

TOWN AND COUNTRY PLANNING SCOTLAND ACT 1997

TOWN AND COUNTRY PLANNING (INQUIRIES PROCEDURES) (SCOTLAND)
RULES 1997 AS AMENDED



**OUTLINE PLANNING PERMISSION FOR GOLF COURSE AND RESORT
DEVELOPMENT ON LAND AT MENIE HOUSE, BALMEDIE, ABERDEEN**

PRINCIPAL PRECOGNITION OF

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Evidence on behalf of Scottish Natural Heritage

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INTRODUCTION

1. I am Stewart Angus, a Policy & Advice Manager in SNH. I take responsibility for coastal ecology advice within the Coastal and Marine Ecosystems and Uses Unit of the Policy & Advice Directorate, also having a middle management function within that Unit. I represent SNH in its role as Lead Agency for the UK Sand Dune Habitat Action Plan and the UK Machair Habitat Action Plan, and I acted as UK co-ordinator for the later stages of the development of all the UK coastal HAPs.
2. I have occupied this post (at times with a different title and within a different structure) since April 1997, though my involvement in international dune science dates back to 1991. I ran the later stages of the SNH contract for the *Sand Dune Vegetation Survey of Scotland* (a major ecological survey contract awarded to Dr T Dargie) including the survey of the Grampian coast, and also developed the methodology for all coastal Site Condition Monitoring in Scotland (with input in its early stages from Dr Dargie), as well as playing a key role in the development of the related UK Common Standards Monitoring.
3. I also have experience of Area work, having been Assistant Regional Officer for Sutherland for seven years, followed by twelve years in the Western Isles, the last 5 of these as Area Manager.
4. I have published two peer-reviewed books, with about two-thirds of each devoted to coastal science, and I have published 14 peer-reviewed scientific papers (6 as joint author), including three papers co-authored with Dr J Hansom and one with Dr Dargie. I work closely with Professor W Ritchie in the Machair Study Group and edit its Newsletter. I also co-edit the re-launched *Sand Dune Machair* series with Professor Ritchie.
5. I am a member of the Editorial Board of the international *Journal of Coastal Conservation*, and was a member of the Editorial panel of the *Proceedings of Littoral 2004*, an international coastal conference held here in the Exhibition Centre in Aberdeen. I am also an Honorary Senior Lecturer in the Geosciences School of the University of Aberdeen, in the Department of Geography and Environment.
6. In my Precognition I will outline the following:
 - The Foveran Links Site of Special Scientific Interest and its reliance on processes and dynamism
 - The context of the SSSI and the wider development site
 - The various sand dune habitats, their inter-relationships, and the role played by ecological processes and dynamism, as well as the critical importance of bare, mobile sand
 - The impact of the development on the ecological interest of the SSSI

- The impact of the development in relation to wider habitat interests.

The Foveran Links Site of Special Scientific Interest

7. The development impinges on the southern third of the Foveran Links Site of Special Scientific Interest (SSSI). Foveran Links SSSI is an outstanding example of the relationship between the processes that shape the landscape and the way habitats adapt to changes in these processes. These habitats also have a value in their own right.
8. In an ecological context, the main processes involve the relationship between climate – mainly wind and rain – and their influence on sand movement, and on water within this sand. An important role is also played by the topography of the land beneath the sand deposits. The outcome of this relationship is a constantly changing landscape, where dry sand is blown locally into great, moving ‘sheets’, that are so mobile little can grow in some places.
9. On these sheets the movement of sand across the surface is so great that plants find it impossible to establish, leaving much of the area of the sheet almost bare of vegetation. The sand forming the sheets comes from upwind areas. In places, the source have lost much, sometimes all, of their sand, leaving them ‘deflated’ – the limit of deflation is determined by the level of the water table (because wet sand will blow only in extreme conditions) or the limit of the sand deposit. The damp areas that have lost much or all of their sand are known as ‘slacks’ or ‘dune slacks’, and these have formed in the wake of the retreating sheet, as described by Dr Hansom.
10. Where sand is more stable, it is colonised by vegetation, classed as ‘mobile’, ‘semi-fixed’ and ‘fixed’ with increasing stability. The vegetation of the SSSI comprises a complete sequence of stability, from bare mobile sand through to fixed dune.
11. The ecological section of the citation (description) of the Foveran Links SSSI states:

Foveran Links contains extensive areas of mobile foreshore and sand dunes as well as fixed dunes, dune pasture, marshes and heath. The relationship between various plant communities and sand stability is clearly shown and the continuing movement of sand masses allow direct observation of these interactions.

Although closely linked and similar to the Sands of Forvie and Ythan Estuary NNR to the north, the site does contain several species and communities which are absent from or less well represented in the NNR. The vegetation of the dune hollows and pasture, some of which are grazed, are especially interesting. (SNH1)

12. Components of the habitat are described in detail below in the section dealing with Annex I habitats, but this SSSI has substantial interest additional to the individual Annex I habitats, relating to the relationship between processes and

habitat, as described in the citation. The Development would seriously disrupt this ongoing dynamic inter-relationship through the large scale stabilisation process that would be required to create a golf course in this area.

The dunes outwith the SSSI boundary

13. The conditions of the SSSI are to some extent duplicated in the area between the SSSI and Balmedie (referred to hereafter as South Menie). Although the movements of sand within South Menie are mostly much less dramatic than within the SSSI part of the development (with the exception of the Balmedie sand sheet at its southern end), the ecological effects of the past movement of the sand sheet through the area are still evident. There has also been less human disturbance of some habitats around South Menie than there has in the northern part of Foveran Links SSSI (outwith the development). The quality of the habitats in South Menie is high and adds considerably to the integrity of the unit. In short, the SSSI plus South Menie together have a value greater than the sum of the parts, an issue addressed in the following section.

The geographical context and ecological importance of the SSSI and the development site

14. The SSSI as a whole and the development site form part of a sediment and habitat unit that stretches from the River Ythan to the Bridge of Don, and conforms to Dargie's "Newburgh to Bridge of Don" site assemblage in his *Sand Dune Vegetation Survey of Scotland* (SDVSS) (SNH22,23). This work was commissioned by SNH to meet the following objectives:
 - *to locate areas of vegetated windblown sand around the coast of Scotland;*
 - *to map and describe the vegetation of unsurveyed areas in the field using the NVC system;*
 - *to harmonise SDVSS results with existing NVC surveys of other sites;*
 - *to present results in a series of reports covering different sectors of the Scottish coast;*
 - *to synthesise results from different coastal sectors as a national report covering all of Scotland.*
15. The NVC referred to in bullet points 2 and 3 above is the National Vegetation Classification (SNH35), a standard means of describing and classifying vegetation types. Dargie surveyed or 'harmonised' earlier reported work covering the entire coastal sand dune resource of some 50,000ha in Scotland covering 558 sites, and this is widely regarded as the standard work on the vegetation of sand dunes, significantly augmenting that of Rodwell, who developed the NVC. Considering that the assignment of non-standard vegetation types is not only highly skilled but somewhat observer-dependent, the fact that Dargie either surveyed or harmonised the entire Scottish coastal dune resource provides a single unified sand dune dataset for Scotland in a UK context.

16. The high nature conservation interest of the Newburgh-Bridge of Don site (which includes the development area) was noted by Dargie in his 2001 report to SNH (SNH 23) thus

In addition to designated land at Foveran Links SSSI, much land in this site [Newburgh to Bridge of Don] is of very high nature conservation interest. The mobile dune environments, acidic grasslands and acidic slacks are all notable. The conditions determining their distribution and quality are not replicated elsewhere in Gordon and every attempt should be made to keep existing semi-natural conditions in their present form and dynamism.”

17. Dargie regarded Newburgh-Bridge of Don as the tenth-largest extent of sand dune in Scotland, covering a total of 1083ha (Dargie 2000), and representing 2.16% of the Scottish coastal sand dune resource. In his National Report (SNH22), Dargie noted:

Open coast dune is extensive along the eastern seaboard, with a few occurrences in Orkney. The largest examples involve the frontages of much of the sites at Inverallochy to Peterhead and Newburgh to Bridge of Don. Both these sectors have some of the largest active blowouts in Scotland which take sand up to 1 km inland (p.15).

18. This emphasises the importance of the mobile sand in a national Scottish context. SNH concurs with this view.

19. The high conservation attributes of the SSSI were thus not merely endorsed by Dargie, but extended to cover additional ground to the south, now also affected by this development. In particular, the development will very substantially alter or remove the *existing semi-natural conditions [and] their present form and dynamism* of Dargie (SNH23).

20. An earlier survey of the vegetation of Foveran Links for the Nature Conservancy Council (SNH24) made the following assessment:

The Menie Links are the only section of the site where the full sequence of communities from shore-line to the back of the links has been preserved. The sequence of recolonising vegetation in the wake of the Menie blowout extends south of the SSSI boundary. A considerable part of this appears intact though the NVC survey did not extend to cover this area.

21. The biological interest of this site is very substantially linked to the geomorphological interest, and these two components of the scientific interest should be regarded as strongly inter-related. The comparative lack of human disturbance noted by Dr Hansom in his evidence is also of importance in rating the biological attributes of the SSSI and ground to the south. This relationship between habitats and processes is critical to the natural heritage interest of SSSI and the remainder of the dune habitat within the development site, and is described in more detail in the next section.

Sand dune habitats

22. This section describes each habitat in turn, addressing them in the context of the Environmental Statement and Annex I of the EU Habitats Directive, but also makes reference to the habitat classes used by SNH in SSSI selection and monitoring. Annex I lists “Natural habitat types of community interest whose conservation requires the designation of Special Areas of Conservation”. Priority habitat types are those for which the Community has particular responsibility. The Directive gives Annex I habitats a level of protection outside Special Areas of Conservation, described in more detail in the Biodiversity section, below. There are four sand dune priority habitats within the “Sea dunes of the Atlantic, North Sea and Baltic Coasts” section of Annex I, of which two occur within the confines of the proposal.

23. Coastal sand dune habitat is conventionally broken down into six components, four of which occur here (the others are fixed calcareous dune and machair, which do not). These six categories are employed by SNH for SSSI selection and monitoring. Each category can accommodate a range of vegetation types, expanded upon below. All four of those listed below occur in the SSSI and in the area to the south within the development proposal, though the dune heath is highly localised within the development section of the SSSI, being much more frequent in the section south of the SSSI boundary (T50).
 - 1 Mobile dune. This includes the bare sand and all the marram-dominated dune. The marram dune (but not the bare sand) corresponds to the Annex I habitat ‘Shifting dunes along the shoreline with *Ammophila arenaria*’ (marram)
 - 2 Fixed acid dune. This corresponds to the Annex I habitat ‘Fixed dunes with herbaceous vegetation (“grey dunes”)’.
 - 3 Dune heath. In the development site this corresponds to Annex I habitat ‘Decalcified fixed dunes with *Empetrum nigrum*’ (crowberry). Other heaths occur elsewhere.
 - 4 Dune slacks. In the development site this corresponds to Annex I habitat ‘Humid dune slacks’.

24. Vegetation is assigned to Annex I habitats using the NVC. Some vegetation is atypical and assignment to NVC community and/or sub-community is largely a matter of skill and judgement, but ultimately a matter of opinion. It would be unproductive to engage in long debates about the allocation of NVC types here: SNH accepts that opinions differ: if a vegetation type is not assigned to one Annex I category it will almost invariably be assigned to another instead, usually of equal conservation status. To minimise disagreement, we have employed the NVC map supplied by the developer (T50), and the assignments of vegetation used by the Joint Nature Conservation Committee, which is the UK competent authority in this field. However, we received this information on 6 May 2008, and our analyses are incomplete. Further comment may be made in respect of habitat distribution in our Rebuttal Statement. Statistics given in the habitat section refer to the 2006 data, with notes made in respect of the 2008 amendments requested by SNH and received in May.

25. Ultimately the NVC is merely a means of classifying vegetation: what matters here is the quality of habitat, and the Foveran SSSI and adjacent links of South Menie unquestionably contain Annex I habitats of very high quality, as confirmed by the ES.
26. Though it is technically possible to calculate the area of each Annex I habitat that would be lost directly to the proposed golf course, SNH takes the view that the impact on processes, as well as indirect impact of golf-related activity, will damage or destroy much of the Annex I habitat within the wider footprint of the development. This is recognised in the ES (7.4). Any figures for habitat or vegetation types directly affected by the course layout should be regarded as a highly optimistic (and unrealistic) minimum.
27. The levels of dynamism and process dependency are such that the relative impacts of the proposed works on individual holes are impossible to predict in the short term, let alone the long term. Many holes will have an impact well beyond their boundaries by changing these processes. The current layout under consideration is also submitted for outline planning consent, and may change should the proposal be consented. SNH thus asserts the validity of using the footprint of the entire course as the impacted area, to varying degrees. It should also be noted that the applicant intends to construct a second course, of which no details are currently available.

Bare dune sand

28. Bare sand is not an Annex I habitat, but the bare sand in the development site has a vital role to play in the functionality of the Annex I habitats, affecting not just sand distribution directly and the formation of various dune structures, but also indirectly changing the levels of water tables and, as the sand sheet progresses, the distribution of dune slack habitat in its wake. Some habitats are thus directly or indirectly *dependent* on sand mobility. Young dune slacks, for example, cannot persist if there is no newly exposed area to colonise, and mobile marram dune habitat requires the sand to be mobile.
29. Though there will be an element of interchange to the north and south, especially in the vicinity of the mouth of the River Ythan, for the purposes of habitat relationships, the functional sediment unit is regarded here as equivalent to the Newburgh-Bridge of Don site assemblage used by Dargie (SNH22, SNH23).
30. The importance of the dynamism of the system to habitat functionality is emphasised by several statements in the ES (cited in the individual habitat sections below). It is the opinion of Scottish Natural Heritage that the maintenance of this dynamism is **critical** to the conservation of the habitat features, and that the level of stabilisation planned by the developer constitutes a severe level of impact on the habitat interest. This is described in the ES (Core Production G3 p71) thus:

Of greatest geomorphological concern is the proposal to stabilise large parts if not all of the active sand dome which, arguably, is the most important single geomorphic element within the main SSSI area. The

importance of the dome extends beyond its actual boundary. As it migrates northwards it overwhelms and creates new types of dunes and other features along its downwind boundary. On its south margin, however, it is moving away northwards and leaving deflation surfaces behind – some of which are wet, others relatively dry and others, possibly, as exposures of older underlying materials such as glacial deposits or raised beach ridges. These retreat features develop in time into stabilised deflation 'plains' of different size, shape and altitude. These, like the encroaching margin on the north edge, also become new habitats. In addition to the dome, there is also an area of active deflation expansion in the northeast sector of the SSSI.

31. The national habitat value of the Newburgh-Bridge of Don site assemblage in respect of the role played by bare sand may be discerned from an examination of figures for bare sand in Scotland and Great Britain. The *Sand Dune Vegetation Survey of Scotland* (SNH22, SNH23) notes the greatest extents of bare sand in Scotland as follows (figures in hectares). Percentages refer to bare sand (as percentage of total site area):

Newburgh-Bridge of Don	79.46 (6.97%)
Inverallochy to Peterhead	58.29 (4.37%)
Sands of Forvie	26.33 (2.89%)

32. Newburgh-Bridge of Don thus has the largest area of bare sand in Scotland. In terms of percentage of site area, Newburgh-Bridge of Don has the 8th largest proportion of its area as bare sand. The three largest areas *proportionally* are given below, demonstrating that the areas involved in these sites are not just smaller, but very much smaller, so that absolute area is a more valid comparative criterion than percentage (size being one of the most important of the 'Ratcliffe criteria' for selection of SSSI interest features – SNH32):

Sandwood	12.75 (16.06%)
Torrisdale Bay (Invernaver)	21.26 (12.09%)
Lossit Bay, Islay	6.72 (9.84%)

33. There are 656ha of bare sand in Scotland, so the Newburgh-Bridge of Don site assemblage holds 12.1% of the bare sand in Scottish dune systems. The development site holds 27.6ha of bare sand, of which 13.76ha is on the SSSI (figures from 2006 TIGLS dataset supplied on 6.5.08, as shown in T50).
34. In terms of Great Britain, there are 135.1ha of bare sand in Wales, with a further 72.4ha of 'bare ground', a total of 207.5ha. The latter category (bare ground) is represented mainly by steel production waste. The greatest area of bare sand + bare ground is at Morfa Dyffryn (total 36.7ha, of which almost all is bare sand) (SNH21). There are 253.3ha of bare sand in England, and only Cornwall exceeds 45ha in total, with 58.4ha (SNH31). Newburgh-Bridge of Don thus holds the largest area of bare sand of any sand dune site in Great Britain. The Great Britain bare sand resource is thus 1062.4ha of bare sand, with the Newburgh-Bridge of Don site holding 7.4%. The development area holds 27.61ha out of the total site area of 79.46ha bare sand, of which 13.76ha is within the SSSI. The

development thus impacts 4.2% of the entire Scottish bare dune resource and 2.6% of the Great Britain resource. The figures used here for this highly variable resource are those supplied by the developer (to provide a single dataset for habitat analysis) and may differ slightly from those employed by SNH in other materials submitted to the Inquiry, depending on the timing and methodology of their respective sources. Such differences are to be expected on such a dynamic site, and are also evident within the developer's own output, e.g. the reviews of successive TIGLS surveys noted in T50.

35. The processes associated with this bare sand and its movement drive the habitat dynamism that accounts for a considerable proportion of the ecological interest of the SSSI section of the development and also for South Menie outwith the SSSI boundary. Individual components of the habitat interest are dependent to varying extents on past, present and future dynamism, described in further detail in each section below.
36. It is our understanding that the main sand sheet at North Menie, which is entirely within the SSSI and where most of the footprint of holes 12, 13 and 17 (layout provided on 6.5.08) would be located, would be completely stabilised. The northern part of the Balmedie sand sheet would also be stabilised. This would remove the sand supply from the areas downwind of both sand sheets, and would halt the evolution of the slack associated with the main sheet. Dr Hansom addresses this issue in more detail.
37. The amount of bare sand in the development site is extraordinarily high in a British context, as is the extent of the relationship between the dynamism of this sand and the development and dynamism of habitats. There are no other British sites that approach this scale of interaction. The level of stabilisation planned by the developer will have a wide impact geographically and ecologically within the development site.
38. If the bare sand stabilised, a very high proportion of the scientific interest of the SSSI and the functionality of Annex I habitats outside the SSSI in the dunes of South Menie would be significantly reduced. Much of the interest of the SSSI would be adversely affected, to a level where denotification of the affected area of the SSSI would have to be considered, as its integrity would be very severely compromised.

Mobile dune

39. This category represents Annex I habitat 2120 Shifting dunes along the shoreline with marram *Ammophila arenaria*. Within the application site this would refer only to SD6 mobile dune, a community that is associated with the highest levels of dynamism of any Sand Dune vegetation listed in the National Vegetation Classification or the Dargie additions. This habitat is often restricted to a narrow fringe parallel to the beach, but is more extensive in the development site due to its close association with the sand sheets as would be expected in the vicinity of large areas of blowing sand.

40. The largest areas of mobile dune are thus along the beach margin of the entire development site, and inland around the sand sheets in the SSSI part of the Development, and in the northern end of the Foveran Links SSSI (outwith the development) and around the Balmedie sand sheet (outside the SSSI) (T50 Figs.3 and 4).
41. Marram is adapted to sand deposition of up to 1m per year, but growth is very slow when accretion of sand is small, as a result of root failure (SNH50, SNH42). If these bare areas were extensively stabilised, as is proposed in this development, this habitat would be very adversely affected, losing extent and functionality to a level that would have a severe impact on the condition of the mobile dune habitat. Though it is evident that at Menie, as on many dunes in Scotland, marram is frequent in dunes that are not so much mobile as 'semi-fixed', the plants are less vigorous. This is linked to reduced root development (SNH42), but is more obviously reflected in lower dominance and reduced flowering when sand deposition is lower (SNH35, SNH50). Where sand deposition is reduced, the NVC types change from mobile dune to other types of dune, even with significant marram present (SNH35, SNH22)
42. There are 2220ha of mobile dune in the UK (JNCC web site) and 1134ha in Scotland (SNH22). A total of 40.44ha of mobile dune is affected by the development, of which 13.66ha lie within the SSSI. The proposal thus threatens 3.56% of the Scottish resource and 1.82% of the Great Britain resource.
43. The most recent course plan received on 6.5.08 indicates that mobile dune will be directly stabilised on and around the main sand sheet and the 14th hole (within the SSSI). In the latter location, SNH understands that this will require chestnut paling fencing, but it should be noted that this is a very dynamic coastline, and placing a major part of the infrastructure of the course in such a dynamic location actively invites future problems for the maintenance of the golf area. Such problems often result in significant ongoing intervention in coastal processes, which could have further significant impacts on this coastline and its natural regulation, with consequent impacts on vegetation dynamics beyond those currently envisaged.

Dune slacks

44. Within the development site this corresponds to NVC communities SD13 young dune slack and SD16 creeping willow dune slack. The young dune slack develops in the wake of the retreating sand sheets and in time is replaced by creeping willow dune slack.
45. The importance of the ecology of the dune slacks of this site is highlighted by the extracts from the ES cited below:

A very important feature of the mobile sand sheets is that they expose bare damp sand behind them as they move north and these areas then undergo habitat succession to form wet ground termed dune slack. The variety of successional vegetation types present at Menie, from the first colonists, through a phase of Dune Willow Salix repens development, to

the oldest ground supporting taller Eared Sallow Salix aurita scrub is probably unique in Scotland in terms of its completeness. It has the largest areas of young dune slack, with much bare damp sand, and these are probably the largest extents of this habitat in Scotland and perhaps in Britain. This was not appreciated fully before undertaking the 2006 NVC survey. (ES 7.3.2.) (SNH emphasis)

The topographic positions of dune slacks at Menie are unusual. The slack floor is a thin but varying layer of wet sand overlying relatively impermeable glacial till. The till has an irregular surface which is largely buried. As a result, slacks form at markedly different levels, each with their own watertable. This is unlike many slacks in Britain which develop in relation to one large domed dune aquifer formed in thick sand. In one location (around NJ991211) slacks form at three levels, with flushes and temporary rivulets connecting the different levels of this 'staircase' feature. (ES 7.3.2)

Once blown sand deposition falls to negligible quantities, a dune grassland cover develops. The sand at Menie is poor in shell content and only small amounts of calcareous fixed dune (the SD8 NVC community) are present. Instead, large areas of acidic fixed dune grassland (the SD12 community) is developed in this site. Various types occur, with four main variants related to moisture (wet and dry forms on low gently undulating ground), past dune mobility (with abundant marram grass, even well inland, usually on the highest dunes and steeper slopes) and high acidity (grassland invaded by small amounts of Heather Calluna vulgaris and Empetrum nigrum). Small areas of these acidic fixed dunes have notable lichens present. (ES 7.3.2)

46. The Environmental Statement reports that the site has an unusual range of ages of dune slacks, and that these are at different levels of the water table. This level of variation in dune slacks would only be expected with a very high range of dynamism, so it is thus highly likely that the site possesses the best range of slacks in Great Britain in terms of stages of development.
47. The rarest type of dune slack in Scotland is SD13 young dune slack. The national report of the *Sand Dune Vegetation Survey of Scotland* (SNH22), rounded the figures up for SD13 young dune slacks, and the national inventory actually has a total for Scotland of 0.17ha, of which the Newburgh-Bridge of Don site assemblage held 0.12ha (70.6%), with small areas also at Luce Bay and Invernaver. This compares with 11.36ha in England, mainly in Merseyside and Lindisfarne (SNH31) and 13.22 in Wales, all at Kenfig dunes (SNH21).
48. With these figures in mind, it is highly notable that the 2006 survey of the development site by Dargie (T50) identified much more SD13 young dune slack than had been noted and reported for the whole of Scotland in the *Sand Dune Vegetation Survey of Scotland* (SNH22). This emphasises the close association of SD13 with dynamism, and also the rarity of young slacks in Scotland and even in the UK. A young slack can only form on recently exposed sand surfaces, and

if these cease to be renewed, as they would with the stabilisation of the sand sheet(s) then the habitat cannot survive.

49. The 2006 TIGLS map reports 3.73ha of SD13 within the development site, with 3.48ha of this within the SSSI – effectively increasing the known young dune slack area in Scotland 20-fold from this site alone. Assuming no significant change at other sites, the site of the proposed development now holds 98.67% of Scotland’s resource of SD13 young dune slack, and 13.18% of the Great Britain resource which, in the light of these recent findings, should be reported as 28.31ha.
50. The fact that this young dune slack is found mainly within the SSSI part of the Development, emphasises its close association with the dynamism and movement of the sand sheets there, and the formation of new deflation hollows in their wake. It also emphasises the national importance of this part of the Foveran Links SSSI.
51. Slacks at this site would be destroyed or partly destroyed over 9-10 of the planned holes, 5 of the holes within the SSSI, including very rare SD13 young slack. Dune slack vegetation is very much process-related and it is extremely unlikely that transplanting schemes could emulate these processes. In the case of SD13 young dune slack this vegetation exists very much as part of a thin skin on the sand surface that is likely to be badly damaged by any relocation methodology. This skin, a form of algal/microbial mat, is believed to be of critical importance in the timing of dune slack succession (SNH27). The likely lack of success of transplanting is addressed in more detail by Paul Rooney.
52. We also understand that dune slacks will have 50-100cm of sand added above their current surface, possibly with additional drainage. This raises the slack surface above the water table. When this surface is vegetated the functionality of these areas as slacks will be permanently destroyed.
53. Dune slack habitat that is not directly destroyed during fairway construction would be adversely affected by dune stabilisation, drainage, and application of fertiliser and/or herbicide (even as drift). The vegetation of the damper slacks or slacks with heath (heath itself is dealt with separately below) would be damaged even by golf play – by clubhead impact, trampling and tracking by buggies. This type of impact, even at a low level, is likely to prevent the development of any new young dune slack vegetation in the wake of the sand sheet adjacent to the 15th hole.
54. As the slacks age, the young dune slack vegetation is replaced by creeping willow dune slack vegetation, giving a variety of age-related structure that is rare in the UK (see extract from ES cited above). The development site (2006 figures) holds 11.83ha of creeping willow dune slack, of which 4.79ha is in the SSSI. All of the dune slack vegetation is highly reliant on its relationship with the water table, and the water table will be altered by soil reprofiling and possibly drainage and more indirect impacts of dune stabilisation on soil/plant/atmosphere water relationships.

55. The development site holds a total of 15.66ha of Annex I habitat Humid dune slacks, of which 8.27ha is within the SSSI.

Dune Heath

56. Though the only mapped heath NVC vegetation is the Priority-rated H11b *Empetrum nigrum nigrum* crowberry heath, there is more heath (in the wider sense – not necessarily the Priority-rated habitat) on the site, especially in the south. This has been acknowledged in Production T50 Table 1, which gives a total area of 15.56ha in the 2008 map, almost all of which is outside the SSSI.

57. The proposed course layout cuts through the main area of H11b, which is likely to destroy areas of a priority-rated European habitat with a very restricted UK distribution, being limited to a total extent of 338ha in the *Sand Dune Vegetation Survey of Scotland* (all UK extent is in Scotland).

58. Though some H11b recorded by Dargie in his *Sand Dune Vegetation Survey of Scotland* (SNH23) on the northern margin of the Menie sand sheet appears to have been buried by the advancing mobile sand, this should not be interpreted as damage, but as a consequence of natural dynamism. The potential for this vegetation to recolonise naturally is illustrated by a report on the situation at the south end of nearby Forvie where an area of sand that was bare in 1954 had, by 1989 become “*almost completely covered by vegetation in which crowberry and heather feature prominently*” (SNH26).

59. The development site holds 15.56ha of this Priority rated habitat, almost all of it well south of the SSSI, representing 4.6% of the Scottish and UK resource of 338ha. A significant part of the UK distribution of this habitat is at neighbouring Forvie.

60. SNH received this information on 6.5.08 and essential contextual information as T50 later that week. SNH analysis of this information is incomplete, and further comment and adjustment of statistics may be made in the SNH rebuttal Statement. The impact on the area figures for other Annex I habitats, notably Grey Dune, is accepted.

Grey dune

61. The priority-rated habitat **2130 Fixed dunes with herbaceous vegetation (“grey dunes”)** represents a wide range of NVC types.

62. The 2008 vegetation map received on 6.5.08 substantially revises the extent of this habitat and also the distribution of the NVC communities that comprise it. Though SNH has had insufficient time to provide new figures for the areas that would be impacted for the areas within and outwith the SSSI, it is clear from the maps and tables in T50 that a large proportion of the development area within and outwith the SSSI would be impacted by the golf development.

63. Excavation and removal of grey dune turf to form fairways would remove large areas of habitat from their natural situation with regard to processes and transitions that could not be duplicated by transplanting.
64. The course will thus have a **severe impact** on the condition of this Priority habitat within and outwith the SSSI.
65. As an international context for the value of Annex I habitat extent in the development site, it is instructive to examine a review of Doonbeg in the Republic of Ireland, also threatened by golf development:

Dúchas – The Heritage Service have estimated that there are national totals of 2,850ha, 3,800 ha and 5,700 ha of embryonic shifting dune, white dune and grey dune, respectively, in Ireland. It is further estimated in Section 3 that there are 0.30 ha, 7.75 ha and 28.70 ha of these habitats in the study area, which represents 0.01%, 0.2% and 0.5% of the national total, respectively. Grey dune is a priority Annex I habitat and the estimated 28.70 ha of this habitat is significant both nationally and in a European context. Additional areas which may in the past have been classified as grey dune at White Strand have been damaged and are not included in these calculations. (SNH19)

66. Using 2006 data, the development holds 84.92ha of grey dune (as compared to the 28.70 ha at Doonbeg), of which 13.75ha lie within the SSSI. There are 21,500ha of grey dune in Great Britain of which 14,900ha are in Scotland. The development site thus holds 0.57% of the Scottish resource. Remember that 28.7ha was regarded in Ireland as being important in a European context – this site has over three times this area.
67. The SSSI and the remaining part of the development area hold habitat such as swamp and wet grasslands that are not Annex I habitat, but these add to the biodiversity of this site, provide continuity of natural habitat, and have moderate interest in their own right. This is acknowledged in T50, which includes some of these as being of ‘Moderate’ conservation interest.
68. Overall, the site holds 144.78ha of Annex I habitat (2006 data), with 88.68ha of this Priority rated. The SSSI holds 35.68ha of Annex I habitat, of which c13.75 is Priority rated. The scale of impact of this proposal on the natural heritage interests and the wider SSSI is strikingly illustrated in Fig 5 of T50, stating that 182.78ha of “Key Dune Habitat” could be impacted by the development. SNH concurs with this map as a general indication of impact.

The impact of golf on sand dune interest

69. The Scottish Golf Environment Group published a list of ‘Principles’ of an Ecological Approach’ to golf course development (SNH37), stating that *The primary principle is to work with nature, rather than against it, to produce a viable and environmentally sustainable recreational resource. A golf course should fit into its surroundings and not be imposed on them.*

70. The golf course will fragment and disrupt ecological processes over the entire footprint of the golf course on the dunes, not just the areas directly lost. Fairways and paths will interrupt ecological gradients and act as biogeographical barriers. This disruption of ecological processes is over and above the impact on vegetation of mobile sand stabilisation. Habitats that need a regular input of blown sand will be deprived of this, and habitats that need regular exposure of new bare surfaces will die out as sand dome movement is stabilised.

71. The Sports Turf Research Institute booklet on heathland management notes that “the fragmentation and isolation of habitats is a worldwide phenomenon and one of the most significant threats now facing the conservation of our remaining landscape”. With respect to golf courses on dune heaths it goes on to say:

chemical and water usage can also severely affect the quality of the heath/moor. ... Chemicals including fertilisers ... and pesticides will, if used without due care and consideration, lead to a rapid transformation and loss of the heathland sward to one with fewer delicate (subordinate) plant species and a much higher percentage of the coarser more dominant grass species and broad-leaved weeds. A major factor influencing the delicate balance that exists on the heathland golf course is the obvious effects caused through trampling and foot traffic. ... the golfer walking or trampling through the sward in search of golf balls is in effect adding an additional kind of stress into the equation, so tipping the balance away from the desirable sward and over to those plant species more able to exploit increasingly disturbed ground. (SNH40)

72. A study of trampling on crowberry dune heath in Denmark demonstrated very high vulnerability to trampling, with crowberry cover reduced by 50% by as few as 200 human transist over a four-month period; soil compaction was also evident (SNH29).

73. Following a field meeting with the developer on 6th May 2008, it is now our understanding that fairways will be established by excavating and removing all turf, removing uneven topography from the exposed surface, then planting this with a proprietary seed mix. The displaced turves will be placed in ‘receptor areas’ built from existing bare areas or surplus sand from reprofiling work, with topography attempting to mimic dune and slack. The impact on Annex I habitat is thus very much higher than we believed when submitting our original objection, in that we would regard all fairways as completely destroyed in terms of their original ecological and conservation value. We do not accept that transplanting in receptor areas is a viable substitute for vegetation that has adapted to natural, dynamic processes. This argument is developed further by Paul Rooney.

74. It is thus evident that construction, management and the playing of golf will have an adverse interest on the Annex I habitats of the SSSI and on those of the remainder of the development site.

Biodiversity

75. The adverse impacts of the Development on the habitats described above, also has an adverse effect on the biodiversity of the site, both for the habitats

themselves and the species associated with them. The policy context for evaluating the significance of these impacts on biodiversity is presented by SNH in its *Policy and Guidance Context for the Consideration of the Development*, to be submitted on 21.5.08 as a Written Statement (CIN/ABS/001).

Favourable Conservation Status and other aspects of the Habitats Directive

76. As set out in the SNH Written Statement (CIN/ABS/001) the overriding aim of the Habitats Directive is to achieve Favourable Conservation Status for habitats listed on Annex I and species listed on Annex II.
77. Article 17 requires reporting on the conservation status of habitats based upon range, extent, structure and function, and future prospects. This proposal adversely affects all but range. Article 17 applies to all habitat, not just those parts of the habitat within designated sites.
SNH reports on the status of all features for which a site is notified as SSSI via its Site Condition Monitoring (SCM) programme, which complies with the UK's Common Standards Monitoring (CSM).
78. The SSSI was in Favourable Condition when monitored in 2000 (Dr Tom Dargie completed the recording forms for Sand Dune), though there were minor problems with issues such as cattle feeding in a limited area of the site. There is no doubt that if this development proceeded, the part of the SSSI within the development site would be permanently in Unfavourable condition, because it would fail to meet targets relating to extent, structure, functionality, zonation, biodiversity and negative indicators (e.g. alien species), and would be judged to be in unfavourable condition, to the extent that denotification of the affected section would have to be considered.
79. SNH employs the results of the SCM and other information that may be available to report to the UK Joint Nature Conservation Committee (JNCC) to inform the UK's report to Europe on the Favourable Condition Status (FCS) of Annex I habitats. It is important to stress that FCS refers not just to the SAC and SSSI network, but to the entire national (UK) resource of each Annex I habitat.
80. The main impacts of the proposed course on the FCS of the four Annex I habitats would be on overall UK area and on structure and function.
81. In terms of capacity of recovery, it would be very difficult to restore the natural features of mobile dune after it had been vegetated for some time: the organic contribution to the soil would impede restoration. Restoration of all natural habitat would be seriously impeded if not impossible due to deterioration or destruction of the natural seed bank by removal of turf and/or successive applications of fertiliser and herbicide.
82. As far as Site Condition Monitoring is concerned, the following extracts from an SNH internal report are of relevance:

Scotland has the bulk (71.4%) of Britain's sand dunes resource, with around 50,000ha of blown sand (dune and machair). Some 9127ha

*(18.25%) of the overall resource has been 'lost' to built development and plantations. Of the remaining 40875ha, 8487ha (21% of 40875) has been converted to improved grassland, where 'natural' species have been displaced by sown perennial rye-grass *Lolium perenne* and crested dogtail *Cynosurus cristatus*. The areas involved can be extensive, with 42.6% of the dune/machair area of Orkney thus converted. In southern Scotland improved grassland may be for amenity rather than agriculture. This leaves 32388ha of dune and machair habitat, 64.7% of the original resource. These figures include machair as there is not yet a complete list of machair sites using the latest definition.*

There are 60 SSSIs in Scotland with sand dune as a notified feature, of which 57 were monitored. Of the 57, 28 were in unfavourable condition (49%), the highest proportion in unfavourable condition of any coastal habitat in Scotland.

83. The Habitats Directive defines conservation status thus:

A habitat's conservation status is 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.

84. It is beyond doubt that the stabilisation of the main sand sheet at Menie will have a very significant detrimental impact on the suite of Annex I habitats and will thus adversely affect the conservation status of these, in that processes will be very significantly disrupted and (for all practical purposes) permanently damaged or destroyed. No mitigation proposed by the applicant will significantly reduce this impact – the developer has made it clear that the Menie sand sheet will be stabilised, with far-reaching impacts on the dynamism of the site, the dynamism of habitats, and the survival of significant areas of these habitats.

85. Production T50 notes the current condition of parts of the SSSI and records these parts as Unfavourable. The supporting information suggests that the problems (which SNH does not dispute) are of a nature that can be addressed and resolved. The loss of condition associated with the construction of a golf course of the type and scale proposed would be irretrievable.

Conclusion

86. Stabilisation of bare and mobile sand will have a very serious negative impact on the condition of sand dune habitat at the development site, within and outwith the SSSI. When the processes are seriously disrupted by this stabilisation, the overall biological interest will be very seriously compromised, probably to the extent that denotification of the southern section of the SSSI would be proposed. This damage would be compounded by golf course construction and management: reprofiling, drainage, herbicide and fertiliser application, and mowing. Play will also have an adverse impact on more vulnerable habitats, even where these are not part of the rebuilt fairways.

87. In the ES, the developer accepts that the proposed golf course would have a 'very severe' impact on the natural heritage interest. The developer proposes to translocate habitats on to existing bare areas and an area of new dune to be constructed in the west. As will be shown by my colleague Paul Rooney, this is most unlikely to succeed.