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1 INTRODUCTION

1.1 Background

Recent initiatives to promote the exploitation of the renewable energy resources of the Western Isles have generated a high level of interest, both locally and nationally. Commissioned by the Scottish Executive in conjunction with the UK Department for Trade and Industry, Comhairle Nan Eilean Siar and Western Isles Enterprise, this study investigates the available resource on and around the Western Isles, and scopes planning-related considerations, for three renewable energy technologies – wind (on- and offshore), wave and tidal stream energy.

The intention is to build upon the results of a recent Scotland-wide assessment, “Scotland’s Renewable Energy Resource 2001” [1], drawing on, as far as possible, local resource data and information on the nature of some key activities and interests in the area. In so doing, this “higher resolution” study should aid in identifying opportunities for development.

The objectives of the study are twofold:

- To use the resource modelling undertaken previously in the Scotland-wide study [1], to “zoom in” on the Western Isles resource with a view to more closely identifying specific potential.
- To make use of local consultation, to gain an understanding of the practicalities of renewable energy deployment throughout the islands. The latter is structured around three known existing interests in the Western Isles – fishing, military activities and the environment.

Technologies were chosen because of their anticipated importance to the Western Isles. Wind – onshore and offshore – and offshore wave energy are known to represent a sizeable potential resource in the Western Isles. Less is known about tidal energy in the area, but there is a strong interest in further study of this resource. A brief assessment of shoreline wave energy potential was also included.

In a study such as this, more detail is always helpful, but inevitably a line must be drawn. Research has been undertaken in order that the following aims are met:

- Prospective renewable energy developers benefit from feasibility-level information on the resource and planning considerations.
- Scottish Executive and local agencies can better judge the practicalities of renewable energy development in the Western Isles, which in turn should help to inform future policy for the area.

The study findings should also be of use to a wide range of other interested parties.

Garrad Hassan and Partners (GH) were contracted to lead the study. Specialist input was provided by Ocean Power Delivery (OPD), Marine Current Turbines (MCT), Wavegen and Spaven Consulting.

1.2 Other activities

There are a number of renewable-energy related activities in the Western Isles, with a marked increase over the last year. These include, but are not limited to, the British Energy/AMEC proposal for an onshore wind farm on Lewis, and government funding to Wavegen for testing of prototype wave energy machines.
While this present study is relevant to these activities, it is written without any further comment on specific projects.

Grid-related issues were also specifically excluded from the remit for the present study, which are the subject of separate scrutiny. A DTI-commissioned report on the costs for undersea cable connections from North West Scotland to centres of high electricity demand has already been published [2]. Further government consideration of strategic grid upgrades is ongoing. Suffice to say, significant grid upgrade in, and (assuming present levels of demand), away from, the Western Isles, is a pre-requisite for large-scale exploitation of the resources considered in this report.

1.3 Report structure

The report is structured in three separate parts as follows:

**Part I: Resource Investigations**

Methods employed, and results, for:

- Resource analysis for onshore and offshore wind, and offshore wave energy
- Resource-based locational investigations for tidal stream and coastline wave energy

**Part II: Development Considerations**

Outcomes of research and consultation on the following activities and interests:

- Fishing
- Civil aviation and military
- Environment

**Executive Summary**

Key findings from Parts I and II, and additional steps to take forward study findings.

1.4 Part II

This report is Part II, “Development Considerations.”

Part II is concerned with investigation of potential constraints to development. This was considered especially helpful for the Western Isles, given its perceived high incidence of environmental interests. The previous Scotland-wide resource assessment quantified the resource under a number of scenarios, all of which removed national, European and international environmental designations from the area available for development. The starting premise in this present exercise was that no area should be automatically excluded from consideration for development, and thus that it would be instructive to investigate the specific interests present in the Western Isles.

The remainder of this report is structured as follows:

- Section 2: environmental interests
- Section 3: military and civil aviation interests
- Section 4: fishing interests
- Section 5: conclusions
GH has authored all the sections but would like to acknowledge the kind help and assistance of:

- Scottish Natural Heritage, David McLennan
- Ecological Consultant, Tom Dargie
- QinetiQ at the Hebrides Range, Murdo MacDonald, Bob Cross
- Spaven Consulting (contracted to GH for assistance on aeronautical interests)
- Western Isles Fisherman’s Association, Duncan McInnes
- Comhairle Nan Eilean Siar, Keith Bray, Alsastair Banks
2 ENVIRONMENTAL INTERESTS

Environmental interests are wide-ranging and sometimes difficult to define. The normal planning process seeks to ensure that developments are undertaken with due care. Statutory agencies have a formal role in this, acting as an authority on specific interests. Scottish Natural Heritage (SNH) is the statutory agency charged with protection of natural heritage interests, and it is these interests which are considered in the remainder of this section (the Scottish Environmental Protection Agency – SEPA – is responsible for controlling emissions to the environment, but this is rarely an issue for the developments under consideration here).

Legislative protection of the natural heritage is afforded at both the national and European level, generally through specification, or “listing”, of important habitats, species, landscapes and geological formations. International agreements also recognise interests of world-wide significance (e.g. St Kilda). The most familiar form of protection is through designated areas – delineated areas within which cited interests reside. Certain listed species are also afforded a certain level of protection if and when they are encountered outwith designated areas.

Around 65% of the land area of the Western Isles is designated for national or European environmental or cultural interests (the latter makes up a fraction of the total area covered). The only Scottish local authorities exceeding this percentage are those containing green belt designations. Listed species and habitats are also known to occur outwith these areas, (as they do throughout Scotland).

Development proposed within designated areas is generally considered to be more likely to meet with resistance on environmental grounds, but the key criterion is the integrity of the interests which the designation seeks to protect. Certain habitats or species may be more or less at risk depending on the nature of development proposed. Given the extent of existing designations, other protected interests and the possibility of future designations (particularly offshore), it is necessary to consider the prospect of renewable energy development co-existing with the natural heritage of the islands.

Table 2.1 describes the main categories of conservation interests present in the Western Isles. It is not an exhaustive list, but is a useful breakdown when considering renewable energy developments for the area as a whole.

<table>
<thead>
<tr>
<th>Conservation Interest</th>
<th>Occurrence</th>
<th>Short description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanket bog</td>
<td>Lewis, centre of the Uists, parts of Harris</td>
<td>Oceanic blanket bog.</td>
</tr>
<tr>
<td>Peat-dwelling birds</td>
<td>Lewis, centre of the Uists, parts of Harris</td>
<td>Divers: black and red-throated divers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Waders: golden plover, dunlin, greenshank</td>
</tr>
<tr>
<td>Machair</td>
<td>West coast of Uist, Benbecula</td>
<td>Raptors: golden eagle, merlin</td>
</tr>
<tr>
<td>Machair and croftland-dwelling birds</td>
<td>West coast and inland of Uists, Benbecula</td>
<td>System of sand dunes and grassland</td>
</tr>
<tr>
<td>Sea birds</td>
<td>Sea cliffs, foraging at sea, on-land tern nests</td>
<td>Geese, corncrakes</td>
</tr>
<tr>
<td>Cetaceans</td>
<td>West coast, especially continental shelf</td>
<td>Dolphins, seals, whales</td>
</tr>
<tr>
<td>Landscape</td>
<td>Subjective, but NSA designations an indication</td>
<td>Harris: mountains</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Uists: machair and croftland</td>
</tr>
</tbody>
</table>

Table 2.1 Categories of conservation interests in the Western Isles
The landscape character assessment for the Western Isles [3] is also a useful guide to the extent of onshore habitats (and associated flora and fauna). Figure 2.1 shows the different landscape character categories, while Table 2.2 lists the percentage area (including inland lochs) taken up by each category, and key conservation interests associated with the different categories.

Figure 2.1 Western Isles Landscape Character Assessment
### Landscape character and conservation interests

<table>
<thead>
<tr>
<th>Landscape character</th>
<th>Percentage (%)</th>
<th>Conservation interests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crofting 1-4 &amp; Uist Farming</td>
<td>11</td>
<td>Geese, corncrake</td>
</tr>
<tr>
<td>Machair</td>
<td>5</td>
<td>Geese, corncrake, machair</td>
</tr>
<tr>
<td>Boggy Moorland</td>
<td>37</td>
<td>Active blanket bog, divers, waders, raptors</td>
</tr>
<tr>
<td>Rocky Moorland</td>
<td>18</td>
<td>Active blanket bog, divers, waders, raptors</td>
</tr>
<tr>
<td>Knock and Lochan &amp; Rock and Lochan</td>
<td>4</td>
<td>None specific</td>
</tr>
<tr>
<td>Mountain Massif 1&amp;2</td>
<td>25</td>
<td>Landscape, raptors</td>
</tr>
</tbody>
</table>

**Table 2.2 Landscape character and conservation interests**

Key conservation interests are described in turn below.

#### 2.1 Blanket Bog Habitat

There are extensive areas of designated and non-designated active blanket bog throughout the Western Isles. Areas of blanket bog can be roughly subdivided into relatively flat expanses of deep bog – the “boggy moorland” of the landscape character assessment, or smaller patches of bog interspersed with rocky outcrops – the “rocky moorland”. Designated areas generally fall in the former subdivision, which have been chosen for their integrity, extent and quality. Drainage characteristics, pH and heath cover maintain the conditions required for the “active” status (i.e. formation of blanket bog is ongoing). Overgrazing and burning can degrade blanket bog by allowing moisture loss. Peat cutting simply removes areas of bog and can degrade adjacent remaining areas. Incentive-led schemes encourage a reduction of these pressures by land users, and are considered by SNH to be successful in doing so. Commercial forestry planting is also detrimental to blanket bog, but there has been very little of this in the Western Isles.

Figure 2.2 below shows the main areas in the Western Isles designated for blanket bog habitat, namely the Lewis Peatlands, Mointeach Seadabhaigh and North Harris candidate SACs. Areas of priority habitat blanket bog have also been identified by the Joint Nature Conservation Council [4]: areas identified, which may include areas of degraded bog, are all of Lewis and Harris, and central North Uist.
Figure 2.2 Areas designated for blanket bog interest

Figure 2.3 and Figure 2.4 show examples of boggy and rocky moorland respectively.

Figure 2.3 Boggy moorland, Lewis peatlands, North Lewis
Where wind farms are sited away from centres of population in Scotland, there is a good chance that peat will be encountered and thus there is some experience of constructing wind farms on peat substrate. In many places it is possible to avoid areas of deep blanket bog altogether by careful routing of roads and turbine siting. Where blanket bog is affected, mitigation measures such as use of floating roads and peat reinstatement (turffing and reseeding) can minimise effects and/or be used to improve areas of previously degraded peat, by way of compensation. A combination of these methods were employed by National Wind Power at the Novar wind farm [5], which is the subject of an ongoing monitoring programme. Similar methods are more recently underway or planned at a number of other wind farms. However, remediation at Novar was with a view to minimising visual impact, and there are currently no wind farms on areas protected for active blanket bog.

There is very little experience from which to draw in informing on the long-term effects of wind farm development on, in particular, areas of “pristine” blanket bog such as that covered by designations in the Western Isles. Nonetheless, inevitably, where avoidance through siting is not possible, there will be some loss and degradation of habitat at least immediately underneath and in close proximity to the turbines and access roads (representing a small percentage of the area occupied by the wind farm). Other possible effects include altered hydrology, erosion from run-off and altered chemistry (concrete turbine bases are alkali and could over the longer-term react with acidic peat to produce salts) [6].

SNH’s advice to developers is to first of all avoid areas of pristine habitat, which in the Western Isles means being steered towards the more rocky moorland areas and siting on areas of already-degraded peat. Where this is not possible, the emphasis will need to be on mitigation and compensatory improvement elsewhere. In the latter case however, SNH advise that it is obliged under the Habitats Directive to, first and foremost, protect the existing designated interests – that is, consideration of compensatory improvement elsewhere would not be relevant in reaching a decision on the existing interests.
2.2 Birds: Blanket bog habitat

A number of important (at the European and international level) bird species reside seasonally or all-year round on blanket bog, reflected in SPA designations coinciding with active blanket bog on the Lewis peatlands and elsewhere. These include breeding red and black-throated divers, waders – golden plover, dunlin and greenshank and raptors – golden eagle and merlin. Divers breed on small lochans and feed in the sea, moving between the two on well-used flight lines. Waders breed and feed in the locality. Raptors do not move about to the same extent as the waders and divers. Knowledge of behaviour patterns is patchy and little is known about their likely response to wind farm development. Monitoring programmes are ongoing at a number of wind farms.

Previous studies (not just on moorland birds) suggest that collision risk is unlikely to be a concern, unless large number of birds regularly pass through the wind farm on migratory routes or foraging expeditions. Displacement of moorland waders and divers has been measured, up to 800 m range, while other studies have found no significant displacement [7].

Generally, it can be difficult to separate wind farm-induced effects from other factors such as temporary human disturbance and ongoing habitat loss. Mitigation measures are often precautionary where likely effects are not known.

If moorland birds were displaced in the Western Isles, SNH consider there is little room for establishment elsewhere, due to saturation of possible alternative locations. If a reduction in the local population resulted, consideration would need to focus on any degradation of protected interests and specifically, if this was significant.

Key areas designated for moorland birds are shown in Figure 2.5, which co-incide and (in the case of the Lewis Peatlands), encompass, two of the blanket bog designations – Mointeach Scadabhaig and the Lewis Peatlands. Some species will occur elsewhere, such as golden eagle and dunlin.

![Figure 2.5 Moorland bird designated areas](image-url)
2.3 Machair

Machair occurs where sand is blown inland from coastal sand dunes on to grass- and peatlands. Species richness in the agricultural components of machair is maintained by historic seasonal grazing patterns. The machair “system” comprises the combination of these different features.

Machair is relatively rare, occurring only in the Western Isles and parts of Ireland. Designated machair takes up only a small part of the Western Isles, and land management practices are long-established and sustained through paid management incentives. Machair areas tend to merge into the crofting in-bye land which is more extensive and less likely to be subject to natural heritage designations. In-bye land is often more intensively managed and subject to individual crofters tenure arrangements. An example of in-bye land is shown in Figure 2.6 below.

There is no experience of construction of wind farms on machair. It will be important to maintain the sand-blow link between the dunes and grasslands, drainage properties and agricultural practices (grazing normally continues unaffected within wind farm boundaries).

Areas designated for machair habitat are shown in Figure 2.7, namely the Monach Islands, and North and South Uist Machair candidate SACs. If undesignated machair is included, machair habitat is estimated [4] to extend down the west coast of Lewis and Harris, parts of the East coast (north of Stornoway), and much of Benbecula, the Uists, Barra and the southernmost islands.

![Figure 2.6 Crofting in-bye land, Isle of Benbecula](image)
2.4 Birds: Crofting and Machair habitat

Key protected birds residing in crofting and machair lands are corncrake, ringed plover, dunlin, terns, barnacle and greylag geese.

Corncrake thrive in actively managed arable land, especially where harvesting practices are corncrake-friendly (starting at the centre of the field and moving outwards to the edges). Impacts would be minimised where these activities continued around the turbines.

Considerations for waders are similar to those on moorland. Terns nest on the ground in a variety of habitats and feed at sea. Little is known of the effects of wind farm development, but if care is taken during the breeding season, effects should be minimised.

Geese are ubiquitous throughout the agricultural areas of the islands. Some breed and/or overwinter in the Western Isles and SNH and others hold extensive records of geese movements and behaviour. Geese are a nuisance to farmers, and shooting is allowed at certain times of year.

Crofting and machair habitats protected for birds interests are shown in Figure 2.8. These are Aird and Borve, Eoligarry, Kilpheder and Smerclate, the Monach Islands, Ness and Barvas, North Uist Machair and Islands and South Uist Machair and Lochs classified SPAs.
2.5 Seabirds

There are several important breeding seabird colonies in the Western Isles, which can be split into two broad categories:

- Rocky cliffs colonies - SPA-designated interests are found on St Kilda, the Shiant Isles, the Flannan Isles and Mingulay and Bernaray. Species include shag, guillemot, fulmar, kittiwake and razorbill. Characterised by wide-ranging foraging at sea, up to many hundreds of kilometers from the colony.
- Estuarine habitats – SPA-designated areas identified as important estuarine habitats [8] are at Kilpheder to Smerclate, South Uist and the North Uist Machair.

The abovementioned SPAs are shown in Figure 2.9 below.
Terns are also classified as seabirds, but can as previously discussed be found in a variety of locations, with foraging distances to sea typically only a few hundred meters.

In a recent review of the effects of offshore wind farms on birds [8], Important Bird Areas (IBA’s) were used as the principal means of identifying important sea bird areas. IBA’s are areas identified by Birdlife International as supporting international and/or nationally important bird populations. While the areas identified co-incide with the locations of classified SPA’s in the Western Isles, the listed interests are not always the same (i.e. IBA’s may include species important at the national as well as European level).

Potential impacts will vary according to the nature of development¹ and species concerned, although the report recommends avoiding areas where large concentrations of protected species congregate (in flight, or while feeding or roosting). In the Western Isles this will include sea bird colonies (cliff roosting and foraging at sea) and coastal and inter-island goose movements.

A recommendation from English Nature is translated in the same report into a 20 km radius “vulnerable area” for wind farms, around areas designated for seabirds feeding offshore: which are the Flannan Isles, St Kilda and the North Uist Machair². It is however recognised that a consistent vulnerable zone approach is flawed (and in this case not relevant to wave devices). There are extensive data on seabird behaviour which shows wide-ranging and fish-stock influenced variability in foraging activity, suggesting impacts on foraging may be minimal.

2.6 Cetaceans

Little is known of the impact of offshore renewables on cetaceans. Potential impacts include displacement during construction, underwater noise-induced changes in behaviour and failure to avoid underwater cables (the latter more relevant for larger plankton-feeding whales). It is well known from offshore oil and gas activity that underwater noise can have adverse impacts – displacing and/or disorientating whales and dolphins, with the type and timing of noise a relevant factor in determining effects. A review of existing information on offshore wind farm noise-induced effects [9] suggests that for some species there may be initial avoidance followed by habituation and possibly, attraction (as feeding grounds), but that monitored data is required.

There are ongoing offshore wind monitoring programmes, including at Blyth offshore wind farm in the UK.

Data on cetacean movements and behaviour in the outer Hebrides is sparse and relies largely on voluntary and/or ad-hoc observations.

2.7 Landscape

National Scenic Areas (NSA’s) are designated for their “outstanding scenic interest or unsurpassed attractiveness.” [10] Designated NSA’s are shown in Figure 2.10. There is a proposal to extend the Uist Machair NSA to include the Sound of Barra, the West half of Barra extending into the sea, and all of Vatersay and surrounding sea.

¹ Sea-level wave devices will for instance have no impact on birds in flight.
² North Uist machair qualifies under its IBA interests (which includes storm petrel) but not its SPA interests (which do not include any offshore-feeding birds).
There is also a landscape character assessment for the Western Isles [3], commissioned as part of a series of assessments for the whole of Scotland. It categorises and describes different landscape types and reviews “forces for change”. While some of the Scottish assessments comment on renewable energy projects, the Western Isles one does not (renewable energy projects were not considered as a force for change at the time). An evaluation of onshore wind in the context of the landscape character assessment – a “landscape capacity” study – has also recently been commissioned.

Figure 2.10 Western Isles National Scenic Areas

The proposed Harris superquarry is contained within the South Lewis, Harris and North Uist NSA. The NSA designation has been central to the protracted (over 11 years since submission of the planning application) deliberations on this proposal, which are ongoing. Development within an NSA (and similarly within other designated areas) which compromises the NSA can only be approved if social and economic benefits are found to be of over-riding benefit, and it on this point that the decision for refusal or approval has hinged. It is also worth noting that views from the sea to the NSA formed part of SNH’s evidence to the planning inquiry.

2.8 Marine designations

With the exception of NSA boundaries extending to sea, there are as yet no sea-based environmental designations around the Western Isles. These are however expected, at least in the form of Marine SACs, and perhaps others. Within the 12 nautical mile limit of territorial waters, designation of marine SACs is ongoing. SACs outwith territorial waters are also being identified, and will be designated once the necessary legislation is in place. The Darwin Mounds, at around 1000 m depth in the north-east corner of the Rockall Trough, are expected to be the first such site designated [11].
3 MILITARY AND CIVIL AVIATION INTERESTS

3.1 Background

There are a number of military and civil installations and activities in the Western Isles. Table 3.1 summarises those identified in this study, and the different interests are described in more detail in following Sections.

<table>
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<tr>
<th>Facility</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Military</strong></td>
<td></td>
</tr>
<tr>
<td>Hebrides Range (EG D701A-E)</td>
<td>The largest air and sea range in UK. Managed by QinetiQ.</td>
</tr>
<tr>
<td>Lower Barvas</td>
<td>Small arms range</td>
</tr>
<tr>
<td>Offshore Practice and Exercise areas, Sea of Hebrides &amp; Minches</td>
<td>Submarine, aircraft and ship exercises, notably during regular “Joint Maritime Course” exercises</td>
</tr>
<tr>
<td>Air defence radar, South Clettraval, North Uist</td>
<td>Long-range cover of North Atlantic approaches to Scotland</td>
</tr>
<tr>
<td>St Kilda</td>
<td>Tracking radars and telemetry for weapons trials on the Hebrides Range.</td>
</tr>
<tr>
<td>Stornoway</td>
<td>Occasional deployment of RAF mobile radar during exercises.</td>
</tr>
<tr>
<td>Aird Uig radio station</td>
<td>RAF high frequency radio transmitter</td>
</tr>
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<td><strong>Civil aerodromes &amp; facilities</strong></td>
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<td>Stornoway</td>
<td>Highlands and Islands Airports Limited (HIAL).</td>
</tr>
<tr>
<td>Benbecula</td>
<td>HIAL</td>
</tr>
<tr>
<td>Barra</td>
<td>HIAL (not officially safeguarded)</td>
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<td>Barra NDB</td>
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<tr>
<td><strong>NATS technical sites</strong></td>
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<tr>
<td>Benbecula DVOR/DME</td>
<td>Co-located VOR and DME on airfield</td>
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<tr>
<td>Benbecula DME</td>
<td>Separate DME facility</td>
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<td>At Pabail Uarach, Eye Peninsula</td>
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<td>Stornoway NDB (Locator)</td>
<td>On airfield.</td>
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<td>Barra NDB</td>
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<td>Stornoway TDME</td>
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<td>NATS VHF/UHF radio transmitter site.</td>
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<tr>
<td>Receiver, Forsnaval, Lewis</td>
<td>NATS VHF/UHF radio receiver site</td>
</tr>
<tr>
<td>En-route radar, Sandwich, Stornoway</td>
<td>NATS en-route secondary surveillance radar, used for predominantly high-level transatlantic traffic.</td>
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<td><strong>Met office</strong></td>
<td></td>
</tr>
<tr>
<td>Weather radar, Stornoway</td>
<td>Druim a'Starraig, antenna elevation 96 m amsl, minimum beam elevation 0º</td>
</tr>
</tbody>
</table>

Table 3.1 Military and aeronautical interests in the Western Isles
3.2 Military Interests

Consultation for military interests across the UK (including those offshore) is, in an industry/MoD “gentleman’s agreement”, through Defence Estates, who are responsible for ongoing dissemination to relevant technical departments [12]. MoD’s stated policy is to treat each project on a case by case basis. In practice this means that there is no official blanket accept or reject policy associated with any area or type of facility, although there are circumstances where MoD has indicated that a rejection would be more likely. It also means that there is little information on which to judge the likelihood of development being acceptable to the MoD prior to submitting specific project information.

Consultation with MoD is a statutory requirement where safeguarding maps are lodged with the relevant local authority, but these do not always cover all those sites in which MoD has an interest (including low flying areas – see below). They also do not apply to wind energy developments, in so far as MoD may wish to be consulted on developments outwith the specified safeguarded boundaries.

New safeguarding regulations for both military and civil sites are being developed by the Scottish Executive (following DTLR’s lead). Contrary to the present situation, the new draft safeguarding circular [13] states under “technical site safeguarding maps and wind turbines” that military safeguarding maps [will] show “colour-coded areas which in total equate to the extent of the safeguarded surface and indicating which types of planning application are to be the subject of consultation.” This implies that new safeguarding maps which include wind turbine safeguarding requirements are anticipated, but it is not clear if this is indeed the case.

The draft safeguarding circular also states that “a list of the currently safeguarded military aerodromes, technical sites and explosives storage areas can be obtained from Defence Estates.” However on enquiry, this is not the case, as the list cannot be made generally available.

3.2.1 Low Flying

Military low flying is carried out over most of the UK. MoD indicated in March 2001 that wind energy projects would be more likely to attract an MoD objection within three Tactical Training Low Flying Areas (none of which are in the Western Isles). The Western Isles is wholly contained within Low Flying Area 14, where normal low flying training down to 250ft above ground level can take place. However relatively little low flying takes place over the Western Isles and an MoD objection to a wind farm in the Western Isles on grounds of physical obstruction to (piloted) low flying is thought to be unlikely.

3.2.2 Hebrides Range

Operated by QinetiQ for a number of clients, including the MoD and BAE Systems, the Hebridean range is the largest air and sea range in the UK. QinetiQ is a wholly-owned MoD fund, but is due to transfer to private ownership. QinetiQ is responsible for providing the technical input to safeguarding the range operations, although it is not clear where ultimate responsibility lies in forming an MoD view on proposed developments in, and impacting on, the range and its associated activities.

The range is split operationally into an inner and outer range. A description of activities at the range is reproduced as Appendix 1. The outer limits of the air danger areas are shown in Appendix 2. Both were kindly provided by QinetiQ.
Part of the rationale for choosing the range’s location is the relatively low incidence of other activity in the area, especially in the seaward areas. Fishing takes place within the sea boundary at agreed safe times. Non-related air traffic is discouraged at notified times through its designation as a “danger area”.

Some £25 million has recently been invested in upgrading the range, it directly employs 285 people and impacts on some 40% of the population of the Uists [14].

In principle, QinetiQ is supportive of measures to increase renewable energy development in the Western Isles. It is also worth noting that QinetiQ itself is a major energy consumer, presently supplied through the grid and on-site diesel, and in which context developments which improved and/or reduced the cost of energy supply, would be of interest.

Potential conflicts with activities associated with the range include:

**Physical obstruction**: the open expanse of sea is a key feature of the range and structures sited within the range may impede current activities, requiring avoidance (and hence a reduction in the range area).

**Construction**: at present there is a busy programme of trials for the foreseeable future, and it is difficult to envisage scope for accommodating busy construction activities without cancellation of trials.

**Radar**: the potential for the rotating blades of wind turbines to return radar readings are sometimes of concern to radar operators. There is as yet no agreed approach to this issue, and it is the subject of ongoing investigations and discussions. To date, experience has been mixed with some projects “visible” to radar giving no cause for concern to operators, while others are subject to protracted discussion or simply have not been progressed on the basis of radar-related objections. A DTI-led working group on wind energy, defence and civil aviation interests is commissioning work on this subject, including developer guidelines due for publication this July.

QinetiQ operates a variety of radar associated with activities on its range. These include:

- Range Control, Rueval. Sea watch, air surveillance and tracking radars; telemetry for missile/target data logging
- Rangehead, West Geirinish. Surveillance/tracking radar
- Seabhal. Sea watch radar, for range clearance.
- Hirta, St Kilda: Sea watch radar, air surveillance and tracking radars, telemetry for missile/target logging

QinetiQ is also responsible for maintenance of the air defence radar on North Uist (see below).

**High structures**: high structures in the inner part of the sea range would potentially obstruct the path of pilotless aircraft. QinetiQ consider this may be less of a problem at the southern-most extent of the range.

**Risk of damage to structures**: missile firing (notably in the inshore waters where Rapier, Starstreak and other short-range missiles are fired) presents a hazard to the integrity and safety of structures. Although it is possible to site structures within the range to minimise this risk, there will always be a risk. QinetiQ could, however, quantify this risk.
3.2.3 Air defence radar

There is an air defence radar on South Clettraval, North Uist. MoD has a policy of objecting to wind farm projects within 74 km of an air defence radar site, where the wind farm is in line of site of the radar and where “there is no significant overlapping radar cover that could provide some form of coverage in the area affected.”[15] This policy has been interpreted as a requirement for projects to meet all of these criteria to attract an objection, although MoD’s response is not always consistent with this. Since the terrorist attacks of September 11, MoD’s policy has become more restrictive, with objections lodged against any development with the potential to cause any degradation of radar coverage or performance, irrespective of overlapping cover. An illustrative map indicating coverage within a 74 km radius of the South Clettraval radar is shown in Figure 3.1 below.

![Figure 3.1 74 km radius from air defence radar](image)

There is potential for overlapping cover with South Clettraval: data from NATS en-route radar on Tiree and Stornoway can be supplied to the RAF as required. However, coverage of low altitude airspace to the west of the Western Isles will not be effective given intervening terrain and distance from North Uist. Stornoway is also a secondary-only radar station, and as such cannot provide overlapping primary cover.

Projects on Lewis would not be in the line of site of the radar due to the intervening Harris mountains.

The South Clettraval radar is predominantly intended for coverage to the West of the Hebrides, and thus development to the East of the radar may be less likely to attract an objection if the policy were to be relaxed.

3.2.4 Navy exercises

There is very little information available from which to judge if these activities might or might not represent a problem for offshore development. The most significant activity around the Western Isles is maritime (air/sea) exercise activity in connection with the Joint Maritime Course (JMC) programme, run from the Clyde Submarine Base, Faslane. JMC exercises take
place 2-3 times a year and usually cover air/sea areas from the southern edge of D701, clockwise around the Western Isles to the North Minch. Most of the activity takes place well out to sea but there are occasionally amphibious landing exercises.

3.2.5 Aird Uig

There is an RAF high frequency (HF) radio transmitter at Aird Uig. Because of the wavelength of signals, this is thought to be highly unlikely to be affected by wind turbines. It is nonetheless an MoD-safeguarded site and consultation is required.

3.3 Civil Aeronautical Interests

Responsibility for safeguarding of civil aeronautical interests falls into two categories:

1. Aerodrome safeguarding. Protection of the aerodrome circuit area and take-off/approach paths.
2. Technical sites. Radar and other navigational aids, which may also be sited at an aerodrome.

Responsibility for both used to lie with the Civil Aviation Authority (CAA). In preparation for the introduction of new safeguarding legislation, responsibility is currently being transferred to the aerodromes themselves for aerodrome safeguarding, and to National Air Traffic Services (NATS) for technical sites. CAA will be notified in the event that a planning authority does not heed the advice of the aerodrome or NATS, and will have the power to ask the Scottish Executive to call in an application. A consultation issued March 2001 [13] sought views on procedures which would result from this transfer (the transfer itself has in the meantime progressed).

Pre-planning consultation on civil aeronautical interests is co-ordinated through the CAA, which allows developers to scope potential limitations prior to triggering formal safeguarding consultation.

There is no controlled airspace associated with any of the aerodromes on the Western Isles.

3.3.1 Civil Aerodromes

Licensed aerodromes are required to meet the aerodrome safeguarding criteria set down in Civil Aviation Publication (CAP) 168, which works on the basis of 3D surfaces protected from physical obstruction. General CAA safeguarding maps lodged with local planning authorities will reflect these CAP 168 criteria. The broad dimensions are:

**Stornoway**
- a circle of radius 15 km from the aerodrome reference point (in the centre of the airfield);
- approach/take-off ‘funnels’ along the extended centreline of the main (north/south) runway, extending to 15,060 m from each end of the runway (approximately 16,160 m from the centre of the airfield) and with a maximum width of 4800 m.

**Benbecula**
- a circle of radius 10 km from the aerodrome reference point (in the centre of the airfield);
- approach/take-off ‘funnels’ along the extended centreline of the main (northeast/southwest) runway, extending to 15,060 m from each end of the runway.
(approximately 15,888 m from the centre of the airfield) and with a maximum width of 4800 m.

Barra is not officially safeguarded, although as a licensed aerodrome it is required to meet the physical obstruction criteria in CAP 168.

The above figures assume that CAP 168 criteria are applied. MoD also lists safeguarding of both Stornoway and Benbecula airports as its responsibility – it is not clear why this is the case.

In addition to the physical obstruction safeguarding process in accordance with CAP 168, aerodromes with published instrument approach procedures are required to survey all obstacles within specified areas, to criteria laid down in CAP 232. Instrument approach procedure design is the responsibility of the CAA Directorate of Airspace Policy (DAP), and is not, strictly speaking, a safeguarding activity. New obstacles are surveyed and if necessary, the minimum height to which aircraft are permitted to descend on the published procedure is revised in order to maintain specified vertical separation between aircraft and obstacles.

Stornoway and Benbecula both have published instrument approach procedures (IAPs). Stornoway’s IAP’s extend to a maximum radius of 10 nm to the north, south and east of the airport. Benbecula’s IAP’s extend to approximately 8.5 nm to the south west, 7 nm to the north and 10.5 nm to the north east of the airport.

Barra also has an IAP but it is a private procedure, only approved for use by Loganair, the sole scheduled service operator at the aerodrome. It would nevertheless be a potential constraint on any wind turbine proposals in that area.

Radar-equipped aerodromes may also provide specific wind turbine safeguarding maps (eg. Prestwick). However none of the Western Isles airports are radar-equipped so this does not apply.

In addition to the existing facilities, HIAL plans to install an Instrument Landing System (ILS) ILS at Stornoway airport in the near future. This will impose additional safeguarding requirements in an area extending northwards along the extended centreline of the runway. There are no specific wind energy-related consultation criteria for ILS equipment, but it must meet specified performance standards within an area 35° either side of the extended runway centreline to a distance of 17 nm, and 10° either side of the centreline to 25 nm.

### 3.3.2 NATS Technical Sites

NATS technical sites – radar, radio navigation aids and voice radio transmitter/receiver stations – are also covered by statutory safeguarding arrangements. NATS have produced a series of specific wind energy safeguarding maps for their technical sites, which have been issued to the relevant local authorities. These maps apply a 30km consultation zone around its radars (including radars at airports where it is the air traffic service provider) and a 10km zone around navigation aids such as VORs (Very high frequency Omnidirectional Range) and DME (Distance Measuring Equipment). Safeguarding is also applied around voice radio communication transmitter/receivers, and to the line-of-sight signal paths between microwave communications relay stations which carry NATS data (e.g. from/to hilltop radio transmitter/receivers).

Interaction between wind turbines and radar is discussed above. Navigational aids provide pilots with information on their position. VORs are transmit-only, while DMEs operate using both transmitted and received signals.
NDBs (Non-Directional Beacons) simply broadcast their position, and can thus be used to ‘home in’ by pilots. These are unlikely to be affected by wind turbines, as they operate in the medium frequency band and are already subject to significant inaccuracies due to terrain, atmospheric and other effects.

In the Western Isles, safeguarded NATS sites are:

- Sandwick en-route secondary surveillance radar, used for predominantly high-level transatlantic traffic (30 km safeguarded radius)
- Radio transmitter facility at Mangersta, Lewis (10 km)
- Radio receiver facility at Forsnaval, Lewis (10 km)
- Stornoway DVOR/DME at Pabail Uarach, Eye Peninsula (10 km)
- Benbecula DVOR/DME (10 km)
- Straight-line path between the Sandwick radar and the radar-monitoring equipment located adjacent to the Stornoway VOR.

3.4 Met Office

Safeguarding of met office rainfall radar is carried out on a site-specific basis. There are several examples of wind farms being accommodated by altering radar antenna elevation or tilt – the applicability of this option is dependent on local terrain. There is at least one example of a proposed wind farm attracting serious concerns on the grounds of met office radar, where purchase of a new radar at a different location is a possible resolution.
4  FISHING INTERESTS

Fishing is a major activity for the Western Isles, employing around 10% of the working population. Fishing activity may be affected by renewable energy development in a number of ways such as:

- The need to navigate around structures
- Limit use of trawling gear around structures
- Avoid use of bottom trawling gear along cable routes

Actual effects will depend on the scale of development proposed and the types of fishing activity undertaken in the vicinity. Offshore wind and wave developments are all suited to the western side of the islands.

4.1 Fishing to the West of the Western Isles

4.2 Static Gear

Activity is dominated here by static gear, namely pots for lobster and brown crab and fixed tangle nets for crayfish. The extent of static gear fishing follows seabed formations but is roughly out to 6 miles offshore along the entire length of all the islands.

Lewesian gneiss – very hard rock – makes up much of the seabed off the west of the Western Isles up to around 100 m depth offshore. Much of it is relatively flat, but further to shore it forms a series of underwater peaks. These conditions favour static gear, but due to the lack of any sand or gravel, there is no bottom-trawling. It also has implications for cable laying – namely that trenching will be very expensive (trenching in hard rock is problematic and time consuming), with alternatives which lay and secure the cable on top of the seabed almost certainly offering a more economically realistic option. There are at present no cables to the Western shore of the islands.

Implications for developers are relatively minor. Fishing boats are small and manoeuvrable. In the unlikely event that a pot or net caught on a cable, fisherman would probably be advised to leave the gear underwater and claim compensation. Such an arrangement works well for the electricity cables to the east of the islands, and in fact entanglements are extremely rare.

4.3 Bottom trawlers

There is one notable area of bottom-trawling to the West of Lewis. The sea bed is sandy here and further to shore between Mangurstadh and Gallan Head. Development in this area would be expected to constrain the area available for trawling.

4.4 Pelagic trawlers

Pelagic, or midwater trawlers operate off the West coast of Lewis and far out to sea beyond St Kilda. Fishing activity follows the shifting migratory patterns of the fish, and major impacts on this activity are considered to be unlikely. Consideration may need to be given to spawning areas and seasons when scheduling construction.
4.5 Benefits to fishing

It is well known that offshore structures can act as undersea reefs, stimulating growth and aiding the health of fish stocks. Trawlers may even choose to fish close to structures because of this effect.
5 CONCLUSIONS

The Western Isles host a wide variety of potentially limiting interests to renewable energy development. This is particularly the case for wind energy, where the moving blades pose additional radar-related issues and where, due to operational experience, constraints are well documented. This report has tended to focus on problem areas, and it should be borne in mind that in many instances it should be possible to show minimal/no impacts from development.

The following sections make some key observations for each interest considered, followed by some broad conclusions which incorporate resource findings detailed in Part I and in the previous Scotland-wide study [1]. Finally, drawing on the findings in Parts I and II, there are some observations on possible next steps.

5.1 Environment Interests

These following have been identified in the context of the Western Isles, but are generally applicable Scotland-wide.

Legal protection: of sites and interests is of significant force, especially at the European level. Implications include the possibility of third party appeals against decisions, and lengthy legal debate (for instance, inevitable ambiguities in legislation rely on resolution of through precedents, which may not as yet be set). A key legislative requirement is to consider the availability of alternative sites, which can be expected to feature highly in any debate on renewables.

Data availability: a lack of suitable data may mean it is impossible to accurately predict impacts. The need, or not, for precaution then becomes a key decision, which will be driven by a combination of the specific environmental context and the need for, and benefits of, development. There is limited guidance in this area, but it is important for planning decisions to separate uncertainties from fact.

Compensatory improvement: rather than simply allowing nature to take its course, there is scope for environmental improvement through active intervention in the Western Isles. This includes for instance habitat creation and enhancement and mink eradication (mink are a serious environmental threat in the Western Isles). There are precedents for renewable energy schemes funding environmental improvement measures, to either compensate for impacts or simply as a community contribution.

Marine designations: with the exception of the Darwin Mounds, which are probably outwith the range of possible interest for developers, there is little information on areas which may prove suitable for marine designation. There are also no proposals for offshore renewables development. Potential for co-incidence of proposals is therefore not known but could be borne in mind by relevant parties.

5.2 Military/aeronautical interests

Unlike environmental interests, where developers will typically engage in detailed discussions and development iterations, aeronautical and especially military interests consultation is with a view to eliciting a simple yes or no. There is no precedent for a successful challenge to a decision. With ongoing multi-interest discussions and studies, there may be some relaxation of this approach, and wind energy developers and aeronautical professionals are increasingly engaging in technical mitigation-based negotiations.
Key considerations for the Western Isles are:

**Strategic appraisal**: while at a detailed level it will always be appropriate to assess proposals on a case by case basis, there may be some scope for strategic-level assessment of aeronautical and military constraints. Due to limited readily available information, this has not been possible to date, but in the context of the Western Isles is almost a pre-requisite given the need for strategic investment in grid reinforcement.

**Uncertainty**: as with environmental interests, there may not be sufficient data for accurate prediction of impacts. There is an obvious reluctance to proceed under these circumstances, given interests at risk. Nonetheless, it is important for parties to engage in discussions as experience shows there can be scope for mitigation and adaptation, and exploration of the operational relevance of impacts.

**Hebrides Range**: the nature and extent of activities here are somewhat unique to the Western Isles. Informal discussions between the council and QinetiQ may help to clarify impacts on development potential.

**Exclusion zones**: the 74 km exclusion zone around the South Clettraval radar sterilises all of the Uists and Benbecula. It is not known if there is scope for relaxing this policy – informal discussions are understood to have been initiated.

### 5.3 Fishing interests

No major conflicts were identified with the predominant west coast fishing activities – mainly static gear. It will nonetheless be important for developers to engage in fisheries liaison. Potential concerns include the need (if any) for fishing exclusions around developments.

### 5.4 Technology conclusions

Onshore wind speeds are favourable for development throughout the Western Isles, and thus all onshore interests considered are relevant. If civil radar consultation zones are included, only the northern-most tip of Lewis and the south east tip of Barra is free of any interest identified in this study. Lewis is dominated by civil aviation interests and the Lewis Peatlands SAC and SPA, Harris by the NSA, and the Uists and Benbecula by the air defence radar exclusion zone. The south west end of Barra which is outwith the radar exclusion zone is covered by the proposed extension to the South Uist NSA.

Offshore wind speeds are similarly favourable around all of the coast, but if depth is a limitation – as it is with currently available technology – then development potential is limited to the west coast of the Uists, Benbecula and South Harris, small isolated areas off the west coast of Lewis and the nearshore inter-island sounds (as detailed in the Scotland-wide study [1]). The west coast of the Uists and Benbecula is almost wholly contained within the Hebrides range, with the exception of west coast Lewis, the remaining areas are subject to ecological and landscape sensitivities. The harsh weather environment of the exposed west coast would rule out present-day offshore wind technology, and thus development interest in the near-term is more likely to be in the relatively sheltered sounds.

The further offshore environment of interest to wave energy developers is less well understood, which suggests an increased reliance on pre-development studies to establish environmental and other interests present. Economic trade offs between increased energy capture but increased costs as projects move away from the coast will be the primary determinant of project location. Only the west coast offers a suitable wave energy resource,
albeit similar survivability considerations as offshore wind apply. These conditions are challenging, but nonetheless testing is already planned for wave devices on this coast (Wavegen intends to site prototype devices here). Large-scale deployment is more likely to be in the medium to long-term. The Hebrides range extends far enough out to sea to cover potential exploitation areas, and thus more promising locations may be off the west coast of Lewis and North Harris, but perhaps avoiding the trawling area west of Mangurstadh and Gallan Head.

Tidal stream is the only technology considered where the resource availability is a fairly limiting factor in its exploitation. All interests considered in this study are not likely to be significant for tidal stream, with the possible exception of cetaceans and seals abundant in nearshore areas. Shipping-related navigational constraints are likely to be important, especially in the Sound of Harris.
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