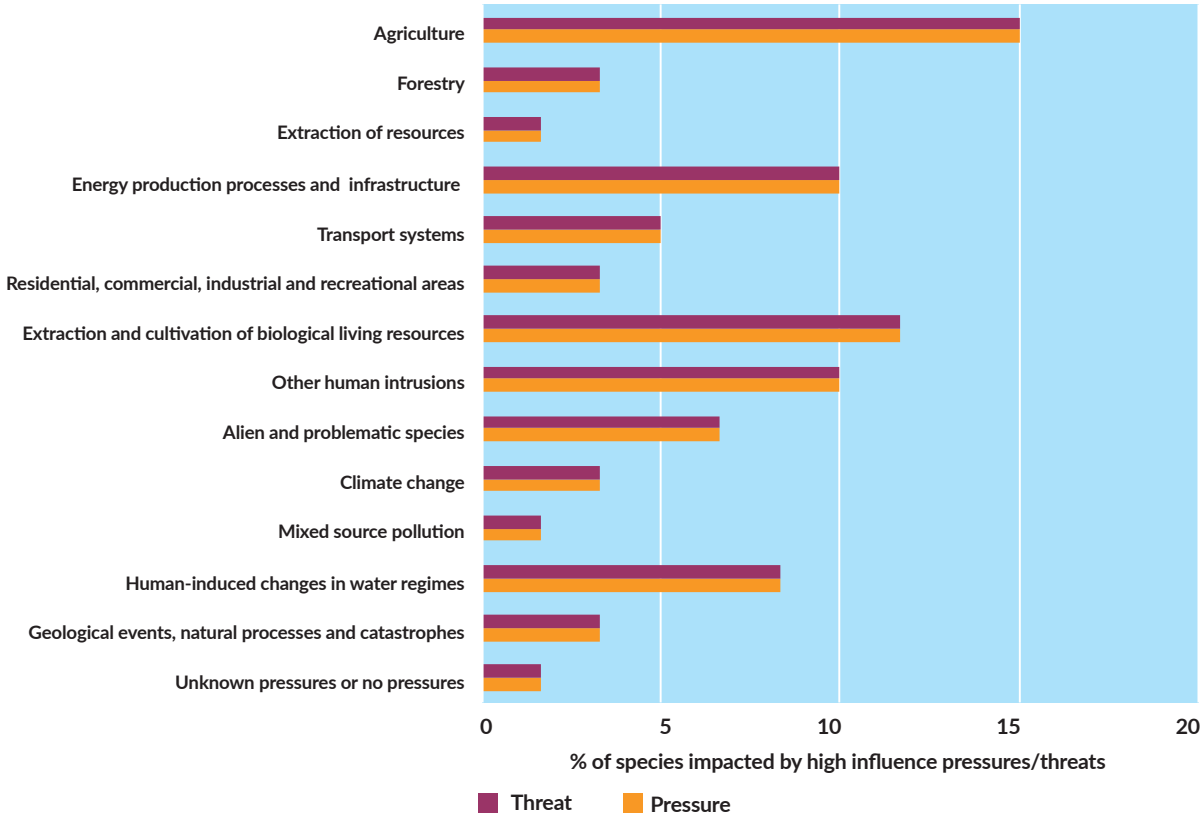


Figure 8: Percentage of species impacted by high influence pressure/threat (Vagrants not included)

SPECIES CONSERVATION MEASURES

Conservation measures are reported for Annex II and V species. Conservation measures (n = 82) are being implemented for 21 of the 54 Annex II species assessed. The most frequent purpose of the measures implemented is maintenance of Range/Population/Habitat for the species (10 species), followed by restoration of habitat (eight species), expansion of range (two species), and increasing population size and/or improvement of population dynamics (one species).

The most widely recorded conservation measure category among the species is "MA Measures related to agricultural practices and agriculture-related habitats", with 17 species listed as having at least one sub-category of this measure implemented. This is followed by "MF Measures related to residential, commercial, industrial and recreational infrastructures, operations and activities" with 14 species. For four marine species the sub-category "MF09 Infrastructure - Reduce/eliminate pollution, incl. noise, light, heat, soil pollution" is listed, and this is primarily linked to reducing the effects of seismic activity. For five fish species, measures relating to both "MC04 Extraction and energy - Reduce impact of hydropower operation and infrastructure" and "MK03 Mixed source pollution - Restoration of habitats impacted by multi-purpose hydrological changes" are required to manage changes in hydrological and coastal systems and regimes, as this includes management of barriers such as weirs and dams.

Agricultural measures are the most frequent (n = 36), with three agricultural measures implemented in relation to the Freshwater Pearl Mussel alone. The most frequent subcategory of agriculture measures recorded is "MA09 Agriculture - Manage use of fertilisers as well as chemicals in agriculture" (n=10). This is mainly identified for aquatic species but also Otter and Lesser Horseshoe Bat. This is followed by "MA10 Agriculture - Reduce/eliminate source pollution to surface and ground waters from agriculture" (n = 8), "MA13 Manage agricultural drainage and water abstraction" (n = 5), and "MA03 Maintain existing extensive practices and landscape features" (n = 4). These measures are delivered through targeted schemes such as NPWS Farm Plans, ACRES, Results-based agri-environment payment schemes (RBAPS), EU LIFE projects and European Innovation Partnership (EIP) projects.

When all other sub-categories of a measure are counted, the next most frequent categories listed for species, outside of agriculture, are "ME01 Transport - Reduce impact of transport operation and infrastructure", and "MF04 Infrastructure - Reduce/eliminate pollution to surface or ground waters", both of which are recorded in eight species assessments.

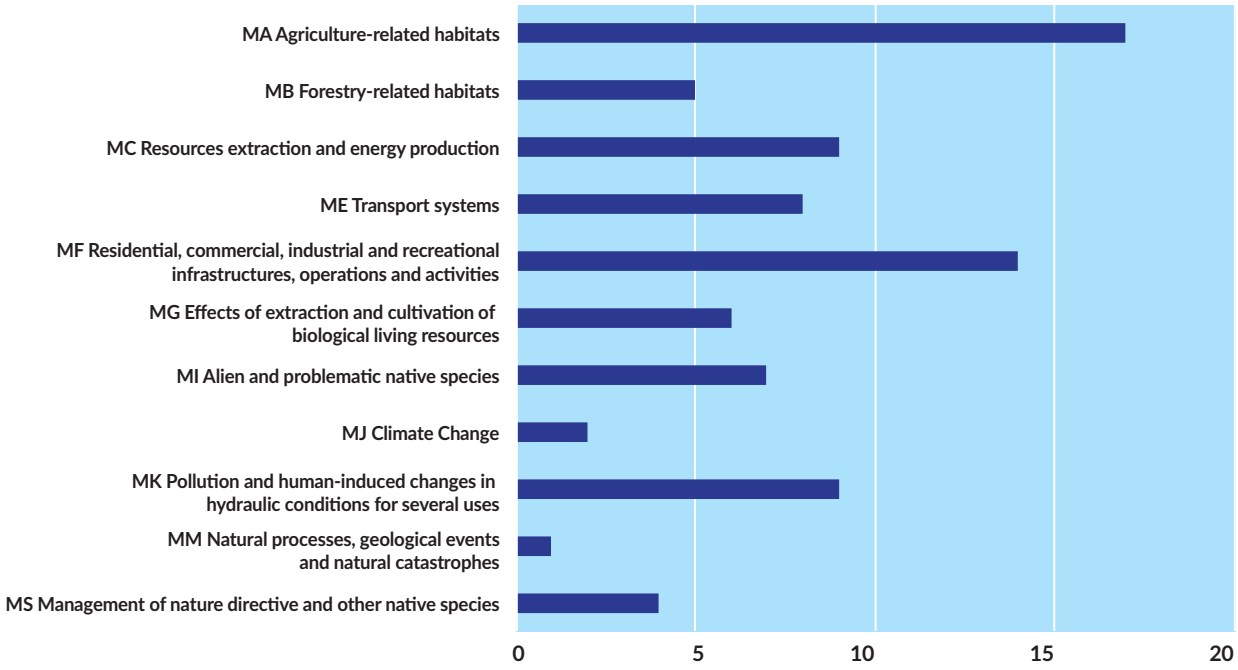


Figure 9: Number of species with associated measures in place

CONTRIBUTION OF THE SAC NETWORK

The trend of habitat in good condition and population trend is determined within the SAC network for habitats and species respectively. This does not take into account whether or not the habitat or species is a selection feature in each SAC. The SAC network affords a greater level of protection for one habitat but no species (Figure 10 a and b). One of these species and three habitats have worse population trends and habitat condition inside the SAC network. For Kerry Slug (*Geomalacus maculosus*), there was an increasing trend nationally but a stable trend within the SAC network, this apparent decrease is likely due to being an artefact of an increase in range for the species nationally in comparison to within SAC networks. A similar artefact has occurred for Hay Meadows with both losses and gains inside and outside the network but a significant net gain of 30.17 ha occurring outside the SAC network. The majority of these gains were recorded in State-owned public parks and demesnes that have been consistently managed by sustained annual mowing for the last 10 years, with conservation condition steadily improving year after year. Both Raised Bog (active)* and Degraded Raised Bogs have stable trends within the network in comparison to increasing trends outside the network. This is due to a balance of some losses and gains observed in outcomes reported in 2019 and 2025. The figure for the condition of these habitats could not be calculated in 2019 and only an estimate could be given. However, there is an increasing trend nationally due to the extensive restoration works currently being undertaken and these habitats should be better off in the next reporting round.

The overall shift in trend for habitats and species is likely to be due to improved knowledge on the state of biodiversity in Ireland, thus reducing the number of unknowns compared to previous reporting rounds.

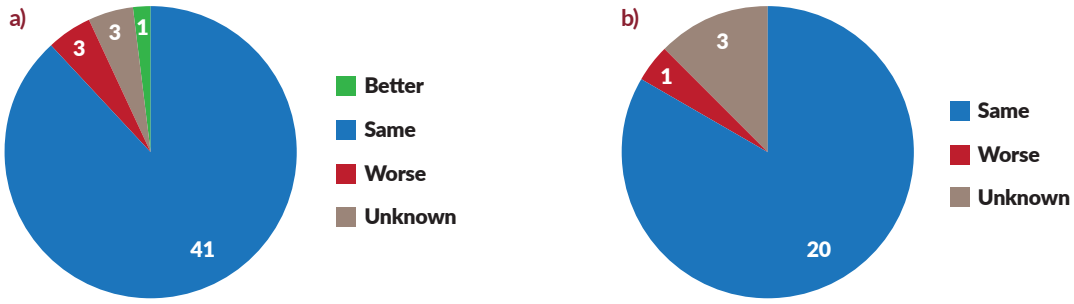


Figure 10: Number of (a) habitats and (b) species that are better, same or worse within the SAC network

CONCLUSIONS

Sanguisorba officinalis: Jim Martin

CONCLUSIONS

This is the fourth Irish report on the status of habitats and species that are protected under the EU Habitats Directive.

HABITAT STATUS

90% of Irish habitats listed in the Habitats Directive are currently in Unfavourable status, with over half showing continued decline. Agricultural pressures remain widespread, in particular grazing regimes that are of excessively high or low intensity which are compromising species-rich swards and/or soil structure. While alien invasive species are commonly reported, they vary according to habitat type, with Common Cordgrass (*Spartina anglica*) recorded in salt marsh habitats, Himalayan Balsam (*Impatiens glandulifera*) in wetlands and Rhododendron (*Rhododendron ponticum*) in woodlands. Impacts associated with recreation and tourism are commonly encountered on cliffs and dune habitats, and coastal defences affect dynamic coastal habitats. Pollution, and specifically nutrient enrichment, affects freshwater and marine habitats, while hydrological impacts are common in wetland habitats. While impacts on condition are more widespread, ongoing losses are significant in grassland and fen habitats.

SPECIES STATUS

The species status assessments are generally faring better, with 58% in Favourable status, including most of the bat species, seals, and cetaceans. A declining trend is reported for 18% of species, with freshwater species most at risk, particularly from pollution. However, an improving trend is reported for 13% of species, with populations of species such as the Marsh Fritillary, Kerry Slug and Pine Marten and many bat species expanding. A small number of species are assessed as being in Unfavourable-Bad status and continue to require concerted efforts to protect and restore them.

Fish species such as the Atlantic Salmon, Sea Lamprey, Pollan and Twaite Shad remain in Bad status. The Sea Lamprey is prevented from reaching suitable breeding habitat in rivers by weirs; the Pollan is impacted by nutrient enrichment in the large lakes where it lives, and by introduced competing fish species, and there are concerns about the habitat quality at spawning sites for Twaite Shad. The IFI have identified a number of barriers blocking fish species movement in rivers, e.g. weirs. It is hoped that action can now be taken to remove these to improve Range, Population size and Quality of habitat for these species. The greatest concern continues to be the Freshwater Pearl Mussel, as only a few rivers have populations that show juvenile recruitment.

CONSERVATION ACTIONS AND PROGRESS

Despite the challenges, significant conservation actions are underway to improve the status of Ireland's habitats and species in the short and medium term. The National Parks and Wildlife Service (NPWS), responsible for nature conservation and wildlife protection, has seen a significant increase in staff numbers since 2020. Additionally, strategic investments have been made in land acquisition and restoration projects, including Ireland's first marine National Park. These measures are expected to improve conservation status, particularly in National Park areas.

A conservation measures programme is being rolled out across Natura 2000 sites. Notably, peatland habitat restoration efforts, including those for Active Raised Bogs, are showing progress. Active Raised Bogs in Ireland increased by 7% between 2018 and 2024, marking the first positive change for this habitat since assessments began in 2007. This improvement is largely due to reduced damage from activities like drainage and peat extraction, as well as increased restoration efforts led by NPWS and Bord na Móna.

The NPWS has also initiated the development of a management and conservation planning framework for designated blanket bog sites in Ireland. This includes the development of National Good Practice Guidelines for the restoration of blanket bogs; an assessment of the restoration potential of conifer plantations within designated sites; the prioritisation of restoration of blanket bog sites on State land within SACs/ Natural Heritage Areas and the development of blanket bog SAC-level provisional restoration

recommendation assessments and the implementation of restoration action plans (RAPs) in several areas. This work is currently being expanded across Blanket Bog SACs. Additionally, the Glenveagh Woodland Management Strategy was published by the NPWS. This aims to restore the ecological value of the park's ancient sessile oak woods and peatland habitats by removing non-native trees and replanting native species. Some of the critical components of the management strategy include managing the deer population to reduce browsing, using native tree species grown in a new in-house nursery, identifying and removing invasive and problematic species, e.g. Rhododendron (*Rhododendron ponticum*), development of a monitoring programme, and implementing conservation measures to protect the woods. These types of strategies are planned to be rolled out to other sites over the coming years.

The NPWS, along with other key stakeholders, has also developed the Lesser Horseshoe Bat Action Plan. Significant range expansion and positive short/long-term population trends provide grounds for genuine optimism about the future prospects for this species. Through dedicated work, our understanding of roosting requirements continues to improve and is informed by an up-to-date assessment of the resilience and priority needs of individual roosts. The NPWS continues to invest in maintaining and improving roost locations and enhancing the species habitats. A significant proportion of this bat's summer and winter roosts is protected within SACs. Additionally, there is a robust licencing system in place supported and underpinned by a strong planning system. Although the species assessment overall is Inadequate (due to a gap in range), the status trend is considered to be improving.

EU LIFE programmes are contributing significantly to improving the status of key habitats. For example, LIFE on Machair focuses on sustainable management of coastal grasslands in SACs, while LIFE INSULAR aims to restore fixed dune habitats. LIFE Lough Carra and Waters of LIFE IP are working to enhance the health of freshwater and coastal ecosystems.

Additionally, the Wild Atlantic Nature LIFE Integrated Project supports farming communities in SAC areas, aiming to add value to ecosystem services while promoting conservation. This initiative has led to the creation of Natura Communities, a network that empowers local communities to lead nature conservation and ecosystem restoration efforts.

There is an increased focus on biodiversity across many policies, with the €1.5 billion Agri-Climate Rural Environment Scheme (ACRES) under the Common Agricultural Policy playing a key role. The scheme offers targeted actions for farmers, particularly in areas dominated by semi-natural vegetation and Natura 2000 sites.

The Forestry Programme 2023-2027 also incentivizes the planting of native woodlands and the conservation of existing forests, with measures in place to protect key habitats such as those of the Freshwater Pearl Mussel.

In 2021, Coillte, Ireland's largest landowner, launched a new vision to enhance biodiversity on its estate. The company has committed to restoring 20% of existing biodiversity and improving ecological management, with plans to expand areas managed primarily for nature to 50% by 2030.

The Water Action Plan 2024 outlines Ireland's roadmap for protecting rivers, lakes, estuaries, and groundwater. The plan includes a multi-billion Euro investment in wastewater infrastructure, a new River Barriers Mitigation Programme, and a Community Water Development Fund to support local conservation projects.

Ireland also secures funding through the European Innovation Partnership Scheme. A number of biodiversity-positive initiatives have been implemented during the reporting cycle and are likely to result in a positive impact on upland, coastal and freshwater habitats.

A new national River Barriers Mitigation Programme will ramp up efforts to remove river-blocks that impact on species like salmon and lamprey swimming upstream to spawn, and a review of arterial drainage requirements and the underpinning Arterial Drainage Act will be undertaken in the context of land use.

Since the last reporting round the All-Ireland Pollinator Plan has made key steps forward in

aiding pollinators and enhancing the habitats they use. The current 2021–2025 plan expanded from 81 to 186 actions. To date over 14,000 actions have been taken across all sectors and more than 5,000 sites have been identified, accounting for approximately 8.3 km^2. While strong progress has been achieved, the plan highlights that continued action is essential to ensure a healthy environment for pollinators into the future.

Linked with the implementation of the All-Ireland Pollinator Plan, NPWS recorded an improving trend for Hay Meadows during the current reporting period. All parameters showed an increasing trend, with Range and Area both increasing over the last two reporting periods (by 9.3% and 14% respectively) and the percentage of habitat with good Structure and Functions increasing from 53% in the last reporting period to 66.8% in the current reporting period. Improvements were due to nature-positive conservation management such as maintaining agricultural practices, extensive mowing and managing fertiliser input. These measures are expected to continue into the next reporting period.

FUTURE CHALLENGES AND GOALS

Although significant progress has been made, challenges remain. Some habitats, particularly lake and coastal marine habitats, continue to suffer from nutrient pollution, and recovery may take years. Additionally, measures implemented in some areas have yet to show detectable improvements, and in some cases, declines elsewhere have offset gains.

Looking ahead, the effects of climate change will present additional challenges, particularly for peatland habitats and aquatic species. However, Ireland is committed to scaling up conservation efforts in the next 6-year period, including by developing a Nature Restoration Plan by 2026. This plan will aim to halt and reverse the decline of Annex I habitats, with the EU's Nature Restoration Regulation setting legally binding restoration targets.

Although considerable work is being undertaken to roll out conservation measures, we must continue to improve our understanding of the ecological requirements of the habitats and species. Pressures can interact and be exacerbated; climate change can cause unexpected consequences. The outcomes of conservation measures can be slow to materialise. Given the many unknowns that still need to be addressed, the role of research and monitoring cannot be underestimated. Without a sound scientific basis our efforts may end up misguided or ineffective.

The next reporting period, due in 2031, will require ongoing restoration, monitoring, and continued cooperation across sectors and society, which will be essential to meet national and EU biodiversity goals. Ongoing collaboration with farmers, in particular, cannot be underestimated as they play a vital role in delivering sustainable practices that support healthy soils and resilient ecosystems. Ireland's progress, backed by science and funding, offers hope for improving the conservation status of its protected habitats and species.

APPENDIX

All Saints Bog and Esker: Bord na Móna

Table 1: Assessment results by habitat for 2007, 2013, 2019 and 2025.

Code	Common name	2007 Overall status	2013 Overall status and operator	2019 Overall status and trend	2025 Overall status and trend	2025 Range	2025 Area	2025 Structure & Functions	2025 Future Prospects
1110	Sandbanks	U-I	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav (Un)	Fav
1130	Estuaries	U-I	U-I (I)	U-I (D)	U-B (S)	Fav (S)	Fav (S)	U-B (S)	U-B
1140	Tidal mudflats and sandflats	U-I	U-I (I)	U-I (D)	U-I (S)	Fav (S)	Fav (S)	U-I (S)	U-I
1150	Lagoons*	U-B	U-B (S)	U-B (D)	U-B (D)	Fav (S)	Fav (S)	U-B (D)	U-B
1160	Large shallow inlets and bays	U-I	U-I (I)	U-B (D)	U-B (D)	Fav (S)	Fav (S)	U-B (D)	U-B
1170	Reefs	U-I	U-B (D)	U-I (S)	U-B (S)	Fav (S)	Fav (S)	Unk	U-B
1180	Submarine structures made by leaking gases	Not assessed	Not assessed	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav
1210	Drift lines	U-I	U-I (D)	U-I (D)	U-I (S)	Fav (S)	U-I (S)	Fav (S)	U-I
1220	Vegetated shingle	U-I	U-I (S)	U-I (S)	U-I (D)	Fav (S)	U-I (D)	U-I (S)	U-I
1230	Vegetated sea cliffs	U-I	U-I (S)	U-I (S)	U-I (S)	Fav (S)	Fav (S)	U-I (S)	U-I
1310	*Salicornia mud*	U-I	U-I (D)	Fav (S)	U-B (D)	U-I (D)	U-I (D)	U-B (D)	U-B
1330	Atlantic salt meadows	U-I	U-I (S)	U-I (D)	U-B (D)	Fav (S)	U-I (D)	U-B (D)	U-B
1410	Mediterranean salt meadows	U-I	U-I (S)	U-I (D)	U-I (D)	Fav (S)	U-I (D)	U-I (D)	U-I
1420	Halophilous scrub	U-B	U-B (D)	U-B (D)	U-B (S)	Fav (S)	U-B (S)	U-I (S)	U-B
2110	Embryonic shifting dunes	U-I	U-I (S)	U-I (S)	U-I (D)	Fav (S)	U-I (D)	U-I (S)	U-I
2120	Marram dunes (white dunes)	U-B	U-I (S)	U-I (S)	U-I (D)	Fav (S)	U-I (D)	U-I (D)	U-I
2130	Fixed dunes (grey dunes)*	U-B	U-B (S)	U-B (D)	U-B (D)	Fav (S)	U-I (D)	U-B (D)	U-B
2140	*Empetrum* dunes*	U-B	U-I (S)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav
2150	Dune heath*	U-B	U-I (S)	U-I (S)	U-I (D)	Fav (S)	Fav (S)	U-I (D)	U-I
2170	Dunes with Creeping Willow	U-I	U-I (S)	U-I (S)	U-I (D)	Fav (S)	U-I (D)	U-I (S)	U-I
2190	Dune slacks	U-B	U-I (D)	U-I (D)	U-I (D)	Fav (S)	U-I (D)	U-I (S)	U-I
21A0	Machair*	U-B	U-B (S)	U-I (S)	U-I (S)	Fav (S)	U-I (D)	U-I (I)	U-I
3110	Oligotrophic isoetid lake habitat	U-B	U-B (D)	U-B (S)	U-I (Un)	Fav (S)	Fav (S)	U-I (Un)	U-I
3130	Slender Naiad-type lakes	U-B	U-I (S)	U-I (D)	U-B (D)	Fav (S)	Fav (S)	U-B (D)	U-B
3140	Hard-water lakes	U-B	U-B (D)	U-B (D)	U-B (S)	Fav (S)	Fav (S)	U-B (S)	U-B
3150	Rich pondweed lake habitat	U-B	U-I (S)	U-I (S)	U-I (Un)	Fav (S)	Fav (S)	U-I (Un)	U-I
3160	Acid oligotrophic lakes	U-B	U-I (D)	U-I (S)	U-I (I)	Fav (I)	Fav (I)	U-I (S)	U-I
3180	Turloughs*	U-I	U-I (S)	U-I (S)	U-I (S)	Fav (S)	Fav (S)	U-I (Un)	U-I
3260	Vegetation of flowing waters	U-B	U-I (D)	U-I (D)	U-I (D)	Fav (S)	Fav (S)	U-I (D)	U-I
3270	Chenopodion rubri	Fav	Fav	Fav (S)	U-I (D)	Fav (Un)	U-I (D)	Fav (S)	Unk

STATUS: Fav = Favourable, U-I = Unfavourable-Inadequate, U-B = Unfavourable-Bad, Unk = Unknown

TREND: I = Improving, S = Stable, D = Deteriorating, Un = Unknown/Uncertain, N/A – Not Assessed

Changes in assessment results may be due to a variety of factors, please read the full assessment reports for context.

Code	Common name	2007 Overall status	2013 Overall status and operator	2019 Overall status and trend	2025 Overall status and trend	2025 Range	2025 Area	2025 Structure & Functions	2025 Future Prospects
4010	Wet heaths	U-B	U-B (S)	U-B (D)	U-B (D)	Fav (S)	U-I (D)	U-B (S)	U-B
4030	Dry heaths	U-I	U-B (S)	U-B (S)	U-B (D)	Fav (S)	U-I (D)	U-B (Un)	U-B
4060	Alpine and subalpine heath	U-I	U-B (I)	U-B (I)	U-B (S)	Fav (S)	U-I (Un)	U-B (S)	U-B
5130	Juniper scrub	U-I	U-I (S)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav
6130	Calaminarian grasslands	U-I	U-I (S)	U-I (D)	U-I (D)	U-I (D)	U-I (D)	U-I (S)	U-I
6210	Orchid-rich calcareous grassland*	U-B	U-B (S)	U-B (D)	U-B (D)	U-I (D)	U-B (D)	U-I (S)	U-B
6230	Species-rich *Nardus* grassland*	U-B	U-B (D)	U-B (S)	U-B (D)	Fav (S)	U-B (D)	U-I (S)	U-B
6410	*Molinia meadows*	U-B	U-B (D)	U-B (D)	U-B (D)	U-I (D)	U-B (D)	U-B (S)	U-B
6430	Hydrophilous tall-herb swamp	U-I	U-B (S)	U-B (D)	U-B (D)	U-I (D)	U-B (D)	U-B (D)	U-B
6510	Hay meadows	U-B	U-B (S)	U-B (D)	U-B (I)	U-B (I)	U-B (I)	U-B (I)	U-I
7110	Raised bog (active)*	U-B	U-B (D)	U-B (D)	U-B (I)	U-B (S)	U-B (I)	U-B (I)	U-B
7120	Degraded raised bogs	U-B	U-B (D)	U-B (D)	U-B (I)	U-B (S)	U-B (I)	U-B (I)	U-B
7130	Blanket bog (active)*	U-I	U-B (D)	U-B (D)	U-B (D)	Fav (S)	U-I (D)	U-B (S)	U-B
7140	Transition mires	U-B	U-B (Un)	U-B (S)	U-B (D)	Fav (S)	U-B (D)	U-B (Un)	U-B
7150	Rhynchosporion depressions	Fav	U-I (D)	U-B (D)	U-I (D)	Fav (S)	U-I (D)	U-I (S)	U-I
7210	*Cladium fens**	U-B	U-B (Un)	U-I (S)	U-B (D)	Fav (S)	U-B (D)	U-B (Un)	U-B
7220	Petrifying springs*	U-B	U-I (S)	U-I (D)	U-I (S)	Fav (S)	Fav (S)	U-I (S)	U-I
7230	Alkaline fens	U-B	U-B (Un)	U-B (D)	U-B (D)	Fav (S)	U-B (D)	U-B (Un)	U-B
8110	Siliceous scree	U-I	U-I (I)	U-I (S)	U-I (S)	Fav (S)	Fav (S)	U-I (S)	U-I
8120	Calcareous scree	U-I	U-I (S)	U-I (S)	U-I (S)	Fav (S)	Fav (S)	U-I (S)	U-I
8210	Calcareous rocky slopes	U-I	U-I (S)	U-I (S)	U-I (S)	Fav (S)	Fav (S)	U-I (S)	U-I
8220	Siliceous rocky slopes	U-I	U-I (S)	U-I (S)	U-I (S)	Fav (S)	Fav (S)	U-I (S)	U-I
8240	Limestone pavement*	U-I	U-I (S)	U-I (S)	U-I (S)	Fav (S)	U-I (D)	U-I (I)	U-I
8310	Caves	Fav	Fav	Fav (S)	Fav (I)	Fav (I)	Fav (I)	Fav (S)	Fav
8330	Sea caves	Fav	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav
91A0	Old oak woodland	U-B	U-B (I)	U-B (D)	U-B (D)	Fav (S)	U-B (D)	U-B (S)	U-B
91D0	Bog woodland*	U-I	Fav	Fav (S)	U-B (D)	Fav (S)	Fav (S)	U-B (D)	U-B
91E0	Alluvial woodland*	U-B	U-B (I)	U-B (D)	U-B (D)	Fav (S)	U-B (D)	U-B (S)	U-B
91J0	Yew woodland*	U-B	U-B (I)	U-B (S)	U-B (S)	U-B (S)	U-B (S)	U-B (S)	U-B

STATUS: Fav = Favourable, U-I = Unfavourable-Inadequate, U-B = Unfavourable-Bad, Unk = Unknown

TREND: I = Improving, S = Stable, D = Deteriorating, Un = Unknown/Uncertain, N/A – Not Assessed

Changes in assessment results may be due to a variety of factors, please read the full assessment reports for context.

Table 2: Assessment results by species for 2007, 2013, 2019 and 2025.

Code	Species name	Annex	2007 Overall status	2013 Overall status and operator	2019 Overall status and trend	2025 Overall status and trend	2025 Range	2025 Population	2025 Habitat for the species	2025 Future Prospects
6985	Killarney Fern *(Vandenboschia speciosa)*	II, IV	Fav	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav
1528	Marsh Saxifrage *(Saxifraga hirculus)*	II, IV	Fav	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav
1833	Slender Naiad *(Najas flexilis)*	II, IV	U-I	U-I (S)	U-I (D)	U-B (D)	U-I (S)	U-B (D)	U-B (D)	U-B
6216	Shining Sickle Moss *(Hamatocaulis vernicosus)*	II	Fav	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav
1395	Petalwort *(Petalophyllum ralfsii)*	II	Fav	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav
1376	Maërl *(Lithothamnion corallioides)*	V	U-I	U-I (I)	U-B (D)	U-B (D)	Fav (S)	Fav (S)	U-B (D)	U-B
1377	Maërl *(Phymatholithon calcareum)*	V	U-I	U-I (I)	U-B (D)	U-B (D)	Fav (S)	Fav (S)	U-B (D)	U-B
1400	White Cushion Moss *(Leucobryum glaucum)*	V	U-I	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav
1409	*Sphagnum* genus (*Sphagnum* spp.)	V	U-I	U-I (S)	U-I (S)	U-I (S)	Fav (N/A)	Fav (N/A)	U-I (N/A)	U-I
1413	*Lycopodium* group (*Lycopodium* spp.)	V	U-I	U-I (S)	U-I (S)	U-I (S)	Fav (N/A)	U-I (N/A)	U-I (N/A)	U-I
1378	*Cladonia* (*Cladina* morphotype) species (*Cladonia* (*Cladina*) subsp.)	V	U-I	U-I (S)	U-I (S)	U-I (S)	Fav (N/A)	Fav (N/A)	U-I (N/A)	U-I
1013	Geyer's Whorl Snail *(Vertigo geyeri)*	II	U-I	U-I (D)	U-B (D)	U-B (D)	U-B (D)	U-B (D)	U-B (D)	U-B
1014	Narrow-mouthed Whorl Snail *(Vertigo angustior)*	II	U-I	U-I (D)	U-I (D)	U-B (D)	U-B (D)	U-B (D)	U-I (D)	U-B
1016	Desmoulin's Whorl Snail *(Vertigo moulinsiana)*	II	U-B	U-I (D)	U-I (D)	U-I (D)	Fav (I)	U-I (D)	U-I (D)	U-I
1024	Kerry Slug *(Geomalacus maculosus)*	II, IV	U-I	Fav	Fav (I)	Fav (I)	Fav (I)	Fav (I)	Fav (S)	Fav
1029	Freshwater Pearl Mussel *(Margaritifera margaritifera)*	II, V	U-B	U-B (D)	U-B (D)	U-B (D)	U-I (S)	U-B (D)	U-B (D)	U-B
1990	Nore Pearl Mussel *(Margaritifera durrovensis)*	II, V	U-B	U-B (D)	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed
1092	White-clawed Crayfish *(Austropotamobius pallipes)*	II, V	U-I	U-I (S)	U-B (D)	U-B (D)	U-I (D)	U-B (D)	Unk	U-B
1065	Marsh Fritillary *(Euphydryas aurinia)*	II	U-I	U-I (D)	U-I (I)	Fav (I)	Fav (I)	Fav (I)	Fav (I)	Fav
1095	Sea Lamprey *(Petromyzon marinus)*	II	U-I	U-B (S)	U-B (S)	U-B (D)	U-B (S)	U-B (S)	U-I (D)	U-B
1096	Brook Lamprey *(Lampetra planeri)*	II	Fav	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav
1099	River Lamprey *(Lampetra fluviatilis)*	II, V	Fav	Fav	Unk	U-I (Un)	Unk	Unk	U-I (D)	Unk
5046	Killarney Shad *(Alosa killarnensis)*	II, V	Fav	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Unk
1103	Twaite Shad *(Alosa fallax)*	II, V	U-B	U-B (S)	U-B (S)	U-B (D)	Fav (S)	U-B (S)	U-I (D)	U-B
5076	Pollan *(Coregonus pollan)*	V	U-B	U-B (Un)	U-B (S)	U-B (S)	Fav (S)	U-B (S)	U-I (S)	U-B
1106	Atlantic Salmon *(Salmo salar)*	II, V	U-B	U-I (S)	U-I (S)	U-B (D)	U-B (D)	U-B (D)	U-I (S)	U-B
6284	Natterjack Toad *(Epidalea calamita)*	IV	U-B	U-B (I)	U-B (S)	U-B (S)	U-B (S)	U-B (Un)	U-I (S)	U-B
1213	Common Frog *(Rana temporaria)*	V	U-I	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav
1223	Leatherback Turtle *(Dermochelys coriacea)*	IV	U-I	Unk	Unk	Unk	Unk	Unk	Unk	Unk
1303	Lesser Horseshoe Bat *(Rhinolophus hipposideros)*	II, IV	Fav	Fav	U-I (D)	U-I (I)	U-I (I)	Fav (I)	U-I (I)	Fav
1309	Common Pipistrelle *(Pipistrellus pipistrellus)*	IV	Fav	Fav	Fav (I)	Fav (I)	Fav (S)	Fav (I)	Fav (S)	Fav
5009	Soprano Pipistrelle *(Pipistrellus pygmaeus)*	IV	Fav	Fav	Fav (I)	Fav (I)	Fav (S)	Fav (I)	Fav (S)	Fav
1317	Nathusius' Pipistrelle *(Pipistrellus nathusii)*	IV	Fav	Unk	Unk	Unk	Unk	Unk	Fav (S)	Fav
1322	Natterer's Bat *(Myotis nattereri)*	IV	Fav	Fav	Fav (S)	Fav (S)	Fav (S)	Unk	Fav (S)	Fav
1314	Daubenton's Bat *(Myotis daubentonii)*	IV	Fav	Fav	Fav (I)	Fav (S)	Fav (S)	Fav (D)	Fav (S)	Fav
1330	Whiskered Bat *(Myotis mystacinus)*	IV	Fav	Fav	Fav (S)	Fav (S)	Fav (S)	Unk	Fav (S)	Fav

STATUS: Fav = Favourable, U-I = Unfavourable-Inadequate, U-B = Unfavourable-Bad, Unk = Unknown

TREND: I = Improving, S = Stable, D = Deteriorating, Un = Unknown/Uncertain, N/A – Not Assessed

Changes in assessment results may be due to a variety of factors, please read the full assessment reports for context.

Code	Species name	Annex	2007 Overall status	2013 Overall status and operator	2019 Overall status and trend	2025 Overall status and trend	2025 Range	2025 Population	2025 Habitat for the species	2025 Future Prospects
1326	Brown Long-eared Bat *(Plecotus auritus)*	IV	Fav	Fav	Fav (I)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav
1331	Leisler's Bat *(Nyctalus leisleri)*	IV	Fav	Fav	Fav (I)	Fav (I)	Fav (S)	Fav (I)	Fav (S)	Fav
1334	Mountain Hare *(Lepus timidus)*	V	U-I	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Unk	Fav
1355	Otter *(Lutra lutra)*	II, IV	U-I	Fav	Fav (I)	Fav (S)	Fav (S)	Fav (S)	Fav (Un)	Fav
1357	Pine Marten *(Martes martes)*	V	Fav	Fav	Fav (I)	Fav (I)	Fav (I)	Fav (I)	Fav (I)	Fav
1364	Grey Seal *(Halichoerus grypus)*	II, V	Fav	Fav	Fav (I)	Fav (I)	Fav (S)	Fav (I)	Fav (S)	Fav
1365	Harbour Seal *(Phoca vitulina)*	II, V	Fav	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav
1345	Humpback Whale *(Megaptera novaeangliae)*	IV	Unk	Unk	Unk	Fav (S)	Fav (S)	Unk	Fav (S)	Fav
1349	Common Bottlenose Dolphin *(Tursiops truncatus)*	II, IV	Fav	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (Un)	Fav (S)	Fav
1350	Short-beaked Common Dolphin *(Delphinus delphis)*	IV	Fav	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav (S)	Fav
1351	Harbour Porpoise *(Phocoena phocoena)*	II, IV	Fav	Fav	Fav (S)	U-I (S)	Fav (S)	U-I (Un)	Fav (S)	U-I
2027	Killer Whale *(Orcinus orca)*	IV	Unk	Unk	Unk	Unk	Fav (S)	Unk	Fav (S)	Unk
2029	Long-finned Pilot Whale *(Globicephala melas)*	IV	Unk	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (Un)	Fav (S)	Fav
2030	Risso's Dolphin *(Grampus griseus)*	IV	Unk	Unk	Fav (S)	Fav (S)	Fav (I)	Fav (Un)	Fav (S)	Fav
2031	White-sided Dolphin *(Lagenorhynchus acutus)*	IV	Fav	Fav	Fav (S)	Fav (S)	Fav (S)	Unk	Fav (S)	Fav
2032	White-beaked Dolphin *(Lagenorhynchus albirostris)*	IV	Unk	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (Un)	Fav (S)	Fav
2034	Striped Dolphin *(Stenella coeruleoalba)*	IV	Unk	Fav	Fav (S)	Fav (S)	Fav (S)	Unk	Fav (S)	Fav
2035	Cuvier's Beaked Whale *(Ziphius cavirostris)*	IV	Unk	Unk	Fav (S)	Fav (S)	Fav (S)	Unk	Fav (S)	Fav
2038	Sowerby's Beaked Whale *(Mesoplodon bidens)*	IV	Unk	Unk	Fav (S)	Fav (S)	Fav (S)	Unk	Fav (S)	Fav
2618	Minke Whale *(Balaenoptera acutorostrata)*	IV	Fav	Fav	Fav (S)	Fav (S)	Fav (S)	Fav (Un)	Fav (S)	Fav
2621	Fin Whale *(Balaenoptera physalus)*	IV	Fav	Fav	Fav (S)	Fav (S)	Fav (S)	Unk	Fav (S)	Fav
5020	Blue Whale *(Balaenoptera musculus)*	IV	Unk	Unk	Unk	Unk	Fav (S)	Unk	Fav (S)	Unk
2624	Sperm Whale *(Physeter macrocephalus)*	IV	Unk	Unk	Fav (S)	Fav (S)	Fav (I)	Fav (Un)	Fav (S)	Fav
5033	Northern Bottlenose Whale *(Hyperoodon ampullatus)*	IV	Unk	Unk	Unk	Unk	Fav (S)	Unk	Fav (S)	Unk
2619	Sei Whale *(Balaenoptera borealis)*	IV	Unk	Unk	Unk	Unk	Fav (S)	Unk	Fav (S)	Unk
1348	Northern Right Whale *(Eubalaena glacialis)*	IV	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant
2028	False Killer Whale *(Pseudorca crassidens)*	IV	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant
2037	True's Beaked Whale *(Mesoplodon mirus)*	IV	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant
2622	Pygmy Sperm Whale *(Kogia breviceps)*	IV	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant
5029	Beluga/White Whale *(Delphinapterus leucas)*	IV	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant
5034	Gervais' Beaked Whale *(Mesoplodon europaeus)*	IV	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant
1102	Allis Shad *(Alosa alosa)*	II, V	Unk	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant
1320	Brandt's Bat *(Myotis brandtii)*	IV	Fav	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant
1304	Greater Horseshoe Bat *(Rhinolophus ferrumequinum)*	II, IV	Not present	Not present	Not present	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant

STATUS: Fav = Favourable, U-I = Unfavourable-Inadequate, U-B = Unfavourable-Bad, Unk = Unknown

TREND: I = Improving, S = Stable, D = Deteriorating, Un = Unknown/Uncertain, N/A – Not Assessed

Changes in assessment results may be due to a variety of factors, please read the full assessment reports for context.

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Rialtas na hÉireann
Government of Ireland

Appendix 8 - RFI Observation

DIRECT PLANNING APPLICATION TO AN BORD PLEANÁLA

in respect of

Arklow Bank Wind Park Phase 2 - RFI

Bord Pleanála Case Reference: OA27.319864

Submissions on Behalf of Blue Ireland Coalition CLG

Blue Ireland Coalition CLG, Garadice House, 3-4 Fairview, Dublin 3, Ireland.

NATIONAL LEVEL	
1 General information	
1.1 Member State	**IE**
1.2 Species code	**1351**
1.3 Species scientific name	***Phocoena phocoena***
1.4 Alternative species scientific name *Optional*	
1.5 Common name *Optional*	**Harbour Porpoise (Muc Mhara)**
1.6i Species description	The Harbour Porpoise is the smallest cetacean species occurring in Irish waters, with adults averaging just 1.4-1.8 m long. Inhabiting only the Northern Hemisphere, the species is mainly found in cold temperate and sub-polar waters, in the North-East Atlantic from Iceland and northern Norway to north-west Africa (Hammond *et al.*, 2008; Bjørge & Tolley, 2009). Harbour Porpoises are the only cetaceans to regularly occur in the Baltic Sea, but do not commonly occur in the Mediterranean (Hammond *et al.*, 2008). A reproductively-isolated population occurs in the Black Sea (Bjørge & Tolley, 2009). The population structure of Harbour Porpoise is currently under investigation, as some evidence of genetic differentiation from the North Atlantic population has been observed in western Greenland (Ben Chehida *et al.,* 2021) and the Baltic Sea (Autenreith *et al.,* 2023). Classified by the IUCN as a species of Least Concern due to its wide occurrence and overall abundance estimates (Hammond *et al.*, 2008), the Harbour Porpoise is one of the most frequently recorded cetacean species in Irish waters (e.g., Berrow *et al.*, 2010; Wall *et al.*, 2013) but is recorded with greater difficulty offshore and in the open Atlantic due to its small size and inconspicuous nature (Ó Cadhla *et al.*, 2004). Although Harbour Porpoises may conduct large scale and/or seasonal movements in some regions, distinct breeding populations, or stocks, and patterns in movement/distribution by populations in western Europe are not well understood (Bjørge & Tolley, 2009; DEHLG, 2009).

2 Maps	
Distribution of the species within the Member State concerned.	
2.1 Sensitive species	*YES/**NO***
2.2 Year or period	***2013-2024***
2.3 Distribution map	Submitted

2.4 Distribution map Method used	*Select one of the following methods:* *a) Complete survey or a statistically robust estimate* ***b) Based mainly on extrapolation from a limited amount of data*** *c) Based mainly on expert opinion with very limited data* *d) Insufficient or no data available*
2.5 Additional maps *Optional*	Range maps were submitted
2.6 Additional information *Optional*	Over the last two decades, there have been continuing and widespread records of Harbour Porpoises in Irish coastal and offshore waters (e.g., Ó Cadhla *et al.*, 2004; Berrow *et al.*, 2010; Wall *et al.*, 2013; Kavanagh *et al.*, 2017; Rogan *et al.*, 2018; Giralt Paradell *et al.*, 2024a, 2024b). The distribution map presented for this species represents all available live sighting records collected during extensive scientific research and monitoring in Irish waters between 2013 and 2024. The period selected for mapping represents a period of intensive and high quality surveillance for cetaceans in Irish waters, across a range of research projects and monitoring programmes, and thus is considered to give an accurate reflection of the current distribution of this species in Ireland. The surveillance programmes, projects and publications that contributed sighting and acoustic detection data to this distribution projection are cited as follows: Berrow & O'Brien (2013); Cronin & Barton (2014); Craig *et al.* (2016); Kavanagh *et al.* (2017), O'Brien & Berrow (2014, 2015, 2016, 2018, 2020); O'Donnell *et al.* (2017, 2018a, 2018b); O'Sullivan & Manning (2017); Berrow *et al.* (2018); Rogan *et al.* (2018); Berrow, *et al.* (2021a, 2021b); Judge (2021); Berrow *et al.* (2022); O'Brien *et al*. (2022); Shine, (2022); Todd *et al.* (2024) and Giralt Paradell *et al.* (2024a, 2024b). Along with the results of previous visual survey effort (e.g., Hammond *et al.*, 2002; Reid *et al.*, 2003; Ó Cadhla *et al.*, 2004; Hammond *et al.*, 2009; Berrow *et al.*, 2010; Wall *et al.*, 2013), recent extensive ship-based and aerial surveys in summer (Hammond *et al.*, 2017; Rogan *et al.*, 2018; Giralt Paradell *et al.*, 2024a, 2024b) and winter (Rogan *et al.*, 2018; Giralt Paradell *et al.*, 2024a, 2024b), these data were integrated into the development of the species range map presented under section 2.5. It should be noted that the spatial and temporal distribution of Harbour Porpoises could be somewhat underestimated due to the difficulty in discriminating between small and inconspicuous cetacean species, particularly in the offshore Atlantic environment (e.g., see Ó Cadhla *et al.*, 2004; Wall *et al.*, 2013; Rogan *et al.*, 2018; Giralt Paradell *et al.* 2024a). Thus, the distribution map presented does not include records where the observed species could not be distinguished, for example, from smaller members of the Family Delphinidae (e.g., Striped Dolphin, Short-beaked Common Dolphin) or the 'unidentified dolphin' or 'unidentified small cetacean' categories often used for indeterminate sightings.

	The distribution of recent sightings (e.g., Cronin & Barton, 2014; Craig *et al.*, 2016; Hammond *et al.*, 2017; Kavanagh *et al.*, 2017; O'Sullivan & Manning, 2017; O'Donnell *et al.*, 2017; Rogan *et al.*, 2018; Giralt Paradell *et al.*, 2024a, 2024b) and acoustic records (Berrow *et al.*, 2018; Todd, *et al*., 2024) along with regional sighting records obtained across three preceding decades (e.g., Berrow *et al.*, 2002; Hammond *et al.*, 2002; Reid *et al.*, 2003; Ó Cadhla *et al.*, 2004; Hammond *et al.*, 2009; Berrow *et al.*, 2010; Wall *et al.*, 2013) indicate the species' widespread nature. The greater densities recorded particularly in the Irish Sea reflect the Harbour Porpoise preference for waters overlying the continental shelf and the continental slope. They are also recorded in coastal waters and occasionally adjacent deeper basin waters (e.g., the Porcupine Seabight; Rogan *et al.*, 2018; Giralt Paradell *et al.*, 2024a). The map drawn for this species provides a good representation of its observed distribution within the period given in 2.2.

3 Information related to Annex V species (Art. 14)

N/A: Not an Annex V species

BIOGEOGRAPHICAL LEVEL

Complete for each biogeographical region or marine region concerned.

4 Biogeographical and marine regions

4.1 Biogeographical or marine region where the species occurs	*Choose one of the following:* *Atlantic, **Marine Atlantic***
4.2 First time reporting	*YES/**NO***
4.3 Additional information	-
4.4 Sources of information	Autenrieth, M., Havenstein, K., De Cahsan, B., Canitz, J., Benke, H., Roos, A., Pampoulie, C., Sigurðsson, G. M., Siebert, U., Olsen, M. T., Biard, V., Heide-Jørgensen, M. P., Öztürk, A. A., Öztürk, B., Lawson, J. W., Tiedemann, R. (2023) Genome-wide analysis of the Harbour Porpoise (*Phocoena phocoena*) indicates isolation-by-distance across the North Atlantic and potential local adaptation in adjacent waters. *Conservation Genetics*, 25, 563-584. Ben Chehida, Y., Loughnane, R., Thumloup, J., Kaschner, K., Garilao, C., Rosel, P.E., Fontaine, M.C. (2021) No leading-edge effect in North Atlantic Harbour Porpoises: Evolutionary and conservation implications. *Evolutionary Applications*, 14(6), 1588-1611. Berrow, S.D. & O'Brien, J. (2013) Harbour Porpoise SAC survey 2013. Report to the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Irish Whale and Dolphin Group. pp. 37.

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5 Range	
Range within the biogeographical/marine region concerned.	
5.1 Surface area	***400,000 km²***
5.2 Change and reason for change in surface area of range	*Is there a change between reporting periods?* *(If yes, more than 1 option b) to f) can be chosen)* ***a) no, there is no change*** *b) yes, due to genuine change* *c) yes, due to improved knowledge/more accurate data* *d) yes, due to the use of different method* *e) yes, but nature of change is unknown* *f) yes, due to other reasons*
5.3 Short-term trend Period	***2013-2024***
5.4 Short-term trend Direction	***stable*** */ increasing / decreasing / uncertain / unknown*

5.5 Short-term trend Magnitude *Optional*	**a) Estimated Minimum**	
	b) Estimated Maximum	
	c) Pre-defined range	
	d) Unknown	
5.6. Short-term trend Magnitude Type of estimate *Optional*		
5.7 Short-term trend Method used	*Select one of the following methods:* *a) Complete survey or a statistically robust estimate* ***b) Based mainly on extrapolation from a limited amount of data*** *c) Based mainly on expert opinion with very limited data* *d) Insufficient or no data available*	
5.8 Long-term trend Period *Optional*	***2000-2024***	
5.9 Long-term trend Direction *Optional*	*stable / increasing / decreasing /* ***uncertain*** */ unknown*	
5.10 Long-term trend Magnitude *Optional*	**a) Minimum**	
	b) Maximum	
5.11 Long-term trend Method used *Optional*		
5.12 Favourable reference range	***a) 400,000 km²***	
	b) if a precise favourable reference range is unknown indicate if the range is: ☐ *approximately equal to the favourable reference range (less than 2% smaller)* ☐ *between 2% and 10% smaller than the FRR* ☐ *between 11% and 50% smaller than the FRR* ☐ *between 51% and 100% smaller than the FRR*	
	c) Indicate if favourable reference range is unknown	
	d) Indicate method used to set reference value (multiple methods can be chosen)	
	☐ *Model-based approach*	*Indicate the quality of information available: High/Moderate/ Low*
	☐ ***Reference-based approach***	*Indicate the quality of information available: High/**Moderate**/ Low*

	☐ ***Expert opinion***
	☐ *Other (elaborate in Additional information 5.14)*
5.13 Range when Directive came into force *Optional*	
5.14 Additional information *Optional*	The natural range of Harbour Porpoises in Irish waters, and marine waters covered by the Directive, is a small component of the species' wider North Atlantic range (Hammond *et al.*, 2008; Bjørge & Tolley (2009); DEHLG, 2009; Hammond *et al.*, 2017; Rogan *et al.*, 2018; Giralt Paradell *et al.*, 2024a), while ongoing evidence from repeated high quality surveys (Rogan *et al.*, 2018 and Giralt Paradell *et al.*, 2024a) continues to confirm the species' occurrence in Irish waters in all seasons. The range map provided consists of the species' recorded and likely predominant natural range based on comparatively recent data (2001-2024) and expert judgement, and is partly derived from 2.3. It consists of a block of contiguous 50x50km grid cells distributed in Irish marine waters up to 2,000 m deep, and including the Irish Sea and coastal areas. Prior to 2000, survey effort targeting cetacean species in Irish offshore waters was comparatively limited in coverage, both spatially and temporally. Since 1999-2000, a number of dedicated multi-annual surveillance programmes for cetaceans have operated in Irish waters, with visual and acoustic surveys extending to the limits of Ireland's EEZ and beyond. With regard to this species, it is considered that the years 2013-2024 represent an appropriate period for the evaluation of short-term trends since dedicated surveillance (e.g. ObSERVE Programme) was carried out during this period. Sighting records from ongoing dedicated surveillance effort in Irish waters (e.g., Berrow *et al.*, 2010; Wall *et al.*, 2013; Cronin & Barton, 2014; Craig *et al.*, 2016; Kavanagh *et al.* 2017; O'Donnell *et al.*, 2017; O'Sullivan & Manning, 2017; O'Brien & Berrow, 2014-2018; Rogan *et al.*, 2018; Giralt Paradell *et al.*, 2024a, 2024b) provide no evidence of a decline in distribution/range in the recent past; indeed there is evidence, through repeated surveillance surveys 2013-2024, that the distribution is somewhat larger than estimated in 2019. The short-term trend for Range is considered to be *stable*. The range value derived from the map referred to above is considered to be the baseline for this species. This surface area calculation is identical to that reported in 2019. Since there is no evidence of a decline in range since the Directive came into force the current range is set as the Favourable Reference Range (FRR). There is an assumption that the current range in Irish waters is large enough (a) to encompass all of the ecological variation required by this species during its occurrences therein and (b) to contribute to the long-term survival of the species.

6 Population		
Population within the biogeographical/marine region concerned.		
6.1 Year or period	***2019-2024***	
6.2 Population size (*in reporting unit)*	**a) Unit**	***Number of individuals***
	b) Minimum	***16,586***
	c) Maximum	***26,567***
	d) Best single value	
	e) Class	
6.3 Type of estimate	*Best estimate / multi-year mean / **95% confidence interval** / minimum*	
6.4 Quality of extrapolation to reporting unit *Optional*		
6.5 Additional population size *(using population unit other than reporting unit)* *Optional*	**a) Unit**	
	b) Minimum	
	c) Maximum	
	d) Best single value	
6.6 Type of estimate *Optional*		
6.7 Population size Method used	*Select one of the following methods:* ***a) Complete survey or a statistically robust estimate*** *b) Based mainly on extrapolation from a limited amount of data* *c) Based mainly on expert opinion with very limited data* *d) Insufficient or no data available*	
6.8 Change and reason for change in population size	*Is there a change between reporting periods?* *(If yes, more than 1 option b) to f) can be chosen)* *a) no, there is no change* *b) yes, due to genuine change* ***c) yes, due to improved knowledge/more accurate data*** *d) yes, due to the use of different method* ***e) yes, but nature of change is unknown*** *f) yes, due to other reasons*	
	The change is mainly due to (select one of the reasons below): *a) genuine change* *b) improved knowledge or more accurate data* *c) the use of a different method* ***d) unknown*** *e) other reasons*	

6.9 Short-term trend Period	***2013-2024***	
6.10 Short-term trend Direction	*stable / increasing / decreasing / **uncertain** / unknown*	
6.11 Short-term trend Magnitude	**a) Estimated Minimum**	
	b) Estimated Maximum	
	c) Pre-defined range	
	d) Unknown	***Short-term trend magnitude is unknown***
6.12 Short-term trend Magnitude Type of estimate		
6.13 Short-term trend Method used	*Select one of the following methods:* *a) Complete survey or a statistically robust estimate* ***b) Based mainly on extrapolation from a limited amount of data*** *c) Based mainly on expert opinion with very limited data* *d) Insufficient or no data available*	
6.14 Long-term trend Period *Optional*	***2000-2024***	
6.15 Long-term trend Direction *Optional*	*stable / increasing / decreasing / **uncertain** / unknown*	
6.16 Long-term trend Magnitude *Optional*	**a) Minimum**	
	b) Maximum	
	c) Confidence interval	
6.17 Long-term trend Method used *Optional*	*Select one of the following methods:* *a) Complete survey or a statistically robust estimate* *b) Based mainly on extrapolation from a limited amount of data* ***c) Based mainly on expert opinion with very limited data*** *d) Insufficient or no data available*	
6.18 Favourable reference population	*a) Population size (with unit) or*	
	b) if a precise favourable reference population is unknown indicate if the population is: ☐ *approximately equal to the favourable reference population (less than 5% smaller)* ☐ ***between 5% and 25% smaller than the FRP*** ☐ *between 26% and 50% smaller than the FRP* ☐ *between 51% and 100% smaller than the FRP*	

<table>
<tr><td></td><td colspan="2">c) Indicate if favourable reference population is unknown</td></tr>
<tr><td></td><td colspan="2">d) Indicate method used to set reference value (multiple methods can be chosen)</td></tr>
<tr><td></td><td>☐ Model-based approach</td><td>Indicate the quality of information available:
High/Moderate/Low</td></tr>
<tr><td></td><td>☐ Reference-based approach</td><td>Indicate the quality of information available:
High/Moderate/Low</td></tr>
<tr><td></td><td colspan="2">☐ <u>Expert opinion</u></td></tr>
<tr><td></td><td colspan="2">☐ Other (Elaborate in Additional information 6.20)</td></tr>
<tr><td>6.19 Population size when Directive came into force
Optional</td><td colspan="2"></td></tr>
<tr><td>6.20 Additional information

Optional</td><td colspan="2">Evidence from multi-annual surveillance programmes (e.g., Ó Cadhla et al., 2004; Berrow et al., 2010; Wall et al., 2013; Kavanagh et al., 2017; Rogan et al., 2018; Giralt Paradell et al., 2024a, 2024b) demonstrate that Harbour Porpoises occur widely in Irish waters and do so throughout the year. This is generally the case throughout continental shelf and slope habitats, though the species appears to occur much less frequently in waters over 1,000-1,500 m deep. The ObSERVE Programme highlighted the importance of the Irish Sea, particularly the northern section, (see Rogan, et al., 2018 and Giralt Paradell et al., 2024a) and the Celtic Sea (Rogan et al., 2018).

Recent and comprehensive data for the entire region of western Europe have been lacking until recently, particularly with regard to sufficient temporal (i.e., beyond one or more summer months or one year) and spatial coverage (i.e., spanning coastal, continental shelf, slope and deeper basin waters, all of which may represent Harbour Porpoise habitat).

Abundance estimates from the SCANS-IV Irish Sea survey estimated 9,773 (CV = 0.32) (Gilles et al., 2023). The overall abundance estimates from ObSERVE Phase II are lower than the lower confidence interval estimates from ObSERVE Phase I. ObSERVE Phase I highlighted the Celtic Sea as a relatively important area for Harbour Porpoise. ObSERVE Phase II reported lower densities in this region (Giralt Paradell et al., 2024a, 2024b), as did SCANS-III and IV surveys carried out in adjacent survey blocks (Hammond et al., 2017; Gilles et al., 2023). In addition, ObSERVE Phase II reported higher densities in the Irish Sea, with a markedly decreased density particularly outside the Irish Sea, suggesting a constriction of the species' range within the region The ObSERVE surveys were conducted over a short time frame and although the temporal patterns should not be considered as trends per se, they do highlight a considerable fluctuation in abundance. The reasons(s) for this fluctuation are not fully understood (Giralt Paradell et al., 2025, in review). SCANS and ObSERVE surveys, when considered</td></tr>
</table>

	together, suggest an abundance decline in parts of North East Atlantic between 2016 and 2022 (Hammond *et al.,* 2017; Rogan *et al.,* 2018; Gilles *et al.,* 2023) with other parts of the North East Atlantic remaining stable (Hammond *et al.,* 2017; Gilles *et al.,* 2023), suggesting that the interannual variations in abundance detected in Irish waters between 2016 and 2022 are unlikely a result of movements on a broader scale, but a consequence of a population decline within this region (Giralt Paradell *et al.,* in prep.). Harbour Porpoise data from Ireland's ObSERVE Phase II (see Giralt Paradell *et al.*, 2024a, 2024b) have not yet been integrated into a European-wide assessment of population size for the species, although this should now be feasible given simultaneous aerial survey efforts in the summer of 2022 (Gilles *et al.*, 2023; Giralt Paradell *et al.*, 2024a, 2024b). The aerial surveys carried out under the ObSERVE Programme were successful in enabling abundance estimates to be derived from the sighting data acquired in summer and winter. The most comprehensive and most robust of these three seasonal estimates (i.e., those with low CV = 0.32; summer 2021) has been presented in 6.2 via minimum and maximum 95% Confidence Limits. Improved knowledge of Harbour Porpoise in previous reporting allowed for the Favourable Reference Population to be set as approximately equal to the 2019 reported estimated population. The current population is estimated to be 5-25% below FRP with the short term trend assessed as uncertain.

7 Habitat for the species

7.1 Sufficiency of area and quality of occupied habitat	*a) Is area of occupied habitat sufficient (for long-term survival)?* ***YES****/NO/Unknown* *b) Is quality of occupied habitat sufficient (for long-term survival)?* ***YES****/NO/Unknown*	
7.2 Sufficiency of area and quality of occupied habitat Method used	*Select one of the following methods:*	
	Area of habitat *a) Complete survey or a statistically robust estimate* ***b) Based mainly on extrapolation from a limited amount of data*** *c) Based mainly on expert opinion with very limited data* *d) Insufficient or no data available*	*Quality of habitat* *a) Complete survey or a statistically robust estimate* ***b) Based mainly on extrapolation from a limited amount of data*** *c) Based mainly on expert opinion with very limited data* *d) Insufficient or no data available*

7.3 Short-term trend Period	***2013-2024***
7.4 Short-term trend Direction	***stable*** */ increasing / decreasing / uncertain / unknown*
7.5 Short-term trend Method used	*Select one of the following methods:* *a) Complete survey or a statistically robust estimate* ***b) Based mainly on extrapolation from a limited amount of data*** *c) Based mainly on expert opinion with very limited data* *d) Insufficient or no data available*
7.6 Long-term trend Period *Optional*	***2000-2024***
7.7 Long-term trend Direction *Optional*	*stable / increasing / decreasing /* ***uncertain*** */ unknown*
7.8 Long-term trend Method used *Optional*	*Select one of the following methods:* *a) Complete survey or a statistically robust estimate* ***b) Based mainly on extrapolation from a limited amount of data*** *c) Based mainly on expert opinion with very limited data* *d) Insufficient or no data available*
7.9 Additional information *Optional*	Use of the range descriptor and range surface area calculation as proxies for habitat and habitat area are judged appropriate for this wide-ranging coastal and offshore species. The species' natural range and thus, habitat, in Irish waters is a small component of its wider North Atlantic range (Hammond *et al.*, 2008; Bjørge & Tolley, 2009; DEHLG, 2009; Wall *et al.*, 2013; Hammond *et al.*, 2017; Rogan *et al.*, 2018; Giralt Paradell *et al.*, 2024a, 2024b). The quality of habitat for Harbour Porpoise was determined by consideration of the relevant direct and indirect pressures thought to be acting on the species and/or its functional group, and its habitat within its natural environment. These pressures were evaluated in the development of the Conservation Plan for Cetaceans in Irish waters (DEHLG, 2009) and informed by more recent scientific surveillance (e.g., Cronin & Barton, 2014; Craig *et al.*, 2016; Hammond *et al.*, 2017; Kavanagh *et al.*, 2017; O'Sullivan & Manning, 2017; Rogan *et al.*, 2018; Giralt Paradell *et al.*, 2024a, 2024b), using available data concerning, *inter alia*, habitat use, population size, distribution and ecology, and threats to the species' protection (e.g., via natural/biological sources, human sectoral activities, management gaps, etc.). Harbour Porpoises may be subject to a number of local and/or regional environmental pressures throughout their range in Irish waters (DEHLG, 2009). However, based on current spatial and temporal data, not all are considered to be of sufficient impact on the species to be causing a significant deterioration in overall habitat

	quality in Ireland from a status that is sufficient for long-term survival. However, bycatch is a significant pressure acting on this species in the North-East Atlantic, which includes all of Ireland's EEZ (see OSPAR QSR M6 Assessment). Long-term trends in habitat for Harbour Porpoise remain uncertain due to insufficient accurate data for this species prior to 1999-2000. However, with improved surveillance (e.g. under the ObSERVE Programme) and numerous ongoing records of Harbour Porpoises in the last two decades, the short-term trend indicates the continued existence of sufficient quality habitat for the species.

8 Main pressures and threats

8.1 Characterisation of pressures/threats

a) Pressure	b) Timing	c) Scope	d) Influence
PG13 Bycatch and incidental killing (due to fishing and hunting activities)	Ongoing and likely to be in the future	Majority 50-90%	High
PC07 Geotechnical surveying	Ongoing and likely to be in the future	Minority <50%	Medium
PG01 Marine fish and shellfish harvesting causing reduction of species/prey populations and disturbance of species (professional)	Ongoing and likely to be in the future	Majority 50-90%	Medium
PX01 Threats and pressures from outside the EU territory	Ongoing and likely to be in the future	Majority 50-90%	Medium

e) Invasive alien species of Union concern	N/A
f) Other invasive alien species *Optional*	N/A
8.2 Methods used *Optional*	
8.3 Sources of information *Optional*	https://www.npws.ie/marine/marine-species/cetaceans https://www.npws.ie/marine/best-practice-guidelines https://www.iucnredlist.org/species/17027/247632759 https://www.gov.ie/en/publication/3bcaf-policy-statement-on-petroleum-exploration-and-production-in-ireland/ https://oar.marine.ie/handle/10793/1782 https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/
8.4 Additional information *Optional*	Harbour Porpoises may be subject to a number of local and/or regional environmental pressures and threats throughout their North Atlantic range (Hammond *et al.*, 2008) and in Irish coastal/offshore waters. In the development and preparation of the Conservation Plan for

	Cetaceans in Irish waters (DEHLG, 2009), a comprehensive review of the pressures and threats believed and/or documented to be acting on this species and/or its functional group was undertaken. The main pressures thought to be acting on this species in Irish waters are considered to involve commercial shipping-based or vessel-based activities that occur primarily on a local or regional scale and/or on a temporary or intermittent basis (e.g., impacts arising from geophysical seismic exploration; impacts from local/regional prey removal by fisheries or by-catch in fisheries, DEHLG, 2009). Based on data from 2016-2020, the estimated level of Harbour Porpoise bycatch significantly exceeded the modelled threshold/removal limit in the North-East Atlantic Assessment Unit, which includes Ireland (Taylor *et al.,* 2022). The species' natural range in Irish waters is a small component of its wider North-East Atlantic range, with movements occurring both within and outside the marine jurisdictions of many States, in which the species may be subject to a range of pressures. Since the species is known to be broadly pelagic in its ecology in the North-East Atlantic (Hammond *et al.*, 2008; Bjørge & Tolley, 2009) and current Harbour Porpoise distribution is very wide in its spatial and temporal occurrence, where a pressure may be regionally intensive, the ranking given is one of medium influence. It should be noted that Ireland has ceased the issuance of new licences for the exploration and extraction of natural gas or oil. The pressure of seismic activities in this regard is reduced. In relation to geophysical and geotechnical surveying, which tend to occur on a local or occasionally regional scale in the waters of Ireland's EEZ a robust regulatory and management regime applies in order to avoid potentially significant impacts on all species of marine mammal. This regime takes cognisance of recent scientific research and surveillance findings (e.g., Hammond *et al.*, 2017; Kavanagh *et al.*, 2017; Rogan *et al.*, 2018; Giralt Paradell *et al.*, 2024a, 2024b) and it is expected that this practice will continue into the future. Ireland's commitment to transition towards a more sustainable economy, relies in part, on the capacity of increasing the generation of energy from renewable sources. The vast extension of the Irish continental shelf provides substantial potential for the development of offshore renewable energy sites. Thus, there may be a change in pressures thought to be acting on this species in the near future (i.e., threats). However surveillance of the species and the pressures potentially acting upon it will continue, while the application of strong management measures (e.g., via the statutory/regulatory process) to avoid potentially significant impacts is also expected to continue.

9 Conservation measures	
9.1 Status of measures	*Are measures needed? **YES**/NO* *If yes, indicate the status of measures:* *a) Measures identified, but none yet taken* *b) Measures needed but cannot be identified* *c) Part of measures identified have been taken* ***d) Most/all of measures identified have been taken***
9.2 Scope of measures taken	*Fill if c) Part of measures identified have been taken or d) Most/all of measures identified have been taken (9.1) was selected:* *Do these impact:* ☐ *<50%* ☐ ***50 – 90%*** ☐ *>90%* *of the population*
9.3 Main purpose of the measures taken	*A. Indicate the main purpose(s) of measures taken:* ***a) Maintain the current range, population and/or habitat for the species*** *b) Expand the current range of the species (related to 'Range')* ***c) Increase the population size and/or improve population dynamics (improve reproduction success, reduce mortality, improve age/sex structure) (related to 'Population')*** *d) Restore the habitat of the species (related to 'Habitat for the species')*
	B. Where more than one option is selected above, indicate the main (primary) purpose (i.e. select only one option): *Maintain current state / expand range /**increase, improve population**/restore habitat*
9.4 Location of the measures taken	*Indicate the location of measures taken (indicate only one option):* *a) Only inside Natura 2000* ***b) Both inside and outside Natura 2000*** *c) Only outside Natura 2000*
9.5 Response to the measures *(when the measures starts to neutralize the pressure(s) and produce positive effects)*	*Indicate the time frame of the response to measures (with regard to the main purpose in field 9.3) (indicate only one option):* *a) Short-term response (within the current reporting period, 2019 - 2024)* ***b) Medium-term response (within the next two reporting periods, 2025-2036)*** *c) Long-term response (after 2036)*

9.6 List of main conservation measures	MC11 Manage/reduce/eliminate pollution types related to resource exploitation and energy production, (including but not limited to noise, light, thermal and soil pollution). MF07 Reduce/eliminate pollution (incl. noise, light, heat, soil pollution) from industrial, commercial, residential and recreational areas and activities. MG05 Reduce bycatch and incidental killing of non-target species. MG09 Other measures to reduce impacts from aquaculture infrastructures and operation.
9.7 Additional information *Optional*	The EC (Birds and Natural Habitats) Regulations 2011-2021 provide strict protection for all of the Irish species listed on Annex IV of the EU's Habitats Directive. It does this by prohibiting certain activities which could impact on the conservation status of those species. Those activities may only be permitted by way of a derogation. This derogation is issued under Regulation 54 of the Regulations and strict criteria must be met before such a derogation can be approved. Other guidance on Annex IV species includes Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish waters published in 2014. Ireland is developing responsible marine wildlife watching guidance for marine wildlife tour operators to support responsible interactions with marine wildlife, promoting their well-being and conservation. Ireland is part of a European flagship initiative gathering fisheries, scientists and environmental ministries and NGOs from 13 European countries, working jointly to minimise incidental bycatch in fisheries which have a high risk of marine mammal bycatch. All measures taken during the reporting period are designed to ensure the maintenance of Harbour Porpoise at a favourable conservation status in Ireland and to ensure that the conservation provisions for this species, as underpinned by Articles 6 and 12 of the Habitats Directive in particular, are robustly implemented including via national legislation (e.g., EC (Birds and Natural Habitats) Regulations 2011-2021 etc.).

10 Future prospects

10.1 Future prospects of parameters	**a) Range**	***Good*** */ Poor / Bad / Unknown*
	b) Population	*Good /* ***Poor*** */ Bad / Unknown*
	c) Habitat of the species	***Good*** */ Poor / Bad / Unknown*
10.2 Additional information *Optional*	Visual and acoustic records of Harbour Porpoise in Irish waters indicate a wide and regular occurrence of the species in coastal waters and those overlying the continental shelf and slope, and to a lesser extent in some deeper basins. Since many significant (i.e., high level) anthropogenic impacts that may affect this wide-ranging species' distribution are more localised in space and time within this extensive and diverse marine area, the	

	Future prospects for the Range and Habitat for the species are considered to be Good. A number of pressures that could act upon this species have been identified. The effect of these pressures may operate on a temporary and/or regional scale and some are likely to continue to act as pressures into the future, thereby constituting a potential threat. While the impacts on individuals or populations of Harbour Porpoise in Irish waters are not well understood, partly due to continuing uncertainty regarding its population trends and ecology within Ireland's marine area, ongoing threats as listed or identified into the future via surveillance will be managed appropriately in Ireland. However, the Reporting Guidelines recommend that future trends of parameters with mostly high or medium influence and Unfavourable-Inadequate Population assessment to be assessed as poor. Consequently, future prospects of the Population parameter are assessed as Poor. Following the Reporting Guidelines Future prospects (field 11.4) are assessed as Unfavourable Inadequate.

11 Conclusions

Assessment of conservation status at end of reporting period		
11.1 Range	***Favourable (FV)*** */ Inadequate (U1) / Bad (U2) / Unknown (XX)*	
11.2 Population	*Favourable (FV) /* ***Inadequate (U1)*** */ Bad (U2) / Unknown (XX)*	
11.3 Habitat for the species	***Favourable (FV)*** */ Inadequate (U1) / Bad (U2) / Unknown (XX)*	
11.4 Future prospects	*Favourable (FV) /* ***Inadequate (U1)*** */ Bad (U2) / Unknown (XX)*	
11.5 Overall assessment of Conservation Status	*Favourable (FV) /* ***Inadequate (U1)*** */ Bad (U2) / Unknown (XX)*	
11.6 Overall trend in Conservation Status	*Indicate the trend (qualifier) for FV, U1 and U2:* *improving / deteriorating /* ***stable*** */ unknown*	
11.7 Change and reasons for change in conservation status and conservation status trend	*Indicate whether there is a change from the previous reporting round and (if yes) the nature of that change. More than one option (b to e) can be chosen.*	
	Overall assessment of conservation status (11.5)	***Overall trend in conservation status (11.6)***
	a) no, there is no difference	***a) no, there is no difference***
	b) yes, due to genuine change	*b) yes, due to genuine change*
	c) yes, due to improved knowledge/more accurate data	*c) yes, due to improved knowledge/more accurate data*

	d) yes, due to the use of different method (including taxonomical change or use of different thresholds)	*d) yes, due to the use of different method (including taxonomical change or use of different thresholds)*
	e) yes, but nature of change is unknown	*e) yes, but nature of change is unknown*
	f) yes, due to other reasons	*f) yes, due to other reasons*
	The change is mainly due to (select only one option): *genuine change / improved knowledge or more accurate data / the use of a different method /**unknown**/ other reasons*	*The change is mainly due to (select only one option):* *genuine change / improved knowledge or more accurate data / the use of a different method /unknown/ other reasons*
11.8 Additional information *Optional*	Contemporary sightings of Harbour Porpoises indicate a wide occurrence of this species primarily through Irish coastal waters and those overlying the continental shelf and continental slope. Hence the Range and Habitat for the species are considered to be *Favourable*. While robust and long-term data on Harbour Porpoise population size and trends in Irish waters as a whole are not available, knowledge of the species' seasonal distribution and summer abundance in western European waters has improved significantly since the Directive came into force. There has also recently been some improvement in population abundance data from a large part of the Irish EEZ, yielding new estimates and associated 95% Confidence Limits based on dedicated cetacean surveillance since 2015. The current population estimate, based on the most recently available survey data, is lower than the population reported in the previous assessment (2019). While there is some uncertainty in the trajectory of North-East Atlantic populations of Harbour Porpoise, given the available estimates for a large part of Irish waters and the species' wide occurrence throughout the year, the Population parameter is considered *Unfavourable-Inadequate*. A number of pressures have been identified. While the effect of these pressures may act on a temporary and/or regional scale and some are likely to continue to act as pressures into the future, not all are considered to be of sufficient magnitude to be causing an adverse impact on populations of Harbour Porpoise in Irish waters. Ongoing threats as listed or identified into the future via surveillance will be managed appropriately. However, the estimated level of Harbour Porpoise bycatch significantly exceeded the modelled threshold/ removal limit in the North-East Atlantic Assessment Unit, which includes Ireland. The species' natural range in Irish waters is a small component of its wider North-East Atlantic range with movements occurring both within and outside the marine jurisdictions of many	

	states in which the species may be subject to a range of pressures. Considering this, the Future prospects for the species are assessed to be *Unfavourable-Inadequate*. Based on the assessments for the Range, Population, Habitat and Future prospects parameters, the overall conclusion is that the Conservation Status of Harbour Porpoise in Ireland is *Unfavourable-Inadequate*. Based on the assessments for Range, Population and Habitat parameters, the Reporting Guidelines recommend a *stable* assessment of overall trend in conservation status where prospects of two parameters are stable and one is uncertain. This overall result differs from the previous Article 17 assessments.

12 Natura 2000 (pSCIs, SCIs and SACs) coverage for Annex II species		
12.1 Population size inside the pSCIs, SCIs and SACs network *(on the biogeographical/marine level including all sites where the species is present)*	**a) Unit**	***Number of individuals***
	b) Minimum	***4,936***
	c) Maximum	***8,836***
	d) Best single value	
12.2 Type of estimate	*Best estimate / multi-year mean / **95% confidence interval** / minimum*	
12.3 Additional population size (using population unit other than reporting unit in field 6.2) *Optional*	**a) Unit**	
	b) Minimum	
	c) Maximum	
	d) Best single value	
12.4 Type of estimate *Optional*		
12.5 Population size inside the network Method used	*Select one of the following methods:* ***a) Complete survey or a statistically robust estimate,*** *b) Based mainly on extrapolation from a limited amount of data,* *c) Based mainly on expert opinion with very limited data,* *d) Insufficient or no data available*	
12.6 Short-term trend of population size within the network Direction	*Short-term trend of population size within the network over the period indicated in field 6.8:* *stable / increasing / **decreasing** / uncertain / unknown*	
12.7 Short-term trend of population size within the network Method used	*Select one of the following methods:* *a) Complete survey or a statistically robust estimate* ***b) Based mainly on extrapolation from a limited amount of data*** *c) Based mainly on expert opinion with very limited data* *d) Insufficient or no data available*	

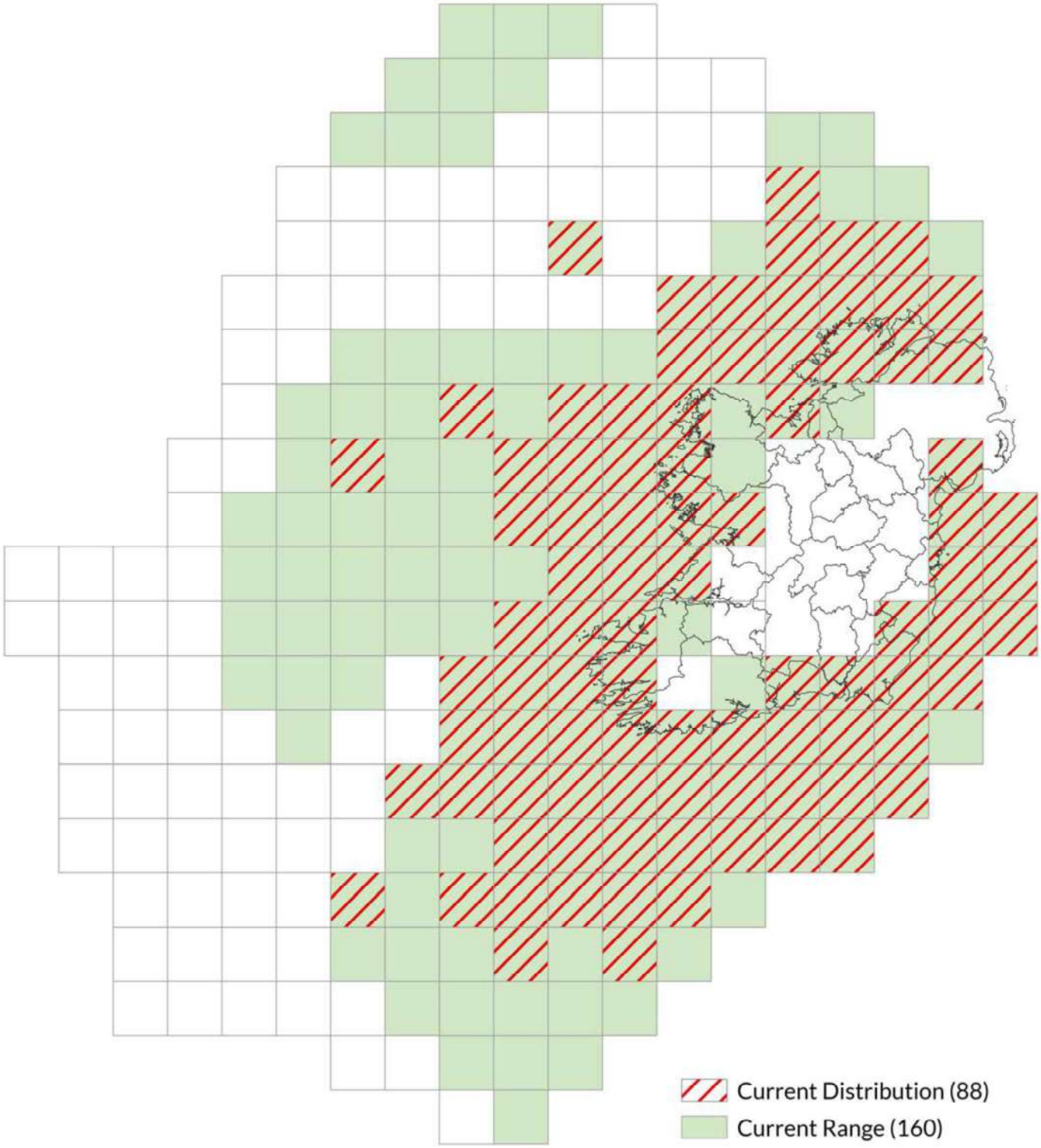
12.8 Short-term trend of habitat for the species within the network **Direction**	*Short-term trend of habitat of the species within the network over the period indicated in field 7.3:* ***stable*** */ increasing / decreasing / uncertain / unknown*
12.9 Short-term trend of habitat for the species within the network **Method used**	*Select one of the following methods:* *a) Complete survey or a statistically robust estimate* ***b) Based mainly on extrapolation from a limited amount of data*** *c) Based mainly on expert opinion with very limited data* *d) Insufficient or no data available*
12.10 Additional information *Optional*	Attributing an accurate population size estimate for such a mobile marine species whose occurrence is variable on a daily, seasonal and inter-annual basis is a challenging task, particularly when working such figures into relatively small spatial dimensions (e.g., within Ireland's network of Natura 2000 sites) within the species' broader transnational range. Evidence from monitoring SACs for Harbour Porpoise in these geographically distinct regions using visual and passive acoustic monitoring suggests an overall decrease (O'Brien & Berrow, 2020, 2022; Berrow *et al.,* 2021; Todd, 2023). The minimum and maximum population sizes given here for this highly mobile and wide-ranging small cetacean species are derived from the results of the ObSERVE Phase II Aerial project (Giralt Paradell *et al.*, 2024a) which succeeded in delivering three separate seasonal estimates of population size and associated 95% Confidence Intervals for Harbour Porpoise within a large proportion of Ireland's EEZ. Further details concerning data considerations and the method used are given in 6.7 and 6.20. In seeking to estimate and represent Harbour Porpoise population size within all SACs in Irish coastal and offshore waters, the lowest of the three abundance estimates derived from the ObSERVE Phase II Aerial line transect data is used, this being from winter 2022 and comprising the lower and upper 95% Confidence Intervals around the estimate (Giralt Paradell *et al.*, 2024a). Given the size and distribution of SACs in Irish coastal and offshore waters, it is considered that these 95% CI-based estimates of population size best capture the potential use of all these sites by Harbour Porpoise throughout the year. It should be noted that this measurement method is not precise and cannot be so, given the species' mobility, variability in occurrence and abundance, constraints on offshore surveillance, and limited knowledge of its life history and ecology in offshore waters.

13 Complementary information *N/A*

Harbour Porpoise

Phocoena phocoena (1351)

Article 17 (2019 - 2024)



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National Parks and Wildlife Service

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Appendix 9 - RFI Observation

DIRECT PLANNING APPLICATION TO AN BORD PLEANÁLA

in respect of

Arklow Bank Wind Park Phase 2 - RFI

Bord Pleanála Case Reference: OA27.319864

Submissions on Behalf of Blue Ireland Coalition CLG

Blue Ireland Coalition CLG, Garadice House, 3-4 Fairview, Dublin 3, Ireland.

JUDGMENT OF THE COURT (Fourth Chamber)

16 July 2026 (*)

(References for a preliminary ruling – Environment – Directive 92/43/EEC – Directive 2009/147/EC – Conservation of natural habitats and of wild fauna and flora – Special protection areas – Appropriate assessment of the implications of a plan or project likely to have an effect on a protected site in view of that site's conservation objectives – Screening – Conservation objectives specific to a special protection area not set)

In Joined Cases C-27/25 and C-356/25,

TWO REQUESTS for a preliminary ruling under Article 267 TFEU from the Court of Appeal (Ireland) (C-27/25) and the High Court (Ireland) (C-356/25), made by decisions of 13 December 2024 and of 11 April 2025, received at the Court on 17 January 2025 and 27 May 2025 respectively, in the proceedings

SU,

Wild Ireland Defence CLG

v

An Coimisiún Pleanála, previously known as An Bord Pleanála,

Minister for Housing, Local Government and Heritage,

Ireland,

The Attorney General,

notice party:

Knocknamona Windfarm Limited (C-27/25),

and

Paddy Massey

v

An Coimisiún Pleanála, previously known as An Bord Pleanála,

Ireland,

The Attorney General,

Minister for Housing, Local Government and Heritage,

notice party:

Curns Energy Limited (C-356/25),

THE COURT (Fourth Chamber),

composed of I. Jarukaitis, President of the Chamber, M. Condinanzi, N. Jääskinen, R. Frendo and A. Kornezov (Rapporteur), Judges,

Advocate General: J. Kokott,

Registrar: C. Strömholm, Administrator,

having regard to the written procedure and further to the hearing on 25 March 2026,

after considering the observations submitted on behalf of:

- SU and Wild Ireland Defence CLG, by J. Devlin, Senior Counsel, M. Heavey, Barrister-at-Law, and B. Harrington, Solicitor,
- Paddy Massey, by J. Devlin, Senior Counsel, M. Heavey, Barrister-at-Law, and B. Harrington, Solicitor,
- An Coimisiún Pleanála, by F. Valentine, Senior Counsel, S. Hughes, Barrister-at-Law, S. O'Connor, Barrister-at-Law, R. McDermott, A. McKenna, R. Minch, G. Murphy, A. O'Connor and M. O'Leary, Solicitors,
- the Minister for Housing, Local Government and Heritage, Ireland, the Attorney General and Ireland, by M. Browne, A. Burke, H. Ignatova and A. Joyce, acting as Agents, and by M. Gray, Senior Counsel, E. Synnott, Barrister-at-Law, and S. Keniry, Barrister-at-Law,
- Knocknamona Windfarm Limited, by N. Dunleavy, Senior Counsel, J. Fitzsimons, Senior Counsel, T. O'Sullivan, Barrister-at-Law, M. Delargy and J. Hurley, Solicitors,
- Curns Energy, by S. Dodd, Senior Counsel, C. Hughes, Barrister-at-Law, H. Gallagher, D. Nagle and G. Tiernan, Solicitors,
- the European Commission, by B. Cullen and N. Ruiz García, acting as Agents,

after hearing the Opinion of the Advocate General at the sitting on 16 April 2026,

gives the following

Judgment

1 These two requests for a preliminary ruling concern the interpretation of Article 6(3) of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (OJ 1992 L 206, p. 7; 'the Habitats Directive').

2 The two requests have been made in two sets of proceedings between, in Case C-27/25, SU, a natural person, and Wild Ireland Defence CLG, an environmental organisation, on the one hand, and An Coimisiún Pleanála, previously known as An Bord Pleanála (Planning Commission, Ireland; 'the Planning Commission'), the Minister for Housing, Local Government and Heritage (Ireland), Ireland and the Attorney General (Ireland), on the other hand, and, in Case C-356/25, Mr Paddy Massey, also a natural person, on the one hand, and the Planning Commission, Ireland, the Attorney General and the Minister for Housing, Local Government and Heritage, on the other hand, concerning the lawfulness of two decisions, adopted by the Planning Commission, granting planning permission for amendments to, or the development of, wind farms.

Legal context

European Union law

The Birds Directive

3 Article 3 of Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (OJ 2010 L 20, p. 7; 'the Birds Directive') provides, in paragraph 1 thereof, as follows:

'In the light of the requirements referred to in Article 2, Member States shall take the requisite measures to preserve, maintain or re-establish a sufficient diversity and area of habitats for all the species of birds referred to in Article 1.'

4 Article 4 of the Birds Directive provides:

'1. The species mentioned in Annex I shall be the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution.

...

Member States shall classify in particular the most suitable territories in number and size as special protection areas [("SPAs")] for the conservation of these species in the geographical sea and land area where this Directive applies.

2. Member States shall take similar measures for regularly occurring migratory species not listed in Annex I, bearing in mind their need for protection in the geographical sea and land area where this Directive applies, as regards their breeding, moulting and wintering areas and staging posts along their migration routes. To this end, Member States shall pay particular attention to the protection of wetlands and particularly to wetlands of international importance.

...

4. In respect of the protection areas referred to in paragraphs 1 and 2, Member States shall take appropriate steps to avoid pollution or deterioration of habitats or any disturbances affecting the birds, in so far as these would be significant having regard to the objectives of this Article. Outside these protection areas, Member States shall also strive to avoid pollution or deterioration of habitats.'

The Habitats Directive

5 The eighth and tenth recitals of the Habitats Directive state as follows:

'Whereas it is appropriate, in each area designated, to implement the necessary measures having regard to the conservation objectives pursued;

...

Whereas an appropriate assessment must be made of any plan or programme likely to have a significant effect on the conservation objectives of a site which has been designated or is designated in future'.

6 The first subparagraph of Article 3(1) of the Habitats Directive provides:

'A coherent European ecological network of special areas of conservation shall be set up under the title Natura 2000. This network, composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II, shall enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range.'

7 Article 4 of the Habitats Directive provides:

'1. On the basis of the criteria set out in Annex III (Stage 1) and relevant scientific information, each Member State shall propose a list of sites indicating which natural habitat

types in Annex I and which species in Annex II that are native to its territory the sites host. ...

The list shall be transmitted to the [European] Commission, within three years of the notification of this Directive, together with information on each site. ...

2. On the basis of the criteria set out in Annex III (Stage 2) ..., the Commission shall establish, in agreement with each Member State, a draft list of sites of Community importance drawn from the Member States' lists identifying those which lost one or more priority natural habitat types or priority species.

...

The list of sites selected as sites of Community importance ... shall be adopted by the Commission ...

3. The list referred to in paragraph 2 shall be established within six years of the notification of this Directive.

4. Once a site of Community importance has been adopted in accordance with the procedure laid down in paragraph 2, the Member State concerned shall designate that site as a special area of conservation [("an SAC")] as soon as possible and within six years at most, establishing priorities in the light of the importance of the sites for the maintenance or restoration, at a favourable conservation status, of a natural habitat type in Annex I or a species in Annex II and for the coherence of Natura 2000, and in the light of the threats of degradation or destruction to which those sites are exposed.

5. As soon as a site is placed on the list referred to in the third subparagraph of paragraph 2 it shall be subject to Article 6(2), (3) and (4).'

8 Article 6 of the Habitats Directive provides:

'1. For [SACs], Member States shall establish the necessary conservation measures involving, if need be, appropriate management plans specifically designed for the sites or integrated into other development plans, and appropriate statutory, administrative or contractual measures which correspond to the ecological requirements of the natural habitat types in Annex I and the species in Annex II present on the sites.

2. Member States shall take appropriate steps to avoid, in the [SACs], the deterioration of natural habitats and the habitats of species as well as disturbance of the species for which the areas have been designated, in so far as such disturbance could be significant in relation to the objectives of this Directive.

3. Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with

other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.

4. If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.

...'

9 Under Article 7 of the Habitats Directive:

'Obligations arising under Article 6(2), (3) and (4) of this Directive shall replace any obligations arising under the first sentence of Article 4(4) of [Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds (OJ 1979 L 103, p. 1)] in respect of areas classified pursuant to Article 4(1) or similarly recognised under Article 4(2) thereof, as from the date of implementation of this Directive or the date of classification or recognition by a Member State under Directive 79/409/EEC, where the latter date is later.'

Irish law

10 Section 177V(1) of the Planning and Development Act 2000, in the version applicable to the dispute in the main proceedings, provides that an appropriate assessment is to include a determination by the competent authority under Article 6(3) of the Habitats Directive as to whether or not a proposed development would adversely affect the integrity of a European site and must be carried out before consent is given for the proposed development. Section 177V(2) lists the matters which the competent authority is to take into account in carrying out an appropriate assessment, which include any information or advice obtained by or provided to the competent authority and any other relevant information. Section 177V(5) states that the competent authority is to give notice of its determination on that appropriate assessment to the applicant for consent to the proposed development, giving reasons for the determination.

The disputes in the main proceedings and the questions referred for a preliminary ruling

Case C-27/25

11 On 28 September 2022, the Planning Commission adopted a decision granting Knocknamona Windfarm Limited planning permission for a development that involved amending a wind farm, for which permission had been granted in 2016 in County Waterford (Ireland). That decision allowed the developer to increase the height both of the turbines, from 126 to 155 metres (m), and of the previously approved meteorological mast, which involved moving from a tubular tower mast of 80 m to a lattice tower mast of up to 99 m.

12 Before adopting that decision, the Planning Commission carried out an appropriate assessment of the implications of that development for five European sites identified as likely to be affected by it, including the Blackwater Callows SPA, designated as a European site under the Birds Directive, located in the counties of Cork (Ireland) and Waterford and situated 13 kilometres (km) from the wind farm concerned.

13 It is common ground that, on the date of adoption of that decision, Ireland had not yet set conservation objectives specific to that SPA.

14 Relying in particular on its inspector's report, the Planning Commission concluded that the qualifying interests of the site concerned included a number of species, including the whooper swan (*Cygnus cygnus*). As regards the other species, the Planning Commission concluded that any adverse effect on the integrity of that site could be excluded on the basis that the area covered by that project was unsuitable for any of those other species. In respect of the whooper swan, the Planning Commission did not find evidence of its presence in or close to that area and therefore concluded that the new dimensions of the mast, turbines and rotors would not have an adverse effect on the integrity of that site vis-à-vis that species. Therefore, the Planning Commission concluded that that development would not adversely affect the integrity of that area.

15 SU and Wild Ireland Defence challenged the lawfulness of the Planning Commission's decision before the High Court (Ireland). They maintain that, in the absence of conservation objectives set by Ireland specifically for the Blackwater Callows SPA, the Planning Commission could not carry out a valid appropriate assessment of the environmental implications of that development for that SPA.

16 By its decision of 28 February 2024, the High Court dismissed the proceedings brought by SU and Wild Ireland Defence. According to that court, in essence, although the setting of conservation objectives specific to the SPA concerned is, in principle, necessary in order for a valid appropriate assessment of the implications of a plan or project for the protected site to be carried out, in the present case, the assessment, which had been carried out on the basis of the general conservation objectives, was still valid, since it was apparent from the scientific data that the whooper swan was not affected by the development at issue in the

main proceedings, irrespective of what conservation objectives had specifically been set for the SPA concerned.

17 The applicants in the main proceedings brought an appeal against the decision of the High Court before the Court of Appeal (Ireland), which is the referring court in Case C-27/25. They submit that the wording of Article 6(3) of the Habitats Directive requires an appropriate assessment to be carried out of the implications of the proposed amendments for the site concerned 'in view of the site's conservation objectives', with the result that it is possible to carry out a valid appropriate assessment only where specific conservation objectives have been adopted beforehand in respect of the SPA in question. The existence of general conservation objectives is therefore insufficient.

18 In the context of those proceedings, the Planning Commission, the Minister for Housing, Local Government and Heritage, and the Advocate General, on the other hand, argue that, although it is true that the conservation objectives specific to the SPA in question must constitute a mandatory point of reference where they exist, there is no absolute preclusion on considering and carrying out an appropriate assessment of the implications of a plan or project for the site concerned in the absence of such objectives. The Habitats Directive does not preclude such an assessment from being carried out without conservation objectives specific to the SPA in question having been adopted. They argue that the main aim of Article 6(3) of the Habitats Directive is to ensure that the integrity of such sites is not adversely affected.

19 The referring court is essentially uncertain whether the Habitats Directive requires conservation objectives specific to a given SPA to have been adopted in order for a national authority, when examining an application for permission for that plan or project, to be able to carry out a valid appropriate assessment of the implications of a plan or project for the site concerned.

20 In those circumstances, the Court of Appeal decided to stay the proceedings and to refer the following question to the Court of Justice for a preliminary ruling:

'Are valid conservation objectives for [an SPA] a prerequisite to the competent authority's jurisdiction to carry out a valid appropriate assessment under Article 6(3) of [the Habitats Directive] when considering an application for a grant of development consent?'

Case C-356/25

21 On 8 January 2021, Curns Energy Limited submitted an application for development consent for a wind farm and associated infrastructure. The development is to include 17 wind turbines within two clusters – 11 of which are to be located in County Waterford and 6 of which are to be located in County Cork – an underground collector cable connection of around 3.3 km in length, a substation with a loop-in connection into the Knockraha –

Woodhouse 110 kilovolt (kV) line via two 40 m overhead lines and a lithium ion battery storage facility co-located with the substation. By order of 8 November 2023, the Planning Commission granted planning permission for the development at issue in the main proceedings. That development is located 9.9 km from the Blackwater Callows SPA.

22 As in Case C-27/25, it is not disputed that, at the date of adoption of that order, Ireland had not yet adopted conservation objectives specific to the SPA concerned.

23 Mr Massey brought an action before the High Court seeking, first, annulment of that decision and, second, declaratory relief in the form of a declaration that the screening of the environmental implications of the development at issue in the main proceedings for the Blackwater Callows SPA should have been carried out having regard to the conservation objectives and/or conservation measures specific to that area, of which, however, there were none at the time when that order was adopted.

24 That court dismissed that application for annulment. However, Mr Massey's application for declaratory relief remains pending before it.

25 The High Court is essentially uncertain whether, under the Habitats Directive, the absence of conservation objectives and/or conservation measures specific to the SPA constitutes a jurisdictional bar preventing a national authority from being able to carry out a screening of the environmental implications of the plan or project at issue for the protected site in order to determine whether it is necessary to carry out an appropriate assessment of those implications.

26 In those circumstances, the High Court decided to stay the proceedings and to refer the following question to the Court of Justice for a preliminary ruling:

'Does Article 6(3) of [the Habitats Directive] as applied to [the Birds Directive] by Article 7 of the former directive have the effect that a determination by a competent authority of a Member State as to whether or not a plan or project not directly connected with or necessary to the management of any site for the purposes of [the Birds Directive] is likely to have a significant effect on any such site, either individually or in combination with other plans or projects, must be carried out by reference to conservation objectives and/or measures established for any site concerned and/or in particular for any site which is proposed to be screened out of consideration as one unlikely to be significantly so affected?'

Procedure before the Court

27 By order of the President of the Court of 20 March 2025, the referring court's request that Case C-27/25 be determined pursuant to the expedited procedure provided for in

Article 105 of the Rules of Procedure of the Court of Justice was refused, and that case was given priority over others pursuant to Article 53(3) of the Rules of Procedure.

28 By decision of the President of the Court of 22 October 2025, Cases C-27/25 and C-356/25 were joined for the purposes of the oral part of the procedure and the judgment.

Admissibility of the request for a preliminary ruling in Case C-356/25

29 The Commission submits that the request for a preliminary ruling in Case C-356/25 is inadmissible on the ground that the referring court has already dismissed the application for annulment of the decision at issue in the main proceedings in that case. In so far as the judgment of that court dismissing that application for annulment has acquired the force of *res judicata*, the dispute in the main proceedings has, it claims, been definitively settled, with the result that the question referred in that case is not only moot, but is also devoid of pertinence for the purpose of adjudicating on the substance.

30 In the present case, that request for a preliminary ruling was made by the High Court in proceedings comprising two parts: one part consists, in essence, of an application for annulment of the decision at issue in the main proceedings, and the other part consists of an application for a declaration that the screening of the environmental implications of the development at issue in the main proceedings for the site concerned should have been carried out taking into account the conservation objectives and/or conservation measures specific to the Blackwater Callows SPA. It is clear from the order for reference that, although the first part of the dispute in the main proceedings has indeed been decided upon by the referring court, the second part nevertheless remains pending before it. That court states that the purpose of that dispute is not limited to the issue of the validity of the decision at issue in the main proceedings, but also covers the application for declaratory relief made by Mr Massey, on which it is yet to rule.

31 In those circumstances, the dispute in the main proceedings retains its purpose, in so far as Mr Massey's application for declaratory relief is still pending before the referring court.

32 The fact that the action in the main proceedings seeks a declaratory remedy does not prevent the Court from ruling on a question referred for a preliminary ruling where the action is provided for under national law and that the question meets an objective need for the purpose of settling the dispute properly brought before the referring court (judgment of 10 December 2018, *Wightman and Others*, C-621/18, EU:C:2018:999, paragraph 31 and the case-law cited).

33 That is the case in the main proceedings. First, it is not disputed that an application for declaratory relief is a type of legal action for which provision is made under Irish law.

34 Second, it should be borne in mind that, according to settled case-law, questions on the interpretation of EU law referred by a national court in the factual and legislative context which that court is responsible for defining, and the accuracy of which is not a matter for the Court to determine, enjoy a presumption of relevance. The Court may refuse to rule on a question referred for a preliminary ruling from a national court only where it is quite obvious that the interpretation of EU law sought bears no relation to the actual facts of the main action or its purpose, where the problem is hypothetical, or where the Court does not have before it the factual or legal material necessary to give a useful answer to the questions submitted to it (judgment of 13 May 2026, *Korfin and Sempiola Invest*, C-225/25, EU:C:2026:401, paragraph 21 and the case-law cited).

35 In that regard, it is clear from the order for reference that the outcome of the application for declaratory relief depends on the Court's answer to the question referred, in that, if the Court were to answer that question in the affirmative, the referring court would have to find that the screening of the environmental implications of the development at issue in the main proceedings for the Blackwater Callows SPA should have been carried out taking into account the conservation objectives and/or conservation measures specific to that area. If the answer is in the negative, that court would then have to dismiss the application for declaratory relief.

36 Therefore, it is not obvious that the interpretation of the Habitats Directive sought bears no relation to the actual facts of the main action or its purpose.

37 It follows that the request for a preliminary ruling in Case C-356/25 is admissible.

Consideration of the questions referred

38 By their respective questions, which it is appropriate to examine together, the referring courts ask, in essence, whether Article 6(3) of the Habitats Directive must be interpreted as meaning that, in the absence of conservation objectives specific to the SPA concerned, a national authority can carry out, when examining an application for consent for a plan or project, valid screening and/or a valid appropriate assessment of the implications of that plan or project for the integrity of that SPA.

39 In accordance with settled case-law, in order to interpret a provision of EU law, it is necessary to consider not only its wording, but also the context in which it occurs and the objectives pursued by the rules of which it is part (judgment of 23 April 2026, *NOI – Blagoevgrad*, C-116/25, EU:C:2026:336, paragraph 31 and the case-law cited).

40 It is also settled case-law that the determination of the meaning and scope of terms for which EU law provides no definition and in respect of which it makes no reference to the law of the Member States must be determined by reference to their usual meaning in everyday

language, while account is also taken of the context in which they occur and the purposes of the rules of which they form part (judgment of 12 February 2026, *Stichting Koskea*, C-490/24, EU:C:2026:89, paragraph 24).

41 With regard to the wording of the provision in respect of which an interpretation is sought, Article 6(3) of the Habitats Directive provides that any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, is to be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives.

42 Further, Article 6(3) of the Habitats Directive specifies that, in the light of the conclusions of the assessment of the implications of a plan or project for the site concerned and subject to the provisions of Article 6(4), the competent national authorities are to agree to the plan or project only after having ascertained that it will not adversely affect the integrity of that site and, if appropriate, after having obtained the opinion of the general public.

43 First, as regards the concept of 'appropriate assessment' within the meaning of Article 6(3) of the Habitats Directive, it must be pointed out that the provision does not define any particular method for carrying out such an assessment. Nonetheless, according to the wording of that provision, an appropriate assessment of the implications for a protected site of the plan or project must precede its approval and take into account the cumulative effects which result from the combination of that plan or project with other plans or projects in view of the site's conservation objectives (judgment of 7 September 2004, *Waddenvereniging and Vogelbeschermingsvereniging*, C-127/02, EU:C:2004:482, paragraphs 52 and 53).

44 Second, it also follows from the wording of that provision that the appropriate assessment of the implications of a plan or project for a site must be carried out 'in view of the site's conservation objectives'.

45 According to the usual meaning in everyday language of the words 'in view of', those words must be understood as requiring that the appropriate assessment be carried out taking into account the conservation objectives of the site concerned.

46 In that regard, the Court has found that it is by taking account of the conservation objectives of a protected site that it is appropriate to determine the extent of the obligation to carry out an appropriate assessment of the implications of a plan or project for that site. In addition, the Habitats Directive requires the competent national authority to catalogue and assess all aspects of that plan or project that might affect the conservation objectives of that site before granting the development consent at issue (judgment of 17 December 2020, *Commission* v *Greece*, C-849/19, EU:C:2020:1047, paragraph 51).

47 In support of that, the Court has also found that Article 6(3) and (4) of the Habitats Directive, which also applies to SPAs pursuant to Article 7 of that directive, under which Member States must carry out an *ex ante* assessment and submit for prior authorisation any plans or projects likely to have a significant effect on the sites concerned, specifies that the protected site's conservation objectives are to act as a 'mandatory reference point' for the appropriate assessments required (see, to that effect, judgment of 12 September 2024, *Elliniki Ornithologiki Etaireia and Others*, C-66/23, EU:C:2024:733, paragraph 42).

48 Additionally, the reference in Article 6(3) of the Habitats Directive to 'the site's' conservation objectives indicates that those conservation objectives must be specific to each protected site.

49 In that regard, the Court has held that those conservation objectives cannot be general and imprecise, but must, on the contrary, be specific and precise and must take into consideration the particular interests of the areas concerned, which assumes that they relate to the main types of natural habitat and species present in the SAC concerned which are of interest for the European Union (see, to that effect, judgments of 17 December 2020, *Commission* v *Greece*, C-849/19, EU:C:2020:1047, paragraphs 58 and 59, and of 21 September 2023, *Commission* v *Germany (Protection of special areas of conservation)*, C-116/22, EU:C:2023:687, paragraph 107 and the case-law cited).

50 Accordingly, it is apparent from the clear and unambiguous wording of Article 6(3) of the Habitats Directive that the appropriate assessment must be carried out based on the conservation objectives specific to the site concerned. If those objectives have not been determined, a valid appropriate assessment cannot be carried out, with the result that conservation objectives cannot be regarded as optional or as having to be taken into account only where they exist.

51 That interpretation is supported by the legislative context of Article 6(3) of the Habitats Directive.

52 First, according to the eighth recital of the Habitats Directive, it is appropriate, in each area designated, to implement the necessary measures having regard to the conservation objectives pursued. The tenth recital of that directive states that an appropriate assessment must be made of any plan or programme likely to have a significant impact on the conservation objectives of a site which has been designated or is to be designated in the future. As the Court has held previously, it is clear from the first sentence of Article 6(3) of the Habitats Directive in conjunction with the tenth recital thereof that the significant nature of the implications for a site of a plan or project not directly connected with or necessary to the management of the site is to be assessed as against the site's conservation objectives. Furthermore, where a plan or project is likely to undermine those objectives, it must be considered likely to have a significant effect on that site (see, to that effect, judgment of

7 September 2004, *Waddenvereniging and Vogelbeschermingsvereniging*, C-127/02, EU:C:2004:482, paragraphs 46 and 49).

53 Having regard to the precautionary principle, in particular, such a risk is deemed to be present where it cannot be ruled out, having regard to the best scientific knowledge in the field, that the plan or project at issue might affect the conservation objectives for the protected site. The assessment of that risk must be made in the light, in particular, of the characteristics and specific environmental conditions of that site (judgment of 15 June 2023, *Eco Advocacy*, C-721/21, EU:C:2023:477, paragraph 37 and the case-law cited).

54 It follows that the requirement to carry out the appropriate assessment required in view of the conservation objectives of the protected site is not purely formal. That requirement is in fact inherent in the very nature of such an assessment, the purpose of which is precisely to determine whether the plan or project concerned is likely adversely to affect the integrity of that site, which can be assessed only in the light of the conservation objectives specific to that site.

55 In that regard, the Court has found that the assessment to be carried out under Article 6(3) of the Habitats Directive may not have lacunae and must contain complete, precise and definitive findings and conclusions capable of removing all reasonable scientific doubt as to the effects of the proposed works that are envisaged on the protected site concerned (judgment of 15 June 2023, *Eco Advocacy*, C-721/21, EU:C:2023:477, paragraph 39 and the case-law cited). Therefore, where specific conservation objectives have not been set prior to the completion of the requisite appropriate assessment, it cannot be found that such an appropriate assessment satisfies those requirements that the findings and conclusions be complete, precise and definitive.

56 Second, the Court has held that the obligations relating to the management of SPAs provided for by Article 4 of the Birds Directive, read in the light of Article 6 of the Habitats Directive, involve the Member States setting conservation objectives for those areas. The Court has found that the legal regime governing an SPA must include such conservation objectives (see, to that effect, judgment of 12 September 2024, *Elliniki Ornithologiki Etaireia and Others*, C-66/23, EU:C:2024:733, paragraph 46).

57 The Court has also found that Article 4(1) and (2) of the Birds Directive and Article 6(2) to (4) of the Habitats Directive must be interpreted as requiring Member States to establish, for each SPA, individual conservation objectives and conservation measures for all protected species and their habitat. In doing so, Member States are responsible for defining priorities according to the significance of those measures for achieving conservation objectives in respect of all those species (judgment of 12 September 2024, *Elliniki Ornithologiki Etaireia and Others*, C-66/23, EU:C:2024:733, paragraph 59).

58 In that regard, Article 4(4) of the Habitats Directive requires the competent authorities of the Member State concerned, when designating the SAC, to establish priorities in the light of the importance of the sites for the maintenance or restoration, at a favourable conservation status, of a certain natural habitat type or a certain species as well as for the coherence of the Natura 2000 network, and according to the threats of degradation or destruction to those sites. Establishing those priorities implies that those conservation objectives must necessarily have been set beforehand (judgment of 17 December 2020, *Commission* v *Greece*, C-849/19, EU:C:2020:1047, paragraph 46).

59 Consequently, the determination of those conservation objectives is a necessary prerequisite for the establishment of conservation priorities and measures (judgment of 29 June 2023, *Commission* v *Ireland (Protection of special areas of conservation)*, C-444/21, EU:C:2023:524, paragraph 156 and the case-law cited).

60 It follows from the foregoing that the conservation objectives, which are to be established beforehand and are specific to each protected site, set the framework both for defining the conservation measures applicable to a protected site and for defining priorities as regards the protection of species and of that site, and how the appropriate assessment of the implications for such a site of plans and projects is to be conducted.

61 Accordingly, determining those conservation objectives constitutes a preliminary stage that is essential for the implementation of the assessment procedure provided for in Article 6(3) of the Habitats Directive.

62 That interpretation is not called into question by the fact, relied on by Ireland, that, under Article 4(4) of that directive, Member States have a period of six years within which to designate SACs.

63 It is true that the process for designating SACs takes place in three stages provided for in Article 4 of the Habitats Directive: the proposal by each Member State of a list of sites, the establishment by the Commission of a list of sites of Community importance, and then the formal designation of those sites as SACs within a period of six years at most, establishing the necessary conservation priorities and measures (see, to that effect, judgment of 12 June 2019, *CFE*, C-43/18, EU:C:2019:483, paragraph 37).

64 However, the Birds Directive, which is applicable to the SPA at issue in the main proceedings, does not contain any equivalent provision laying down such a period for SPAs. The rules for designating SACs and SPAs respectively are structurally distinct, notwithstanding the fact that they pursue common objectives within the Natura 2000 network. Therefore, by virtue of the reference made in Article 7 of the Habitats Directive, the obligations arising under Article 6(2), (3) and (4) of that directive are to replace any

obligations arising under Article 4(4) of the Birds Directive and apply to SPAs as soon as they are classified as such by the Member States.

65 In any event, it is apparent from the documents before the Court that Blackwater Callows was designated as an SPA within the meaning of the Birds Directive in 2010. It is common ground that, on the date on which the decisions at issue in the main proceedings were adopted, in 2022 and 2023 respectively, Ireland had not adopted conservation objectives specific to that area.

66 In that regard, it should be recalled that the failure of a Member State to adopt specific and precise conservation objectives for sites coming within the Natura 2000 network constitutes a failure to fulfil its obligations under Article 4(4) of the Habitats Directive (judgment of 29 June 2023, *Commission* v *Ireland (Protection of special areas of conservation)*, C-444/21, EU:C:2023:524, paragraph 158 and the case-law cited). As is apparent from paragraph 64 of the present judgment, those obligations also apply to SPAs as soon as they are classified as such by the Member States.

67 The interpretation of Article 6(3) of the Habitats Directive set out in paragraphs 60 and 61 of the present judgment is also borne out by the objectives pursued by that directive.

68 As is apparent from the first subparagraph of Article 3(1) of the Habitats Directive, the very structure of the Natura 2000 network involves each site performing a specific function there, with the result that it contributes to the overall coherence of that network and, therefore, to the achievement of the general objective of ensuring a favourable conservation status for all the species and habitat types listed in Annexes I and II to the Habitats Directive.

69 That general objective is given concrete expression vis-à-vis protected sites through the establishment of conservation objectives defining the status to be achieved for those species and habitat types within the sites concerned. In that regard, the Court has underscored the importance of preserving the sites concerned at a favourable conservation status, which entails the lasting preservation of the constitutive characteristics of the site concerned that are connected to the presence of a natural habitat type or species whose preservation was the objective justifying the designation of that site in the list of sites of Community importance, in accordance with that directive (see, to that effect, judgment of 24 June 2021, *Commission* v *Spain (Deterioration of the Doñana natural area)*, C-559/19, EU:C:2021:512, paragraph 166 and the case-law cited).

70 Accordingly, the defining of the conservation measures applicable to a protected site and the defining of priorities as regards the protection of protected species and sites, and how the appropriate assessment of the implications of plans and projects is to be conducted for

such a site are the specific actions and mechanisms to be put in place with the aim of attaining the conservation objectives set for the site concerned.

71 The specificity and precision of the conservation objectives set by the Member State concerned therefore make it possible to verify whether the conservation measures based on those objectives are appropriate for attaining the desired conservation status of the site in question (see, to that effect, judgment of 21 September 2023, *Commission* v *Germany (Protection of special areas of conservation)*, C-116/22, EU:C:2023:687, paragraphs 115 and 116). The same applies to the conduct of the appropriate assessment of the implications of plans and projects for a protected site.

72 In the absence of conservation objectives that have been established beforehand and are specific to the site concerned, the appropriate assessment which the national authorities must carry out is necessarily based on an insufficiently precise and complete basis, as has been noted in paragraph 55 of the present judgment, which has the effect of increasing the risk that plans or projects not directly connected with or necessary to the management of that site, but adversely affecting its integrity, may be authorised by those national authorities, thereby causing significant, or even irreparable, ecological damage to that site.

73 The absence of those objectives would, moreover, deprive the appropriate assessment procedure of the foreseeability and legal certainty that are necessary for it to be implemented in conditions appropriate to ensuring that the objectives pursued by the Habitats and Birds Directives are attained. In that regard, the Court notes that the obligations on Member States under Article 6 of the Habitats Directive must be implemented effectively and by complete, clear and precise measures (judgment of 12 September 2024, *Elliniki Ornithologiki Etaireia and Others*, C-66/23, EU:C:2024:733, paragraph 56 and the case-law cited).

74 Therefore, an appropriate assessment of the implications of a plan or project for a protected site conducted without the conservation objectives specific to that site having been adopted beforehand risks compromising the objectives pursued by Article 6(3) of the Habitats Directive and, ultimately, the objectives of that directive itself.

75 It follows from all the foregoing considerations that the prior adoption, by the competent national authorities, of conservation objectives specific to the site concerned is a condition that must be satisfied in order for the appropriate assessment required under Article 6(3) of the Habitats Directive to be lawful.

76 As regards the stage involving the screening of the environmental impact of the plan or project at issue on the protected site, which is the subject of the question referred for a preliminary ruling in Case C-356/25, the Court notes that that stage is a preliminary stage intended to determine whether it is necessary to carry out, subsequently, an appropriate

assessment of the implications of that plan or project for the site concerned (see, to that effect, judgment of 12 April 2018, *People Over Wind and Sweetman*, C-323/17, EU:C:2018:244, paragraph 40).

77 In that regard, Article 6(3) of the Habitats Directive sets out clearly that the obligation to carry out such an assessment is dependent on both of the following conditions being met: the plan or project in question must not be connected with or necessary to the management of the site concerned and it must be likely to have a significant effect on the site (judgment of 12 April 2018, *People Over Wind and Sweetman*, C-323/17, EU:C:2018:244, paragraph 32).

78 The screening stage, as a preliminary step to determine whether it is necessary to carry out an appropriate assessment, is specifically intended to determine whether those conditions are satisfied.

79 That screening stage does not involve carrying out an analysis as full and precise as the analysis which must be carried out in the context of the appropriate assessment of the implications of a plan or project for the site concerned. The Court has held that the analysis of measures capable of avoiding or reducing any significant effects on the site concerned must be carried out not at the screening stage, but at the appropriate assessment stage. According to the Court, taking account of such measures at that screening stage would be liable to compromise the practical effect of the Habitats Directive generally and the appropriate assessment in particular, as the latter stage would be deprived of its purpose and there would be a risk of circumvention of that stage, which constitutes, however, an essential safeguard provided for by the directive (see, to that effect, judgment of 15 June 2023, *Eco Advocacy*, C-721/21, EU:C:2023:477, paragraphs 46 and 47 and the case-law cited).

80 As regards the first of the conditions referred to in paragraph 77 of the present judgment, the issue of whether the plan or project at issue is directly connected with or necessary to the management of the site concerned clearly relates to the characteristics of that plan or project considered in itself. It follows that the adoption of conservation objectives specific to the protected site cannot be regarded as indispensable in that regard.

81 As regards the second of those conditions, it involves, inter alia, cataloguing the protected sites which might be affected by the plan or project in question, taking account of the potential effects of that plan or project. It may be possible to carry out such cataloguing without it being necessary to take into account the conservation objectives specific to each of the protected sites. That may be the case where the delimitation of the geographical area which the plan or project is likely to affect makes it possible to rule out – with the certainty required in accordance with the precautionary principle, on the basis of objective criteria, such as the distance between that plan or project and the protected sites and the existence

or absence of plausible impact pathways – any risk of certain protected sites being affected, irrespective of the conservation objectives specific to those sites.

82 By contrast, as regards protected sites within the geographical area likely to be affected by that plan or project, the assessment of the probability or risk that that plan or project will have a significant effect on those sites cannot be carried out without taking account of the conservation objectives specific to those sites. The Court notes in that regard that, as is apparent from paragraphs 76 to 79 of the present judgment, that assessment does not involve carrying out as complete and precise an analysis of the implications of the plan or project concerned for the protected site as the appropriate assessment itself, but rather an assessment of whether, taking account of the conservation objectives specific to that site, the probability or risk that that plan or project will have a significant effect on it may or may not be ruled out.

83 In the light of the foregoing, the Court holds that, in the context of the screening phase, it may be possible to delimit the geographical area likely to be affected by a plan or project without it being necessary to take into account the conservation objectives specific to each of the protected sites. By contrast, the assessment of the probability or risk of such a plan or project having a significant effect on a protected site within that geographical area cannot be carried out without taking account of the conservation objectives specific to that site.

84 In the light of all the foregoing considerations, the answer to the questions referred is that Article 6(3) of the Habitats Directive must be interpreted as meaning that, where conservation objectives specific to the SPA concerned have not been adopted beforehand, a national authority cannot carry out a valid appropriate assessment of the implications of a plan or project for the integrity of that area, in the context of the examination of an application for consent for that plan or project. In the context of the screening phase, it may be possible to delimit the geographical area likely to be affected by a plan or project without it being necessary to take into account the conservation objectives specific to each of the protected sites. By contrast, the assessment of the probability or risk of such a plan or project having a significant effect on a protected site within that geographical area cannot be carried out without taking account of the conservation objectives specific to that site.

Limitation of the temporal effects of the present judgment

85 At the hearing, Ireland requested the Court to limit the temporal effects of the present judgment.

86 In that regard, it should be recalled that the interpretation which, in the exercise of the jurisdiction conferred on it by Article 267 TFEU, the Court gives to rules of EU law clarifies and defines the meaning and scope of those rules as they must be or ought to have been understood and applied from the time of their entry into force. It is only exceptionally that

the Court may, in application of the general principle of legal certainty inherent in the EU legal order, be moved to restrict for any person concerned the opportunity of relying on a provision which it has interpreted with a view to calling into question legal relationships established in good faith. Two essential criteria must be fulfilled before such a limitation can be imposed, namely that those concerned should have acted in good faith and that there should be a risk of serious difficulties, with those criteria being cumulative (judgment of 19 March 2026, *DB InfraGO and DB RegioNetz Infrastruktur*, C-770/24, EU:C:2026:218, paragraph 61 and the case-law cited).

87 Accordingly, the Court has taken that step only in quite specific circumstances, notably where there was a risk of serious economic repercussions owing in particular to the large number of legal relationships entered into in good faith on the basis of rules considered to be validly in force and where it appeared that individuals and national authorities had been led to adopt practices which did not comply with EU law by reason of objective, significant uncertainty regarding the implications of provisions of EU law (judgment of 19 March 2026, *DB InfraGO and DB RegioNetz Infrastruktur*, C-770/24, EU:C:2026:218, paragraph 62 and the case-law cited).

88 In the present case, it does not appear that Ireland has demonstrated a risk of serious difficulties. On the contrary, given that that Member State ultimately adopted, in 2024, conservation objectives specific to all SPAs located in its territory and that, in accordance with the principle of legal certainty, EU law does not require that administrative bodies be placed under an obligation, in principle, to reopen an administrative decision which has become final upon expiry of reasonable periods for legal remedies or by the exhaustion of remedies (judgment of 19 March 2026, *DB InfraGO and DB RegioNetz Infrastruktur*, C-770/24, EU:C:2026:218, paragraph 65 and the case-law cited), such a risk appears to have been ruled out.

89 Since the second criterion referred to in paragraph 86 above is not satisfied, it is not necessary to ascertain whether the criterion relating to the good faith of those concerned is satisfied.

90 It follows from the foregoing that it is not appropriate to limit the temporal effects of the present judgment.

Costs

91 Since these proceedings are, for the parties to the main proceedings, a step in the action pending before the referring court, the decision on costs is a matter for that court. Costs incurred in submitting observations to the Court, other than the costs of those parties, are not recoverable.

On those grounds, the Court (Fourth Chamber) hereby rules:

Article 6(3) of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

must be interpreted as meaning that where conservation objectives specific to the special protection area concerned have not been adopted beforehand, a national authority cannot carry out a valid appropriate assessment of the implications of a plan or project for the integrity of that area, in the context of the examination of an application for consent for that plan or project. In the context of the screening phase, it may be possible to delimit the geographical area likely to be affected by a plan or project without it being necessary to take into account the conservation objectives specific to each of the protected sites. By contrast, the assessment of the probability or risk of such a plan or project having a significant effect on a protected site within that geographical area cannot be carried out without taking account of the conservation objectives specific to that site.

Jarukaitis Condinanzi Jääskinen

Frendo Kornezov

Delivered in open court in Luxembourg on 16 July 2026.

A. Calot Escobar I. Jarukaitis

Registrar President of the Chamber

* Language of the case: English.

From: Niall Feery (Housing)
Sent: Wednesday 7 June 2023 15:11
To: anna.farley@ceaenvironmental.co.uk
Subject: Amended Licence Under EU Regulation 54
Attachments: DER-CETACEANS-2023-31-Mac Lir Offshore Wind Farm (Amended 06.06.2023).pdf

Hello Anna,

I am emailing in relation to the issuing of a Reg. 54 Derogation Licence (DER-CETACEAN-2023-31) issued to Mac Lir Offshore Wind Ltd in connection with investigating the suitability of the site for a wind farm development located off the coast of Co. Wexford, Wicklow and Dublin. I am emailing to inform you that the NPWS has revoked this licence effective immediately.

The Wildlife Licencing Unit of the NPWS has recently adopted a new policy for all derogation licences issued under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011. To bring these licences in line with our reporting requirements to the EU, Reg. 54 derogations will now have a maximum licence period of one calendar year i.e. licences can only be issued to cover activities within the period January 1st – December 31st of a given year. We are required under EU law to report on licences on a yearly basis. If works are expected to run beyond that timeframe an applicant may apply for an extension/renewal of their licence closer to the ending period of the existing one.

Please see attached an amended licence to reflect this policy change. In order to renew this licence for the overall work period (ending 2028) Mac Lir Offshore Wind Ltd will have to reapply annually and submit a report detailing progress of works and the status of mitigation implementation. Should you wish to discuss the matter further or have any questions please don't hesitate to get in touch.

Regards

Niall Feery
Wildlife Licencing Unit
An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage
An tSeirbhis Páirceanna Náisiúnta agus Fiadhúlra
National Parks and Wildlife Service
90 Sráid an Rí Thuaidh, Margadh na Feirme, Baile Átha Cliath 7, D07 N7CV
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