

TOWN AND COUNTRY PLANNING SCOTLAND ACT 1997

TOWN AND COUNTRY PLANNING (INQUIRIES PROCEDURES) (SCOTLAND)
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**OUTLINE PLANNING PERMISSION FOR GOLF COURSE AND RESORT
DEVELOPMENT ON LAND AT MENIE HOUSE, BALMEDIE, ABERDEEN**

PRINCIPAL PRECOGNITION OF

Dr JIM HANSOM, M.A., Ph.D., F.R.G.S.

Reader,
Department of Geographical and Earth Sciences
University of Glasgow
Glasgow G12 8QQ
Evidence on behalf of Scottish Natural Heritage

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Scottish Natural Heritage
16/17 Rubislaw Terrace
Aberdeen
AB10 1XE

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INTRODUCTION

1. My name is Dr. Jim Hansom. I am a Reader in the Department of Geographical and Earth Sciences at the University of Glasgow. My research interests include coastal change, erosion and management in response to the changes in sediment supply, sea level and storm activity that affect beaches, sand dunes and rocky coasts.
2. I have written over 90 peer-reviewed scientific publications and 3 peer-reviewed books including *Coasts* (1988) Cambridge University Press, and *The Coastal Geomorphology of Great Britain* (2003) (with V.J. May), a volume of the Geological Conservation Review published by the Joint Nature Conservation Committee (statutory adviser to the UK Government on UK and international nature conservation with responsibility for the delivery of UK and international responsibilities of the separate nature conservation agencies - the Council for Nature Conservation and the Countryside, the Countryside Council for Wales, Natural England and Scottish Natural Heritage. I served on the Scientific Advisory Committee of SNH for 8 years and the West Areas Board of SNH for 8 years, the final 4 as its vice-chair. I am a director of the SCAPE Trust (Scottish Coastal Archaeology and the Problem of Erosion). I am editor of the *Scottish Geographical Journal*, I serve on the editorial boards of the *Journal of Coastal Research*, *Journal of Coastal Conservation*, *Irish Geography* and I am the former editor of *Applied Geography*.
3. I have acted as a geomorphological consultant on several coastal developments, including golf developments, gas pipeline and electricity interconnector landfalls, and housing developments, that have involved both loch shores and open coast beaches and dunes. In 2004, I was invited by the previous owner of Menie Estate to advise on the geomorphological implications of a proposed golf development involving the Menie Links part of the Foveran SSSI. My advice at that time was that for scientific and dune management reasons, any development should attempt to avoid the very active sand blow environment of the Menie sand sheet and high dunes at Sandend Burn and that specialist advice should be sought

regarding the avoidance of the ecologically important habitats in the south of Menie Links. I was not further involved in this site until 25 October 2006.

4. On 25 October 2006 I was commissioned by SNH to appraise the geomorphological interests of Foveran Links SSSI and to consider the implications of the TIGLS proposals (Core Production G3) on the designated interests of the SSSI and the adjacent dune areas to the south.

5. In my precognition I will outline the following:
 - (A) The geomorphological interests of Foveran Links SSSI (which includes the northern part of Menie Links);
 - (B) The importance of the geomorphological interests at Menie Links compared with the remainder of Foveran Links SSSI, Northeast Scotland and the broader sand dune resource of Great Britain;
 - (C) The impact of the proposed development on the designated geomorphological interests of Menie Links within Foveran Links SSSI;
 - (D) The geomorphological interests of the areas outwith the SSSI, which are pertinent to the proposed development;
 - (E) Coastal processes within Aberdeen Bay and their link to the designated geomorphological interests at Menie Links and the proposed golf course development at Menie Links;
 - (F) Overall assessment of the proposed development on the geomorphology of Menie Links.

(A) The geomorphological interests of Foveran Links SSSI (which includes the northern part of Menie Links)

6. The Foveran Links SSSI covers three contiguous areas of sand dunes named on the OS map. These are Foveran Links which abut the Ythan estuary at the northern end of the SSSI, Drums links which extend south of Foveran Links to the Sandend Burn, and Menie Links to the south of the Sandend Burn. The SSSI boundary covers the whole of Foveran and Drums Links, and the northern end of Menie Links south of the Sandend Burn (SNH 1). The northern end of Menie

Links. hereafter referred to as “north Menie” comprises the southern third of the Foveran Links SSSI and has two main areas of bare sand: the extensive bare sand area of the north Menie sand sheet in the south and the much smaller bare sand area between the higher Sandend Burn dunes in the north (SNH 11). Moving southward from the SSSI boundary lies the southern part of Menie Links and then Pettens Links, which abuts with Balmedie Links at its southern boundary.

7. The SSSI citation (SNH 1) states that:

“...Foveran Links is an important part of the Sands of Forvie coastal area to which it is closely linked by a variety of environmental processes. Foveran Links, together with South Forvie, is a type example of what may be described as a normal sand dune system with a dynamic interchange of material between the frontal dunes and the extensive sand beach and spit complex at the mouth of the River Ythan. The site is of exceptional importance for the study of a wide variety of coastal landforms and processes...”

The area covered by the Foveran Links SSSI dune system together represent an exceptional site for coastal dune geomorphology since there exists a remarkable assemblage of wind-blown landforms, some of which are natural and of an extent that is unparalleled in Great Britain (the natural sand sheet and inundated dunes at north Menie), while others are more representative of the dune coastline of northeast Scotland (the Sandend Burn high dunes and the human modified sand sheet at Foveran). Of these the natural features at the north Menie sand sheet are of outstanding scientific interest both individually and as an assemblage, containing an

“unrivalled suite of geomorphological features and deposits that are of considerable national scientific interest”

(SNH 6). North Menie is regarded to be an excellent field site for innovative research at a variety of scales, a view fully supported by independent experts (SNH 6).

8. The dune landforms and processes at north Menie form a spectrum of dune features and processes ranging from a highly dynamic bare sand sheet and

associated vegetated adjacent dune features, to relatively more stable vegetated inter-dune hollows (dune slacks). The main sand sheet is highly mobile with large areas of wind-blown bare sand that are subject to movement during windy conditions. The lack of vegetation colonisation on the sand sheet surface indicates a vigorous wind-dominated environment that is (and has been throughout the period of its documented history) hostile to the establishment of the pioneer species and dune grasses that flourish on adjacent dunes.

9. The unvegetated sand sheet at north Menie represents a landform that is in dynamic equilibrium, with its overall location, shape and surface features constantly self-adjusting to changes in sand budget. Erosion and transport of sand in the south feeds the rapid transit of sand northward over the sand sheet surface to be eventually deposited as the wind slows when the vegetated dunes in the north are encountered, leading to their progressive burial (SNH6). An unusual feature of the north Menie dunes is that as the sand sheet migrates to bury the dune and dune slack vegetation in the north it also systematically re-exposes previously sand-covered surfaces in the south which are then sequentially re-colonised by vegetation. Deflation of these surfaces continues until a more resistant subsurface is reached, such as beach gravel, glacial till or the underlying water table. Since such surfaces may be more poorly drained than adjacent sandy surfaces and are characterised by distinctive vegetation, they are called dune slacks. Over time this process has resulted in the wholesale movement of the sand sheet in a northward and down-wind direction. This inherent dynamism not only underpins the rationale for the designation of the site for geomorphological processes and forms but, as is described in the precognition of Stewart Angus for SNH, also supports a wide range of sand dune ecological interests that fundamentally depend upon the geomorphological functioning of the site. The evidence and time frame for this dynamism is based on the historical aerial photograph record (1946, 1949, 1954, 1963, 1967, 1973, 1988, 1994, 2001, 2006) although the Old Statistical Account for Scotland (1791) for Belhelvie Parish, which includes Menie, reports trees found buried beneath the "*benty hillocks*" or sand dunes at the coast, attesting to dune movement and inundation of mature vegetation by sand before that time (SNH 11). Within a Great Britain context this long-lived dune movement has created a distinctive and

unique set of landforms whose progressive northerly movement has left in their wake a series of ecological stepping-stones back through time.

10. Measurement of the rate of northward movement of the sand sheet along a coast-parallel transect (SNH 6) demonstrates variable rates of migration of the south and north margin between 1949 and 2006 (Table 1) that range from 14m/yr in the decade 1988-1994 to 5m/yr over the decade 1994-2006. These mean rates of northward movement should be viewed with caution as the progress of individual sections of both margins is highly variable and unlikely to represent even progression during the periods measured. The scale and rate of movement is best visualised using time-series geo-referenced vertical aerial photography (SNH 6) which reveal the large scale northward movement of the Menie sand sheet between 1949 and 1973. A maximum bare sand area of 15ha occurred between 1949 and 1963, followed by a reduction to 9.4ha between 1973 and 1988, an increase to 11.5ha in 1994 and 11.4ha in 2006. In addition, the northward movement of the sand sheet is such that the position of the *northern* margin in 1949 barely overlaps the 2006 position of the *southern* margin.

Table 1 Amount and annual rate of northward movement of the margins of the Menie sand sheet along a coast-parallel transect (+ values show north movement, - values show south movement).

Time period	South margin	North margin
1949-1963	150m (11m/yr)	-20m (-1.4 m/yr)
1963-1973	110m (11m/yr)	-55m (-5.5 m/yr)
1973-1988	190m (13 m/yr)	210m (14 m/yr)
1988-1994	40m (7 m/yr)	80m (14 m/yr)
1994-2006	60m (5 m/yr)	60m (5 m/yr)

11. It is important to view the assemblage of landforms at Menie as functionally interrelated to the overall beach conditions within Aberdeen Bay (SNH 3). The Menie sand sheet is fed by wind erosion of sand from two main sources, upwind blow-outs sited close to the coastal edge and erosion of the flanks of pre-existing dunes that become inundated by the advancing sand sheet. Blow-outs are linear

deflation hollows produced by wind erosion of sand, often, but not exclusively, cut into the dune ridges closest to the beach so the condition of the beach-dune interface is critical to this supply source. In previous decades not only the position but also the width of these blow-outs has fluctuated so that in some years they are low and wide, with little vegetation growth to impede sand transit inland. This causes alternating phases of instability and enhanced dynamism to pass throughout the sand sheet (i.e. when the coastal blow-outs are wide, the bare sand area and dynamism increases (as occurred in 1949) and vice versa when the blow-outs are narrow and sand movement becomes temporarily impeded by vegetation (as is the present situation). Shoreline positions plotted from aerial photographs and GPS (SNH 6) show that short term variations in beach width do occur that will result in accretion in some areas followed by erosion of the same areas a few years later. It is likely that the widths of the blow-out gaps behind the beach and the extent and vigour of the sand sheet at Menie, are related to variations in sand supply on the beach at north Menie and thus the overall sand supply within Aberdeen Bay. Since the northward movement of the sand sheet is such that the position of the *northern* margin in 1949 barely overlapped the 2006 position of the *southern* margin then the active blow out gap that feeds sand to the sand sheet has also migrated northward and narrowed, with the previous blow-out gaps to the south becoming stabilised by vegetation. Although some blow-outs move northward, the aerial photograph record shows more northerly blow-outs opening as their southern counterparts are closed (SNH 6, SNH 11).

12. Human visitor pressure may also impact on the dune vegetation initiating instability, particularly in the critical area close to the beach and car access to the rear of the Menie dunes is known to have occurred in the 1960s and 1970s (SNH 12). However, widespread instability at north Menie precedes this period of popular car ownership and associated recreation pressure, with the 1945 and 1949 photographic evidence showing the sand sheet to be at a maximum over the same period as the blow-out gap to the beach was at its widest (SNH 11).
13. The scientific interest of the more restricted bare sand area of the high Sandend Dunes at the northern part of Menie Links is linked to the proximity of the Sandend Burn which serves to restrict any northward movement of substantial

amounts of sand. The burn limits the northward progression of the dunes and also may contribute to their growth, since if evacuation of sand is restricted then the dunes may build higher *in situ*. Separated from the main Menie sand sheet in the south by flat gravelly areas, but connected to and partly fed by the main coastal dune ridges to the southeast, much of the sand in this area appears to be recycled from erosion of the flanks of the adjacent high dunes to be cascaded down over steepened slopes into Sandend Burn. Scientifically interesting in its own right, this smaller and self-contained section of the SSSI may be operating as a semi-closed sediment system (SNH 3), unlike its more open and dynamic southern neighbour. However, evidence of human interference is another important difference in the scientific interest within the SSSI, with military pattern barbed wire fences exposed in the eroding flanks of the high dunes.

14. The key to the geomorphological interest at north Menie lies in the ongoing dynamism, unfettered movement and scale of the main sand sheet and this has resulted in the development of a classic assemblage of landforms and dune habitats that are dependent on this dynamism. The combination of these elements and the relative lack of human interference (unparalleled in mainland Great Britain) make this part of the Foveran SSSI of prime scientific interest.

(B) The importance of the geomorphological interests at north Menie Links compared with the remainder of Foveran Links SSSI, Northeast Scotland and the broader sand dune resource of Great Britain

15. The now partly stabilised sand sheet in the extreme northern part of Foveran Links SSSI is of scientific interest from both a geomorphological and ecological perspective. The dunes remain representative of the dune features of North East Scotland and although the sand sheet now has a much restricted and diminishing sediment supply it remains of interest precisely because of the dynamics of this change. In addition it has been affected in the past by sand extraction and military use (sand loading ramps, blockhouses and pillboxes are now eroding out of the dune surfaces) as well as by more recent back beach erosion protection measures aimed at sealing blow-outs at the coastal edge in the south-east of the bare sand area. In spite of this, the dunes and stabilising sand sheet remain of

interest. In contrast, north Menie has remained relatively free of human interference leaving the dynamic processes unhindered and resulting in a very active sand sheet site, burial of downwind dunes, exposure of upwind current deflation surfaces and re-exposed surfaces. Together these represent an exceptional series of landforms at a scale of development unseen elsewhere in Great Britain.

16. Migrating sand sheets are rare on the coast of Great Britain and although blow-outs occur on most dune coasts, there are extremely few locations where such features feed large sand sheets which migrate consistently along the coast. As a result of human development and afforestation, many of the dune systems in England and Wales are now relatively stable with the few and restricted areas of bare sand totalling 135ha in Wales and 253ha in England (SNH 31). In Scotland the total bare sand area is much greater at 656ha. All of the major sand sheets in Great Britain occur in Scotland and since the bare sand areas of the Western Isles and the rest of Scotland are mainly small and fragmented, the North East coast hosts a significant proportion of the Great British sand dune resource, the dunes between Newburgh and Bridge of Don comprising 80ha (12.1%) of the bare sand area contained in Scottish sand dune systems (SNH 22, 23). As a result the North East of Scotland hosts the largest areas of bare sand in Great Britain. However, the areal extent of this resource is of secondary importance to a scientific interest based on the extent and unmodified dynamism of the inter-related processes, landform and vegetation assemblage at north Menie.

17. The north Menie part of Foveran Links SSSI has recently been proposed as a Great Britain Geological Conservation Review site (GCR site) to recognise its scientific interest at a Great Britain Level (Table 2) and is currently under review by the Chief Scientists' Group of the UK JNCC. This review takes a minimalist approach whereby additional sites must materially add to the list of features or processes included. A summary of the site qualification criteria to be satisfied for the GCR designation are that they:

- include elements or features that are representative of the essential Earth science features of Great Britain;

- may also include exceptional sites that are nationally or internationally-important.

To achieve GCR status, standard comparative information between sites is needed and a discussion of why a site is important should refer to, for example, international importance (e.g. presence of 'type' features, rarity in Great Britain, globally or both), exceptional development of feature(s), and 'completeness', as well as describing the site's role in representing part of the GCR network. The sand sheet at north Menie is of similar extent and quality as the sand sheets in Denmark and Holland, some of which have been deliberately destabilised in order to recreate the sand dune dynamics and diversity of habitat that currently occur naturally at north Menie. It is my view that the predominately natural process, landform and vegetation assemblage at the north Menie part of the Foveran Links SSSI is of national (Great Britain) and international importance, a view shared by Scottish Natural Heritage, Natural England, The Countryside Council for Wales, and by three independent expert reviewers (Prof J. McManus (St Andrews University), Prof V. May (Bournemouth University) and Dr M. Smith (Chief Geologist, Scotland, British Geological Survey) (SNH 6).

Table 2 Geomorphological interests and significance of North East Scotland's large dynamic designated sand dune systems (SNH 6).

Site & Status	Special Interest	GCR Criterion	GCR Criterion	GCR Criterion
		<i>Representative features</i>	<i>Exceptional features</i>	<i>National / International features</i>
Strathbeg (GCR)	Shore-parallel dune ridges, large blowouts, sand sheet, restricted sediment supply	Dune ridges and slack systems	Parabolic blowouts	Nationally important dunes & sand sheet. Internationally important parabolic dunes
Forvie (GCR)	Shore-parallel dune ridges, well-documented dune movement, large parabolic dunes, re-circulating sand supply to sand sheet, limited migration to north	Dune ridges & slack systems	Re-circulating sediment system supplies sand sheet; exceptional parabolic dunes in north	Internationally important re-circulating sand sheet. Internationally important parabolic dunes.
Foveran Links (GCR & SSSI) (ie excluding north Menie Links)	Shore-parallel dune ridges, north-moving sand sheet now stabilising with restricted sediment supply, sand feed to Ythan & Forvie to north	Dune ridges & slack systems	Now restricted sand sheet movement due to reduction in sand supply	Nationally important, diminishing sediment supply contributing to reduced dynamics of sand sheet
Foveran Links (SSSI) (north Menie Links)	Shore-parallel dune ridges, highly dynamic sand sheet migrating north, controlled by sand feed from south & driven by breaks in coastal dune ridge	Dune ridges and slack systems	Highly dynamic large sand sheet. Migration north in recent years has been fuelled by dynamic sand supply from the south	Internationally important, ongoing wind-driven sediment feed & rapid north migration of sand sheet landforms

(C) The impact of the proposed development on the designated geomorphological interests of north Menie Links within Foveran Links SSSI

18. The key to the designated geomorphological interest is fundamentally based on the unfettered operation of the natural processes of wind blown sand erosion and deposition that result in landform dynamism and mobility of the sand sheet at north Menie Links. As a result the proposal to stabilise the sand surface will serve to remove the key scientific interest. The TIGLS Environmental Statement (Core Production G3) acknowledges that dynamism underpins the designated geomorphological interests:

“Subject to detailed appraisal, however, the active deflation surfaces, mobile sand sheets, retreating escarpments and high active dune ridges to the north and especially northeast of the “dome” are likely to be considered to be of higher conservational value for geomorphological reasons”

Yet the ES (Core Production G3) and the detailed geomorphological report (SNH 3) acknowledges that as part of this proposal all of the key areas of bare sand will need to be stabilised. Of greatest geomorphological concern is the proposal to stabilise most of the active sand sheet at north Menie Links which is the most important single geomorphological element within the area of the SSSI affected by the proposed development.

19. Since the original detailed application was withdrawn by the developers, a revised course layout was submitted by the developer (received 18 April by SNH) and, later, a hole by hole summary of the impacts (T4) (received 12 May by SNH) and so at the time of writing (18 May) there has been insufficient time to fully assimilate its implications. Thus the right to incorporate further comments within the rebuttal statements is reserved. Core Production G3, T4 and SNH 3 all acknowledge that the impact on the geomorphology for all 18 holes will be at least “Minor Adverse” and will be “Major Adverse” for most of the proposed holes within the designated area (Core Production G3). I concur with Core Production G3 that the degree of stabilisation of the sand sheet and dune surfaces in the proposed development will be extensive and adverse for the geomorphological interest. T4 shows that almost 11Ha of a total of 14Ha of bare mobile sand in the

north Menie part of the SSSI is proposed to be stabilised. Since the bare sand contained within the Sandend Burn dunes is excluded from the development and the total area of bare sand on the north Menie sand sheet in 2006 was 11.4Ha (SNH 6) then close to 100% of the sand sheet will be stabilised. This serves to remove the geomorphological interest of the site. In this crucial respect Core Production G3 fails address the key point of the designation and proposes to remove the dynamism of the site. It also fails to fully detail the mitigation measures on site, or provide compensatory sites elsewhere, to recreate the processes and landforms that will be destroyed by the proposed development. Setting aside the fundamental point that stabilisation will arrest the dynamism for which this site is designated, it remains to summarise the impacts that the proposed development will have on the SSSI on a hole by hole basis.

20. The “Back Nine Holes” (within the SSSI). T4 acknowledges that all of these holes impact on the geomorphological interest but that some holes, or parts of holes, are located in stable dune topography and in places deflation surfaces are used that may be floored by gravel or are close to the water table. T4 states that:

“all tees, fairways and greens require construction, stabilisation and cut and fill construction techniques. These cut and fill operations have not been described in detail, but are referred to as topographic smoothing where any uneven topography, deeper hollows and depressions and obstructive ridges and sand hills are modified or partly removed to achieve the necessary shape of the fairway”

Hole 10 lies mainly within older topography characterised by patches of glacial material with a sandy veneer in places and sited well inland below the rising ground to the east. The surrounding dunes are active and will require local stabilisation.

Hole 11 lies east of the more stable dunes but the areas between tees and fairways lies within area of young re-depositional dunes that will require stabilisation as well as the construction of artificial dunes on flat ground to the west of the fairway.

Hole 12 has been repositioned in this layout but still requires the use of the north extension of encroaching young dunes which are part of the sand sheet. The tees lie in mainly deflated areas (and so will require to be grassed over). T4

states that the green is close to the tees for Hole 13 at 24.5m O.D.

“and will be part of the stabilisation requirements of the “dome” bare sand area. About 50% of the Hole is on some type of stabilisation area”

That substantial modification of the surface of the northern part of the north Menie sand sheet associated with this hole is correct. What is unstated is that the sand feeder areas to the south and east of this hole will also be required to be stabilised by vegetation, otherwise the hole will be regularly inundated by blown sand from an extremely active section of the sand sheet.

Hole 13 This is a short hole located east-west across the central/south part of the rising bare sand sheet, T4 stating:

“its construction is totally dependent on progressive stabilisation of this surface. This stabilisation will have to cover a much greater area than the fairway, green and tees. It will require almost complete cover, in order to avoid sand drifting to or from the areas to be used for the requirement of golf course design”

In addition the green of Hole 13 is sited partly on the steep east slope of the sand sheet, an area subject to sand movement. This will require substantial cut and fill of sand to produce a gentler surface as well as complete stabilisation by vegetation. Again, what is left unstated is that the bare sand feeder areas outwith the footprint of the Hole will also require to be stabilised to prevent sand encroachment.

Hole 14 is a re-sited hole from the first course layout and is now sited within the dry dune slack between the coastal dune ridge and the interior high dune ridge. The fairway lies at 8.30m OD and is the closest part of the proposed course to the active frontal dunes and beach. A substantial part of Hole 14 thus occupies an area that is affected by blown sand from the crest of the coastal dune as well as sand movement cascading east down the side of the high dunes that is occasionally blown from the sand sheet beyond. As such this hole will require considerable cut and fill as well as stabilisation of the surfaces produced. The coastal dune ridge will also require active management to prevent or slow sand blow, likely by the use of paling fences. The proximity of this part of the proposed course to the active coastal dune and coastal edge beyond is not recognised good practice and may require further remedial works in the future. Although SNH 3 claims that:

“... the case for the coastal dune remaining untouched is absolute”

at this hole, the coastal dune is extremely close to the fairway and both managed coastal dune and fairway will be affected by blown sand during windy conditions.

Hole 15 again is a re-sited hole from the first course layout and is now sited within a damp slack at about 12m O.D. and underlain by glacial deposits to the south of the Sandend Burn high dunes. This hole has a more limited impact on geomorphology since it is sites on low lying and level ground close to the water table. However, the southern flanks of the high dunes to the north may have to be partly stabilised to prevent sand cascading down these steep slopes onto the fairway and will almost certainly require drainage works since it has standing water during wet and cold conditions. There will be a substantial impact on the habitat of damp slack vegetation that will be addressed by Stewart Angus of SNH.

Hole 16 lies within a presently fairly stable area of mature dune with only limited cut and fill required for golf purposes.

Hole 17 lies along the main axis of the Menie sand sheet with the tees located on stable mature surfaces east of the green of Hole 16. The fairway rises south over the young dunes forming as the northern edge of the Menie sand sheet advances over the per-existing low dunes. The green is sited at 19.5m O.D. on a very active area of the sand sheet close to the area where there is an active sand feed from the eroding dune to the south and east. The steep faces of the dunes to the east will allow sand to cascade into this area. T4 states that about 60% of this Hole will require some degree of stabilisation and other (unspecified) forms of protection. Again, no account is given of the adjacent surfaces outwith the Hole area that will require to be stabilised to prevent sand encroachment.

Hole 18 is a straight alignment along the axis of the deflation surface produced by the northward transit of the Menie sand sheet. The tees are proposed to be sited within the high dunes that are joined to the dunes of the coastal edge by a high, but still active partly vegetated sandy ridge that separates two linear blow-outs that were formerly wider and more active than at present since they have become partly closed by sand deposition and vegetation growth. Since these very exposed tees will be surrounded by steep erosional slopes and active sand blow they will require (T4):

“well positioned, protective stabilisation measures”

T4 claims the blow-out to be a wide “gap” in the coastal dune ridge that is now closed and re-vegetated. Whilst it is agreed that the “gap” has narrowed and become more vegetated than formerly, there still remains a substantial flow of wind blown sand through this area as evidenced by the amounts of sand deposited along the flanks and crest of the dunes. The fairway and green of this Hole lie along the axis of a low-lying damp slack area with broken mature dune topography. Some amount of cut and fill will be needed here but the main impact will be upon the well developed vegetation communities that will be commented upon by Stewart Angus of SNH.

(D) The geomorphological interests of the areas outwith the SSSI, which are pertinent to the proposed development

21. Although the principal concerns for the geomorphological interests are largely located at north Menie Links within the Foveran Links SSSI, the “Front Nine Holes” of the proposal also directly affects the mature dune topography of the southern part of Menie Links, Pettens Links and impinges on the Balmedie sand sheet to the south.

22. The “Front Nine Holes” (outwith the SSSI). The front nine holes (Holes 1-9) lie to the south of the Menie Links part of Foveran Links SSSI and largely are proposed to be formed within lower and less topographically varied surfaces. Mostly they lie within stable and mature dunes with limited bare sand areas or in deflation surfaces that are now dune slacks or are close enough to the water table to support standing water bodies. As such these stable areas are of lesser scientific interest for geomorphology (but of high ecological interest, see the precognition of Mr Stewart Angus) than the bare sand and active areas to the north. Irrespective of this, the extensive nature of the proposed course design in this area will mean that substantial amounts of cut and fill will be required across a large but spatially distributed area (Holes 1,2,5,6,7,8,9). This in itself will require that the modified surfaces that are produced be stabilised. However, the impacts on the geomorphology of two holes are of greater geomorphological importance: Holes 3 and 4.

Hole 3 is proposed to be approached from a deflation surface to the north towards the green which is sited in a dune hollow between high and steep mature and vegetated dune faces on the east and west. The channel of the Blairton Burn impinges on this low lying area and is actively eroding northward into the area to be occupied by the proposed green. The burn channel has been deflected northward by the northward sediment movement within Aberdeen Bay and the presence of the northward deflected channel is partly responsible for the erosion of the high dune face on the coastal edge. Whilst it is possible that the channel may break through the narrow northward extending dune promontory, it shows no signs of doing so at present and will almost certainly allow erosion of the dune and the area of the green at Hole 3 to progress. As such it will then become necessary to artificially re-route the channel through the low dune ridge to the east (as has been done within recent years to the channel of the Menie Burn to the north). Since this area is affected by wave activity during stormy high tide conditions then intervention in the near future is likely to be required. This may be acceptable in so far as any works should leave the interchange of sediment flow between beach and dune entirely unimpeded and that any structural intervention is prohibited. Structural interventions on an open coast like Aberdeen Bay that is subject to northward sediment movement would enhance the possibility of the present erosional effects being further propagated northward. Indeed SNH 3 supports this view by stating:

“ it is important that the proposed development should not impinge in any way on the beach and the seaward side and crest of the main coastal dune ridge...”

Hole 4 The southernmost proposed hole is to be sited along the axis of the terrace of the low-lying Blairton Burn. This area is subject to intermittent flooding as evidenced by the nature of the vegetation and the distribution of debris washed down both the stream and stranding at its margins. Closer to the beach, high tide likely penetrates inland for a short distance. As such the Blairton Burn will require a degree of training and canalisation to control seasonal flooding or the level of the fairway will need to be elevated. No mention of either of these possibilities is mentioned in T4. The eastward dogleg and green of Hole 4 is sited at the northern mobile edge of the Balmedie sand sheet. The Balmedie sand sheet is subject to sand movement northward, although to a lesser extent than at

north Menie. The green of Hole 4 then will be subject to the same type of sand inundation processes as are experienced at the northern edge of the Menie sand sheet and will thus be required to be stabilised in the same way as is proposed at the Menie sand sheet. Indeed, it will be difficult for the developers to restrict the amount of sand moving onto the proposed course without also stabilising a substantial part of the northern part of the Balmedie sand sheet. There is no mention in Core Production G3 or T4 of the longer term management of this part of the proposed golf course, which is surprising given the likelihood of substantial sand inundation from the sand sheet. T4 states:

“This mobile sand will need to be controlled and some ground stabilisation will also be needed, but the most mobile part of this sand sheet is further west (see Hole 5)”

yet the assessment of Hole 5 makes no mention of any ground stabilisation needed in the vicinity of the tees which lie in the path of the advancing sand sheet other than:

“The entire area is mature and stable, and will require normal amounts of topographic smoothing”

Core Production G3 does not consider the area south of this toward Balmedie and therefore ignores any likely future problems associated with sand blow from areas beyond the immediate golf development for the proposed championship golf course, let alone any implications arising from the siting of the second proposed golf course. This proposal therefore not only threatens the unique and designated interests of the north Menie part of the Foveran Links SSSI by the stabilisation of sand movement under vegetation, but it also threatens the integrity of the undesignated bare sand area at Balmedie.

(E) Coastal processes within Aberdeen Bay and their link to the designated geomorphological interests at north Menie Links and the proposed golf course development at Menie Links

23. The general context of the operation of coastal processes within Aberdeen Bay is also pertinent to this proposal since the sand supply to the north Menie sand sheet depends on the sand supply to the beach at Menie Links. If the beach at Menie Links is erosional then instability is transmitted to the sand sheet via a

larger than normal gap in the frontal blow-outs. If the beach is accretional then the gap narrows on account of dune grasses colonising the excess blown sand and the sand sheet becomes less dynamic. Indeed, the Core Production G3 acknowledges that

“the main long-term factor which needs to be recognised is net sediment deficiency in the coastal cells for beach nourishment and primary dune building.”

It is known that the net sediment movement in Aberdeen Bay is from south to north and that the long-term erosion that affects the southern part of Aberdeen Bay is increasingly extending northwards towards Menie (SNH 5). Within SNH 5, severe erosion of between 3 and 4 m extending as far north as Black Dog Links is reported. Further, Figure 5.4 of SNH 5 notes that accretion north of Menie between 1883 and 1932 was replaced by shoreline retreat, to produce a net retreat between 1883 and 1985. However, it is also clear from the shoreline positions plotted in SNH 6 that the trend of erosion moving north from the southern part of Aberdeen Bay is not linear and short term variations occur that result in accretion in some areas that are followed by erosion of the same areas a few years later and vice versa. For example, in the south of Menie Links, erosion of the beach and frontal dunes occurred between 1973 and 1994, yet the north part of Menie Links (in the area of the sand sheet) accreted over the same period, resulting in low dunes being built that remain in place in spite of some recent erosion (SNH 6). In spite of this short term variability, it remains that most authorities agree that there is a long term sediment deficit within Aberdeen Bay (SNH 3, 5, 6, T 11). Since the net sediment drift direction is from south to north within Aberdeen Bay, the corollary is that propagation of erosion from south to north is highly likely. This conclusion concurs with that of SNH 5 which states that the (recently completed) coast protection works in Aberdeen Bay will increase the length of currently eroding coast, a situation not fully acknowledged within Core Production G3.

(F) Conclusion: Overall assessment of the proposed development on the geomorphology of Menie Links

24. The proposed development of the southern part of the Foveran Links SSSI requires the wholesale stabilisation of the bare sand dune surfaces and arresting the dynamic processes that give rise to them. This includes the northern part of Menie Links including the Menie sand sheet and parts of the Sandend Burn dunes. Since these processes and the resulting landforms are recognised as being of exceptional quality and extent, at a scale of development not seen elsewhere in Great Britain, they have been designated as a SSSI and candidate GCR. The proposed development will therefore result in the destruction of the geomorphological interest, which also supports a wide range of designated ecological interests (as you will hear from Stewart Angus, SNH). The cessation of these processes raises significant questions over the medium and long-term success of any mitigation works attempted by the developer (as you will hear from Paul Rooney, Liverpool Hope University). Further, if the proposed development proceeds then the degree of impact on the dune landforms both within and outwith the SSSI in terms of stabilisation, cut and fill and topographic smoothing will be significant. Further concerns relate to the newly revised layout requiring the part stabilisation of the northern extent of the Balmedie sand sheet. At this location, although obvious conflict exists, little attention has been focussed on the medium to long-term management implications for the proposed championship golf course or of the proposed second golf course.
25. Despite an acknowledgement in Core Production G3 of the interrelated nature of the processes, landforms (and of the role these play in the management of the existing ecological interests), the works required to construct the golf development will remove the vital dynamic geomorphological processes for which the north Menie part of the Foveran Links SSSI was designated. Indeed, the proposed golf development falls far short of the 'Principles of an Ecological Approach to Golf Course Development' published by The Scottish Golf Environment Group (SNH 37) which states 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”.

In summary there are significant, specific and wide ranging concerns relating to the proposed development that, if consented, will remove the geomorphological interest for which the north Menie part of the Foveran Links SSSI was designated, as well as impacting negatively on the geomorphology of the undesignated area to the south of the SSSI.