

Technical Appendix 8.1: Habitats and Vegetation

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ANNEXES

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1.0 Introduction

This Technical Appendix has been prepared to accompany Chapter 8 of the Oliver Forest Wind Farm ('the Proposed Development') Environmental Impact Assessment (EIA) Report.

It presents detailed methodologies and results of desk study and field surveys completed to establish baseline habitat conditions to inform the design and assessment of the Proposed Development.

The objectives of the baseline studies were to:

- establish the spatial distribution of habitats and vegetation communities which may be impacted by the Proposed Development;
- identify the presence and distribution of any habitat types listed on Annex 1 of the Habitats Directive¹, the Scottish Biodiversity List (SBL) and / or which represent potential Groundwater Dependent Terrestrial Ecosystems (GWDTEs) for subsequent hydrological assessment; and
- record the presence of any protected or non-native plant species listed on Schedule 8 and 9 of the Wildlife and Countryside Act 1981 (as amended) respectively.

It should be read with reference to the following:

- Figure 8.1: Statutory Designated Sites For Nature Conservation Ecological Interest.
- Figure 8.2: Non-Statutory Designated Sites For Nature Conservation Interest.
- Figure 8.3a: Desk Study Records – Notable Botanical Species.
- Figure 8.4: Desk Study Records – 'Invasive' Non-Native Species.
- Figure 8.5: Phase 1 Habitat Survey Plan.
- Figure 8.6a: National Vegetation Classification (NVC) Survey Plan.
- Figure 8.6b: Peatland Condition Areas.

Only common species names are referred to within the main text of this Technical Appendix. Scientific names for all species referenced are supplied in Annex A. The only exception is where species are stated in the name of NVC communities.

2.0 Methodology

2.1 Desk Study

A desk study was undertaken to identify the proximity of the site to any statutory or non-statutory designated sites for nature conservation with habitat or botanical qualifying interests and to obtain any existing records of protected and/or non-native flora within the site and the surrounding wider area. Records from, and including, 2012 are considered.

Key desk study sources, search areas and information obtained is summarised in Table 1.

Table 1 – Desk Study Sources and Information Sought

Key Source - incl. Date	Information Sought	Search Area
NatureScot's Sitelink https://sitelink.nature.scot/home-2022	Proximity to statutory designated sites, with ecological interests.	Within 10 km of the site (as shown on Figure 8.1).
NatureScot Maps https://opendata.nature.scot/datasets-2024	Proximity to woodland habitat on the ancient woodland inventory.	Within, and adjacent to the site.
The Wildlife Information Centre (TWIC) – October 2022	Existing records of protected and notable habitats and plant species. Non-statutory designated sites.	Within 2 km of the site, as shown on Figure 8.2.
Consented Whitelaw Brae Wind Farm – April 2024	Existing habitats and vegetation records from baseline field surveys.	Land defined within the boundary of the consented scheme.

¹ Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

2.2 Field Surveys

The following field surveys have been completed:

- Phase 1 habitat survey.
- National Vegetation Classification (NVC) survey.

Survey methodologies and subsequent interpretation of results have made reference to the following key pieces of guidance:

- An Illustrated Guide to British Upland Vegetation (Averis *et al.*, 2014).
- Handbook for Phase 1 Habitat Survey - a technique for environmental audit (Joint Nature Conservation Committee, 2010).
- Commissioned Report 766 - Manual of terrestrial EUNIS habitats in Scotland (SNH, 2017).
- Common Standards Monitoring Guidance for Upland Habitats (JNCC, 2009).
- National Vegetation Community Users' Handbook (Rodwell, 2006).
- British Plant Communities. Volume 1. Woodlands and Scrub (Rodwell (ed.), 1991).
- British Plant Communities. Volume 2. Mires and Heaths (Rodwell (ed.), 1992).
- British Plant Communities. Volume 3. Grasslands and montane communities (Rodwell (ed.), 1992).
- British Plant Communities. Volume 4. Aquatic communities, swamps and tall-herb fens (Rodwell (ed.), 1998).
- WFD95: A Functional Wetland Typology for Scotland – Field Survey Manual (SNIFFER, 2009).
- Field flora of the British Isles (Stace, 1997).
- Land Use Planning System Scottish Environment Protection Agency (SEPA) Guidance Note 31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (SEPA, 2014).

2.3 Field Methodologies

Phase 1 Habitat Survey

An extended Phase 1 habitat survey of the site ('Survey Area') was undertaken on 17 June 2022, in accordance with the UK industry standard Phase 1 Habitat Methodology (JNCC, 2010).

NVC Survey

An NVC survey was undertaken on 11 and 12 July 2022. The NVC survey comprised all noteworthy habitats within the site. The survey concentrated on those areas where plant communities were deemed likely to form Annex 1 habitats and / or represent GWDTEs.

On 01 April 2024, a further NVC survey was undertaken of the habitat classified as 'M19' during the July 2022 survey, in the north-west of the site (to be affected by the Proposed Development) to refine the habitat classification and record information into the condition of the habitat (results presented in Annex F, and Figure 8.6b).

During survey, square quadrats of relevant size were distributed throughout homogenous stands identified in order to provide a representative sample of the vegetation community present.

In each quadrat sample area, data were collected on the presence and abundance of vascular plant species using the Domin scale. These data were then analysed and classified to an NVC vegetation community, where possible, using the keys in Rodwell (various) British Plant Communities Volumes 1 to 5, aided by analysis using the Modular Analysis of Vegetation Information System (MAVIS) created by the UK Centre for Ecology and Hydrology.

Condition Assessment – Glenmuck Bog Wildlife Site

A condition assessment was undertaken of the habitats in the Glenmuck Bog wildlife site on 16 May 2023. The methodology was adapted from the Common Standards Monitoring Guidance for Upland Habitats, published by the JNCC (2009) and used by NatureScot for monitoring SSSIs. The results of the condition assessment are presented in Annex E.

Personnel

Surveys in June and July 2022 were conducted by M. Wood; a competent botanist with considerable experience of undertaking Phase 1 Habitat and NVC surveys for proposed wind farm developments, across numerous comparable upland sites in Scotland. The NVC update survey in April 2024 was conducted by R. Whytock who is an experienced botanist with a specialism in bog habitats. The condition assessment of Glenmuck Bog wildlife site was led by Ms S. Turner who is an experienced botanist.

The NVC analysis was checked by Ms S. Turner a competent botanist with experience of undertaking and analysing NVC surveys for similar upland sites across Scotland.

The peatland assessment was undertaken by R. Whytock using the NatureScot peatland assessment sheet².

Limitations

All parts of the site were accessible. This meant that habitats typically out to at least 250 m from the Proposed Development infrastructure were surveyed with the exception, in the north, of some of the 250 m buffer around Turbine 4 and some of its associated infrastructure, due to design evolution. Turbine 4 and its associated infrastructure and surrounding habitats to which effects are to be determined was however appropriately covered during the surveys (see Figures 8.5 and 7.6). As such, no substantive limitations are identified.

3.0 Results

3.1 Desk Study

Statutory Designated Sites for Nature Conservation

This section should be read with reference to Figure 8.1.

The site does not form part of any statutory designated site for nature conservation with qualifying habitat and / or botanical interests.

Table 2 provides a summary of statutory designated sites with qualifying habitat and / or botanical interest located within 10 km of the site.

Table 2 – Statutory Designated Sites for Nature Conservation. SAC - Special Area of Conservation, SSSI - Site of Special Scientific Interest

Designated Site	Distance and Direction from the Site	Botanical and / or Habitat Qualifying Interests
International		
River Tweed SAC	Immediately adjacent to the site to the south-east	Rivers with floating vegetation often dominated by water-crowfoot.
Moffat Hills SAC	9.25 km, south-east	Acidic scree. Alpine and subalpine heaths. Blanket bog. Dry heaths.
National		
River Tweed SSSI	Immediately adjacent to the site to the south-east	Trophic range river/stream. Vascular plant assemblage.
Tweedsmuir Hills SSSI	2.38 km, east	Bryophyte assemblage. Upland assemblage. Vascular plant assemblage.
Craigdilly SSSI	8.8 km, south-east	Sub-montane scrub.

Non-statutory Designated Sites for Nature Conservation

There are three non-designated sites for nature conservation within 2 km of the site, one of which is located within the site (details in Table 3). The three sites are designated Scottish Wildlife Trust “Wildlife Sites” and also “Local Biodiversity Sites – to be adopted”. The location of non-statutory sites is shown on Figure 8.2.

² <https://www.nature.scot/doc/advising-peatland-carbon-rich-soils-and-priority-peatland-habitats-development-management> (Accessed 08 April 2024).

Table 3 – Non-statutory Designated Sites of Nature Conservation

Designated Site	Distance and Direction from the Site	Botanical and/or Habitat Interest
Glenmuck Bog	Within the site	Unmodified blanket bog, valley mire, flush and species-rich marshy grassland along a small burn.
Hawkshaw Bog	Adjacent to southern site boundaries, other side (south) of the River Tweed	Blanket bog on the banks of the River Tweed, with small areas of base-rich flush and marsh with a range of flora and fauna, including amphibians. The riverside vegetation supports regenerating broadleaf trees.
Talla Reservoir	1.1 km south-east of the site	A large, oligotrophic man-made reservoir with a narrow fringe of grassland and conifer plantation; surrounded by upland grassland and conifer plantation.

Priority Habitats

No information on priority habitats was returned by the TWIC data search.

Existing Protected, Notable and Non-Native Botanical Records

TWIC data returned 78 locally 'notable' botanical species, with 348 individual records, within 2 km of the site. These include local rarities and plants appearing in local biodiversity action plans in southern Scotland. Furthermore, this included ten nationally or internationally notable species were returned with 35 individual records. A small number of records of three species on the Scottish Borders Local Biodiversity Action Plan (LBAP) were recorded on-site (greater tussock-sedge, chickweed-wintergreen and juniper), with juniper also a Scottish Biodiversity List (SBL) species. Records of three other species, although not LBAP or SBL, were also returned from the site (stag's-horn clubmoss, water-purslane and cranberry), and these are termed 'locally rare' species (or in the case of water-purslane, 'very locally rare'). Records are provided on Figure 8.3a.

Nine records of 'invasive' non-native botanical species were returned by TWIC, comprising 20 individual records, within 2 km of the site, with the nearest record, monkeyflower on the periphery of the site. Records are provided on Figure 8.4.

Baseline survey results for the consented Whitelaw Brae Wind Farm revealed wet modified bog as being the most dominant habitat within the survey area (57.05 %), with semi-improved acid grassland (14.8 %), marshy grassland (11.79 %) and conifer plantation (11.59 %). The extent of all other habitats was limited (<3.5 % coverage). The bog habitats comprised of NVC communities including M19, M23 and M25, with other NVC communities identified for wet heath (M15), grasslands (including U4, U6, U20, MG6 and MG10) and tall ruderals (U16).

Ancient Woodland Inventory Habitat

No woodland habitat listed on the ancient woodland inventory is present within, or adjacent to, the site.

3.2 Field Surveys

This section presents the results of the field surveys, including an overview of broad phase 1 habitat types and, where relevant, detailed NVC communities present within the Survey Area and their distribution. It should be read with reference to Figures 8.5 and 8.6a.

Phase 1 habitat survey Target Notes are detailed in Annex B, and detailed species lists, NVC tables are presented in Annex C, with site photographs presented in Annex D.

3.3 Phase 1 Habitats

The site is sloping, rising from around 260 m from the banks of the River Tweed to the tops of Upper Oliver Dod and Glenmuck Height at 490 m and 472 m above ordnance datum (AOD) respectively. The site is largely comprised of commercial forestry plantations, composed of densely planted Sitka spruce with small areas of larch and some patches of Scots pine and planted native broad-leaved trees. The open high ground is dominated by bog, with lower and steeper slopes within rides and along watercourses mostly being a mosaic of dry dwarf shrub heath, marshy grassland, acid grassland and bracken.

The lower parts of the site support some areas of semi-natural woodland and mature scattered trees, mostly being a mix of beech, sycamore, ash and Scots pine. In the low-lying valley bottom along the public road and the banks of the River Tweed there are several fields of semi-improved grassland used for sheep grazing.

A1.1.1 Broad-leaved Woodland – semi-natural: This woodland is mostly confined to a steep burn gully in the south-east of the site near the public road. This area is characterised by tall mature trees, mostly beech, ash,

alder and some Scot's pine. Ground flora is mostly grasses with some ferns, mosses and ericoids including common heather and bilberry. Trees are up to 20 m tall. (See Annex B: Target Notes, Target note TN12).

A1.1.2 Broad-leaved Woodland - plantation: There are several small areas of planted native broad-leaved trees, mostly scattered around the periphery of large plantation blocks, but a few larger patches occur in the extreme east of the site (see Annex B, TN5 and TN11). These are mostly composed of birch, rowan and alder trees and are around 5 m tall.

A1.2.2 Coniferous Plantation: This habitat dominates the majority of the site and is almost entirely composed of Sitka spruce trees with some scattered larch and a few areas of Scots pine in the south-east of the site. Most trees are around 10 m in height.

A1.3.2 Mixed Plantation: There is a strip of mixed planted trees in the east of the site, which includes sycamore, spruce, pine, Douglas fir and rowan trees. These trees are more open than the rest of the commercial blocks allowing in more light and are around 8 m tall.

A2 Scrub: The extreme south of the site has a small area of grey willow growing in a strip between the public road and the River Tweed. The trees are around 3 m to 4 m tall.

A3 Scattered trees: There is an area of scattered mature trees within a field of semi-improved grassland used for sheep grazing on the east side of the public road (see Annex B, TN4). These trees are a mix of Scot's pine, spruce and sycamore. The trees are over 20 m tall.

A4 Clear-fell: There are a few small areas of clear-fell in the east of the site that appears to be recovering into acid grassland and bracken dominated habitats.

B1.1 Acid Grassland – un-improved: This habitat is present in scattered patches across the site, almost always adjacent to, or in a mosaic with, dry dwarf shrub heath and bracken (see Annex B, TN7). It is characterised by a mix of grasses including sheep's fescue, bents, mat grass and herbs including heath speedwell, tormentil and heath bedstraw. It occurs mostly on well drained slopes with shallow soil.

B1.2 Acid Grassland – semi-improved: This grassland is found predominantly between the public road and the River Tweed, with smaller areas adjacent to the forestry on the north side of the road. This has variable composition and is characterised by a range of grasses and herbs representative of both acid and neutral grasslands, suggesting that the habitat is tending to more neutral composition in areas of heaviest grazing.

B5 Marshy Grassland: This habitat is both widespread in the site and extensive in some areas. Some areas are dominated by rush, mostly along burn lines and in damp hollows, and others are dominated by purple moor-grass, mostly found in rides within the forestry (see Annex B, TN1).

C1 Bracken: Found within open areas of the site. Dominated by stands of bracken, in areas of sparser cover it has an acid grassland understory or occurs as the understory in parts of planted and semi-natural broadleaf woodland.

D1 Dry Heath: Found mostly on steeper slopes and in burn gullies in the centre and north of the site, the dry heath grows on shallow peat often in mosaics with acid grassland and bracken. The habitat is dominated by common heather, with bilberry, green-ribbed sedge, hard fern and hypnoid mosses, such as glittering wood-moss.

E1.6.1 Blanket Bog: The blanket bog is dominant on the high ground and hill tops in the north-west of the site and another extensive area near the public road. It is found on deep peat and dominated by a mix of common heather and hare's-tail cottongrass with cranberry, bog asphodel and bog forming mosses, such as acute-leaved bog moss and papillose bog-moss (see Annex B, TN2).

F1 Swamp: Adjacent to the pond in the north of the site there is a bottle sedge dominated swamp. This habitat occurs in a natural depression in the landscape where the water table is at, or above, the surface of the ground.

G1 Standing water: There are four small ponds scattered around the site. They are all quite clear and contain some floating pondweeds and emergent rushes and sedges (see Annex B, TN8, TN9, TN10 and TN13). Two of these ponds were subject to eDNA surveys to check for evidence of great crested newts (see Technical Appendix 8.2).

G2.4 Dystrophic running water: Four small streams cut down hill across the site. The River Tweed flows along the eastern boundary (See Annex B, TN3 and TN6).

3.4 NVC Communities

Dry Heath

H10a Calluna vulgaris-Erica cinerea heath, typical sub-community

H12a Calluna vulgaris-Vaccinium myrtillus heath, Calluna vulgaris sub-community

The H10a heathland community is found in a relatively small area on steep hillsides where it occurs on shallow, well drained peaty soil, transitioning into acid grassland. The vegetation is dominated by a mix of common heather and bell heather with an understorey of hypnoid mosses and a few other species such as green-ribbed sedge, tormentil, sheep's fescue and occasional juniper.

The H12a community is scattered across the site, but in small, localised patches on sloping embankments of shallow, well drained peat. It often forms a mosaic with acid grassland and U20 bracken. The vegetation is dominated by thick common heather with an understorey of hypnoid mosses and a few other species such as bilberry, heath bedstraw, sheep's fescue, hard fern and green-ribbed sedge. Grazing appears fairly limited.

Blanket Bog

M19a Calluna vulgaris-Eriophorum vaginatum blanket mire, Erica tetralix sub-community

This bog community occupies flat to gently sloping open ground, in two main areas, near the public road and along the hill tops above the commercial forestry. It occurs on deep peat that is fairly damp, transitioning into a purple moorgrass dominated M25 community where the peat becomes shallower. There are also some mosaic areas with U4 acid grassland and U20 bracken.

The vegetation is dominated by a mix of common heather and hare's-tail cottongrass with other constants at lower abundance including cross-leaved heath, wavy hair grass, acute-leaved bog-moss and red-stemmed feathermoss. Bilberry and cranberry feature less frequently, as do other mosses including heath plait-moss and springy turf-moss.

The condition assessment of the M19a habitat in the north-west of the site, identified the main continuous area of M19a to be of 'possible national interest' with all other areas of M19a in that locality unlikely to be of national interest (see Figure 8.6b and Annex F).

Marshy Grasslands

M23a – Juncus effusus/acutiflorus – Galium palustre rush pasture, Juncus acutiflorus sub-community

M23b – Juncus effusus/acutiflorus – Galium palustre rush pasture, Juncus effusus sub-community

M25 Molinia caerulea - Potentilla erecta mire, no sub-community assigned

The M23a community was found only in one very small area on-site at NT 08105 24753, at the base of a narrow valley on damp, poorly drained soil. The vegetation is dominated by sharp-flowered rush with relatively diverse herb species including ragged robin, bugle, cuckoo flower, meadowsweet and common ragwort. Marsh thistle and creeping buttercup are also abundant. Grazing appears quite limited.

The M23b community is much more widespread, occurring along burn lines and damp depressions across the site. The soil tends to be fairly wet and of variable depth, and grazing is limited. The community is dominated by dense tussocks of soft rush, with limited presence of grasses, mainly creeping soft-grass, Yorkshire fog and creeping bent. Herbs are also limited, consisting mainly of marsh bedstraw, common sorrel, marsh thistle and marsh willowherb.

The M25 grassland occurs along tracksides and in rides within the commercial forestry centrally within the site. It occurs on shallow peat, often damp, on flat to gently sloping ground, and grazing appears limited. The vegetation is overwhelmingly dominated by purple moorgrass tussocks with few other plants, occasionally tormentil, heath bedstraw and bilberry.

M27 – Filipendula ulmaria-Angelica sylvestris mire

This mire community occurs in a limited area adjacent to the road, in a damp depression on poorly drained soil adjacent to areas of heath and bracken. The vegetation is dominated by dense stands of meadowsweet and a mix of other herbs including common valerian, cleavers, lady's bedstraw and wild angelica.

S9 Carex rostrata swamp

This swamp community occurs as emergent vegetation at the periphery of an open water pond on the high ground in the north of the site, where it transitions into surrounding M19a bog. The vegetation is dominated entirely by dense stands of bottle sedge.

Acid Grasslands

U4a Festuca ovina - Agrostis capillaris - Galium saxatile grassland, typical sub-community

U4b Festuca ovina - Agrostis capillaris - Galium saxatile grassland, Holcus lanatus - Trifolium repens sub-community

U5d Nardus stricta - Galium saxatile grassland, Calluna vulgaris - Danthonia decumbens sub-community

U20 Pteridium aquilinum - Galium saxatile community

The U4a acid grassland community is widely distributed around the site but is mostly confined to small areas in mosaic with adjacent H12 heath and U20. It mostly occurs on sloping terrain on shallow, well-drained soil where some grazing seems to occur. The vegetation is dominated by a mix of grasses including common bent, sheep's fescue, sweet vernal-grass. Mat grass and bilberry are more occasional associates. Herbs are represented by constant tormentil and heath bedstraw, with mosses dominated by springy turf moss and red-stemmed feather-moss.

The U4b grassland community occupies most of the fields in the lower portion of the site around the public road and the River Tweed. It occurs on flat to gently sloping terrain on shallow, well-drained soil. The vegetation includes a mix of grasses, with constants smooth meadow grass, sweet vernal grass, velvet bent and Yorkshire fog. There are a variety of herbs, including constant creeping thistle, common sorrel, lesser stitchwort, yarrow and creeping buttercup. Other more occasional species include heath woodrush, wild angelica, tormentil, white clover, yellow rattle, tufted vetch, bird's foot trefoil, heath speedwell, lady's bedstraw and pignut. Springy turf-moss is a constant.

This is not a typical acid grassland community and actually sits on the boundary between U4b and the neutral MG6 grassland community. Species such as tormentil, velvet bent, sweet vernal-grass, heath speedwell, springy turf-moss are typical acid grassland species, however other acid grassland indicators such as sheep's fescue, common bent, wavy hair-grass and heath bedstraw are absent, meaning the community does not qualify as a lowland acid grassland priority habitat.

Rodwell (1992) indicates there is a transition from U4b to MG6b (*Lolium-Cynosuretum, Anthoxanthum* sub community), with agricultural improvement. It is possible that this is happening here with the mostly heavy sheep grazing. There is likely to be some spatial variation across the community but U4b is considered the best fit overall due to the presence of some remaining acid grassland indicators.

Occasional pignut was found in scattered locations, this is a typical constant of the species rich hay meadow community MG3 and not generally found in more improved communities such as MG6. This may suggest the remnants of a previous more species-rich, less intensively grazed past community.

The U5d grassland community is present on steeply sloping ground in the north-west of the site within, or near, dry heath communities.

Woodlands

W2 Salix cinerea - Betula pubescens - Phragmites australis woodland

W15 Fagus sylvatica - Deschampsia flexuosa woodland

The W2 scrub woodland occurs in a very small area at the far western end of the site next to some M23b grassland, between the public road and the River Tweed. The terrain is flat and poorly drained, resulting in damp to marshy ground conditions. The vegetation is dominated by grey willow and also rowan.

The W15 woodland community occurs along the steep slopes of a burn in the east of the site. It is largely dominated by mature beech trees around 20 m tall with a mix of Scot's pine, downy birch and some rowan. The ground flora is a mix of grasses such as purple moor-grass and tufted hair-grass with broad buckler fern, lady fern and some patches of bilberry.

3.5 Habitats Summary: Protected and Notable Habitats and Potential Groundwater Dependence

Vegetation communities present within the Survey Area and included in the NVC survey are summarised in Table 4, along with corresponding Habitats Directive (92/43/EEC) Annex 1 Habitat types, SBL priority habitat type and potential GWDTE status in accordance with SEPA guidance (2014) and NatureScot NVC / EUNIS / Annex 1 correspondence tables (2017). Table 4 should be considered in conjunction with Figure 8.6a.

There are also a number of watercourses and small ponds within the site, which are likely to be SBL priority habitats. Ponds are described in Target Notes 8, 9, 10 and 13 and watercourses in Target Notes 3 and 6 (see Annex B for details).

Some of these habitats are protected by non-statutory nature designations. In the west of the site, on the north side of Weird Law, habitats including blanket bog and marshy grassland are included in Glenmuck Bog – part of

this designated site is an existing Scottish Wildlife Trust Wildlife site, and part a proposed local biodiversity site (see Figure 8.2).

Some areas of the M19a is of possible national interest and this is shown in Annex F, and with areas shown on Figure 8.6b.

Table 4 – Summary of Vegetation Communities in the Survey Area

Phase 1 habitat	NVC community	Principal corresponding Habitats Directive Annex I type/s	Corresponding SBL Priority Habitat Type	Potential dependence of community/habitat on groundwater.* 1=high, 2=moderate, 3=low
D1 Dry heath	H10a <i>Calluna vulgaris</i> – <i>Erica cinerea</i> heath, typical sub-community	4030 European dry heaths	Upland Heathland	3
D1 Dry heath	H12a <i>Calluna vulgaris</i> – <i>Vaccinium myrtillus</i> heath, <i>Calluna vulgaris</i> sub-community	4030 European dry heaths	Upland Heathland	3
E1.6.1 Blanket bog	M19a <i>Calluna vulgaris</i> – <i>Eriophorum vaginatum</i> mire, <i>Erica tetralix</i> sub-community	H7130 Active blanket bog	Blanket Bog	3
B5 Marshy grassland	M23a <i>Juncus effusus</i> / <i>acutiflorus</i> - <i>Galium palustre</i> rush pasture, <i>Juncus acutiflorus</i> sub-community	-	Upland flushes, fens and swamps	1
B5 Marshy grassland	M23b <i>Juncus effusus/acutiflorus</i> - <i>Galium palustre</i> rush pasture, <i>Juncus effusus</i> sub-community	-	-	1
B5 Marshy grassland	M25 <i>Molinia caerulea</i> - <i>Potentilla erecta</i> mire.	-	-	2
E3 Fen	M27 – <i>Filipendula ulmaria</i> – <i>Angelica sylvestris</i> mire	-	Lowland fen	2
F1 Swamp	S9 <i>Carex Rostrata</i> swamp	3160 Natural dystrophic lakes and ponds	Freshwater and wetland	3
B1.1 Acid grassland – unimproved	U4a <i>Festuca ovina</i> - <i>Agrostis capillaris</i> - <i>Galium saxatile</i> grassland, typical sub-community	-	-	3
B1.2 Acid grassland – semi-improved	U4b <i>Festuca ovina</i> - <i>Agrostis capillaris</i> - <i>Galium saxatile</i> grassland, <i>Holcus lanatus</i> - <i>Trifolium repens</i> sub-community	-	-	3
C1 Bracken	U20 <i>Pteridium aquilinum</i> – <i>Galium saxatile</i> community	-	-	3
A2 Scrub	W2 <i>Salix cinerea</i> - <i>Betula pubescens</i> - <i>Phragmites australis</i> woodland	-	Wet woodland	2
A1.1.2 Broadleaved semi-natural woodland.	W15 <i>Fagus sylvatica</i> - <i>Deschampsia flexuosa</i> woodland	-	-	3

* As listed in Appendix 4 of SEPA (2014) LUPS Guidance Note 31. The categorisation of GWDTEs is preliminary and is based on vegetation communities present, and therefore confirmed GWDTE categorisation is based on subsequent formal hydrological assessment.

4.0 References

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ANNEX A - SCIENTIFIC PLANT NAMES

Table A-1 – Common and Species names of Plants / Vegetation included in this Technical Appendix

Common Name	Species Name
Acute-leaved bog-moss	<i>Sphagnum capillifolium</i>
Alder	<i>Alnus glutinosa</i>
Ash	<i>Fraxinus excelsior</i>
Beech	<i>Fagus sylvatica</i>
Bell heather	<i>Erica cinerea</i>
Bent grasses	<i>Agrostis</i> spp.
Bilberry	<i>Vaccinium myrtillus</i>
Birch	<i>Betula</i> spp.
Bird's-foot trefoil	<i>Lotus corniculatus</i>
Bog asphodel	<i>Narthecium ossifragum</i>
Bog-mosses	<i>Sphagnum</i> spp.
Bottle sedge	<i>Carex rostrata</i>
Bracken	<i>Pteridium aquilinum</i>
Broad buckler fern	<i>Dryopteris dilatata</i>
Bugle	<i>Ajuga reptans</i>
Cleavers	<i>Galium aparine</i>
Cock's foot	<i>Dactylis glomerata</i>
Common bent	<i>Agrostis capillaris</i>
Common heather	<i>Calluna vulgaris</i>
Common ragwort	<i>Jacobaea vulgaris</i>
Common sorrel	<i>Rumex acetosa</i>
Common valerian	<i>Valerian officinalis</i>
Cranberry	<i>Vaccinium oxycoccus</i>
Creeping bent	<i>Agrostis stolonifera</i>
Creeping buttercup	<i>Ranunculus repens</i>
Creeping soft-grass	<i>Holcus mollis</i>
Creeping thistle	<i>Cirsium arvense</i>
Cross-leaved heath	<i>Erica tetralix</i>
Cuckoo flower	<i>Cardamine pratensis</i>
Douglas fir	<i>Pseudotsuga menziesii</i>
Downy birch	<i>Betula pubescens</i>
Glittering wood-moss	<i>Hylocomium splendens</i>
Grey willow	<i>Salix cinerea</i>
Hard fern	<i>Blechnum spicant</i>
Hare's-tail cottongrass	<i>Eriophorum vaginatum</i>
Heath bedstraw	<i>Galium saxatile</i>

Common Name	Species Name
Heath plait-moss	<i>Hypnum jutlandicum</i>
Heath speedwell	<i>Veronica officinalis</i>
Juniper	<i>Juniperus communis</i>
Lady fern	<i>Athyrium filix-femina</i>
Lady's bedstraw	<i>Galium verum</i>
Larch	<i>Larix</i> spp.
Lesser stitchwort	<i>Stellaria graminea</i>
Marsh bedstraw	<i>Galium palustre</i>
Marsh thistle	<i>Cirsium palustre</i>
Marsh willowherb	<i>Epilobium palustre</i>
Mat grass	<i>Nardus stricta</i>
Meadowsweet	<i>Filipendula ulmaria</i>
Papillose bog-moss	<i>Sphagnum papillosum</i>
Pignut	<i>Conopodium majus</i>
Pondweed	<i>Potamogeton</i> sp.
Purple moor-grass	<i>Molinia caerulea</i>
Ragged robin	<i>Silene flos-cuculi</i>
Red-stemmed feathermoss	<i>Pleurozium schreberi</i>
Rowan	<i>Sorbus aucuparia</i>
Scot's pine	<i>Pinus sylvestris</i>
Sharp-flowered rush	<i>Juncus acutiflorus</i>
Sheep's fescue	<i>Festuca ovina</i>
Sitka spruce	<i>Picea sitchensis</i>
Smooth meadow-grass	<i>Poa pratensis</i>
Soft rush	<i>Juncus effusus</i>
Spike-rush	<i>Eleocharis</i> sp.
Springy turf-moss	<i>Rhytidiadelphus squarrosus</i>
Sweet vernal-grass	<i>Anthoxanthum odoratum</i>
Sycamore	<i>Acer pseudoplatanus</i>
Tormentil	<i>Potentilla erecta</i>
Tufted hair-grass	<i>Deschampsia cespitosa</i>
Velvet bent	<i>Agrostis canina</i>
Wavy hair-grass	<i>Avenella flexuosa</i>
White clover	<i>Trifolium repens</i>
Wild angelica	<i>Angelica sylvestris</i>
Yarrow	<i>Achillea millefolium</i>
Yellow rattle	<i>Rhinanthus minor</i>
Yorkshire fog	<i>Holcus lanatus</i>

ANNEX B - PHASE 1 HABITAT SURVEY TARGET NOTES**Table B-1 – Phase 1 habitat survey Target Notes (should be read with reference to Figure 8.5 and photographic plates presented in Annex D)**

Target Note	Grid Reference	Description	Photographic Plate (Annex D)
TN1	NT08812 24295	An example of a typical ride within the commercial forestry, here dominated by a monoculture of purple moorgrass marshy grassland.	1
TN2	NT08997 25537	An example of the common heather and hare's tail cotton-grass dominated blanket bog on the summit of Oliver Dod hill, with bog mosses and bog asphodel.	2
TN3	NT09183 24282	Stream around 1 m wide, flowing smoothly down hill, very clear water over a bed of small boulders and pebbles. No emergent vegetation but banks of grasses, rushes and meadowsweet. Caddis fly larvae appeared abundant.	3
TN4	NT09147 23997	Scattered mature spruce, Scot's pine and sycamore trees within semi-improved grassland. The trees are 20+ m in height and show some potential as bat roosts.	4
TN5	NT07991 23116	An example of some of the small blocks of planted broadleaves on the site, in this case some alder along the banks of one of the streams.	5
TN6	NT07870 23168	Stream around 1m wide and around 30 cm deep. Very clear water, flowing smoothly over a bed of pebbles and gravel. Banks mostly composed of grasses like Yorkshire fog and some lady fern. Many small invertebrates.	6
TN7	NT07383 23613	Example of one of the open areas within the forest, showing a steep hillside with a mosaic of bracken, dry heath and acid grassland communities.	7
TN8	NT08287 23444	Small pond in the west of the site around 8x20 m in size and at least 1 m deep. Emergent rushes and sedges present around the periphery with a dense covering of floating pondweed. Many invertebrates, including damselflies and dragonflies.	8
TN9	NT08341 23451	Large pond approximately 20x80 m in size with peat stained water, adjacent to the pond at TN8. Periphery with a variety of rushes and sedges. Lots of open water but still a lot of floating pondweed. Also a large number of invertebrates including dragonflies and damselflies.	9
TN10	NT07680 24267	Large pond in the north of the site on the edges of blanket bog. Around 50x30 m in size, depth unknown but appeared to be at least 1 m, heavily peat stained water. Lots of open water but dense emergent bottle sedge around lots of the edges.	10
TN11	NT08950 24420	Another example of some of the planted broadleaves on site. Here many birch and a few rowan trees, in a small stream valley with slopes mostly dominated with bracken.	11
TN12	NT08999 24384	Semi natural broad-leaved woodland found in the same stream valley as the above target note. Here the trees are dominated by mostly a mix of mature birch, alder and beech and there are some tube planted broadleaved trees also. The forest is at maximum around 20 m tall with an understorey of bracken, grasses and some soft rush, with odd patches of bilberry and common heather.	12
TN13	NT09660 24951	Pond around 10 x 25 m in size and maybe 0.5 m deep. Water is very clear with a mud bottom. Lots of open water with floating pondweeds and emergent rushes and spike rushes. Lots of invertebrates present, including damselflies and many tadpoles were also present.	13

ANNEX C - NVC SURVEY RESULTS

Tables C-1 and C-2 outline DOMIN scales and scores for NVC survey results.

Table C-1 – Dominance (DOMIN) scale

Code	Approximate percentage cover in quadrat
10	>90 %
9	75 – 90 %
8	51 – 75 %
7	34 – 50 %
6	26 – 33 %
5	11 – 25 %
4	5 – 10 %
3	<5 %, many individuals
2	<5 %, a few individuals
1	<5 %, one or two individuals

Table C-2 – NVC Tables

Phase 1 habitat type	Dry heath					
NVC Community	H10a <i>Calluna vulgaris</i> – <i>Erica cinerea</i> heath, typical sub-community					
Quadrats	Q1	Q2	Q3	Q4	Q5	
OS grid co-ordinates	NT 08015 24739	NT 08069 24770	NT 08126 24797	NT 08157 24859	NT 08212 24927	
Indicative peat Depth (cm)	10	10	15	10	10	
Vegetation height (cm)	40	40	40	40	40	
Species	Cover					Constancy
<i>Calluna vulgaris</i>	7	7	7	7	7	5
<i>Erica cinerea</i>	7	7	7	7	7	5
<i>Pleurozium schreberi</i>	7	7	7	6	6	5
<i>Potentilla erecta</i>	3	3	3	4	4	5
<i>Festuca ovina</i>	3	3	3	-	3	4
<i>Carex binervis</i>	3	-	-	3	-	2
<i>Hypnum jutlandicum</i>	5	5	5	7	6	5
<i>Rhytidiadelphus squarrosus</i>	4	5	5	6	5	5
<i>Juniperus communis</i>	-	5	-	-	-	1
<i>Agrostis capillaris</i>	-	-	4	-	-	1
<i>Deschampsia flexuosa</i>	-	-	3	-	3	2
<i>Blechnum spicant</i>	-	-	-	4	-	1
<i>Sorbus aucuparia</i>	-	-	-	-	2	1
<i>Hylocomium splendens</i>	-	-	-	-	4	1

Phase 1 habitat type	Dry heath					
NVC Community	H12a <i>Calluna vulgaris</i> – <i>Vaccinium myrtillus</i> heath, <i>Calluna vulgaris</i> sub-community					
Quadrats	Q1	Q2	Q3	Q4	Q5	
OS grid co-ordinates	NT 07959 23111	NT 07373 23738	NT 07393 23880	NT 08019 24123	NT 07940 24398	
Indicative peat Depth (cm)	10	10	10	10	10	
Vegetation height (cm)	40	50	45	50	45	
Species	Cover					Constancy
<i>Calluna vulgaris</i>	8	8	8	8	8	5
<i>Vaccinium myrtillus</i>	5	4	4	5	5	5
<i>Galium saxatile</i>	3	3	3	4	3	5
<i>Hypnum jutlandicum</i>	6	4	7	6	5	5
<i>Polytrichum commune</i>	5	-	-	-	-	1
<i>Pleurozium schreberi</i>	5	8	6	5	6	5
<i>Vaccinium vitis-idaea</i>	3	-	-	-	-	1
<i>Rhytidiadelphus squarrosus</i>	3	3	4	4	5	5
<i>Festuca ovina</i>	3	3	3	4	3	5
<i>Erica cinerea</i>	-	4	3	-	-	2
<i>Potentilla erecta</i>	-	-	-	4	3	2
<i>Carex binervis</i>	-	-	-	3	-	1
<i>Luzula multiflora</i>	-	-	-	3	-	1
<i>Luzula sylvatica</i>	-	-	-	3	-	1
<i>Blechnum spicant</i>	-	-	-	-	4	1

Phase 1 Habitat Type	Blanket Bog											
NVC Community	M19a <i>Calluna vulgaris</i> – <i>Eriophorum vaginatum</i> mire, <i>Erica tetralix</i> sub-community											
Quadrat	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10		
OS grid coordinates	NT 06970 24125	NT 07310 24341	NT 07700 24135	NT 07789 24055	NT 08249 24553	NT 09017 25576	NT 08644 23586	NT 08485 23484	NT 08374 23421	NT 08276 23365		
Indicative peat depth (cm)	100+	100+	100+	100+	100+	100+	100+	100+	100+	100+		
Veg height (cm)	40	40	40	40	40	40	40	40	40	40		
Species	Cover											Const.
<i>Calluna vulgaris</i>	6	5	5	5	6	5	7	5	5	6	5	
<i>Eriophorum vaginatum</i>	6	7	7	6	6	6	5	6	5	5	5	
<i>Deschampsia flexuosa</i>	4	3	3	3	3	3	3	3	3	3	5	
<i>Sphagnum capillifolium</i>	7	4	7	6	6	-	4	3	4	5	5	
<i>Pleurozium schreberi</i>	5	7	4	5	3	4	7	7	8	7	5	
<i>Erica tetralix</i>	4	4	3	4	3	4	3	3	3	3	5	
<i>Plagiothecium undulatum</i>	3	-	-	-	3	-	-	-	-	-	1	
<i>Vaccinium myrtillus</i>	-	5	4	5	4	-	5	5	5	5	4	
<i>Hypnum jutlandicum</i>	-	-	4	5	5	6	5	3	-	-	3	
<i>Rhytidiadelphus squarrosus</i>	-	-	5	3	5	-	-	-	-	-	2	
<i>Hylocomium splendens</i>	-	-	-	5	-	-	3	4	3	4	3	
<i>Narthecium ossifragum</i>	-	-	-	-	-	5	-	-	-	-	1	
<i>Trichophorum germanicum</i>	-	-	-	-	-	4	-	-	-	-	1	
<i>Vaccinium oxycoccus</i>	-	-	-	-	-	3	3	3	3	3	3	
<i>Vaccinium vitis-idaea</i>	-	-	-	-	-	3	-	-	5	3	2	
<i>Eriophorum angustifolium</i>	-	-	-	-	-	-	3	-	-	-	1	
<i>Juncus squarrosus</i>	-	-	-	-	-	-	4	-	-	-	1	
<i>Molinia caerulea</i>	-	-	-	-	-	-	-	4	-	-	1	

Phase 1 habitat type	Marshy Grassland					
NVC Community	M23b – <i>Juncus effusus</i> – <i>Galium palustre</i> rush pasture, <i>Juncus effusus</i> sub-community					
Quadrats	Q1	Q2	Q3	Q4	Q5	
OS grid co-ordinates	NT 07817 24288	NT 07404 23546	NT 08592 23791	NT 08392 23239	NT 08130 23083	
Soil depth (cm)	30	50	45	45	40	
Vegetation height (cm)	75	75	75	75	75	
Species	Cover					Constancy
<i>Holcus mollis</i>	5	-	3	4	4	4
<i>Sphagnum fallax</i>	8	-	-	-	-	1
<i>Juncus effusus</i>	7	8	8	8	8	5
<i>Agrostis stolonifera</i>	4	-	3	4	3	4
<i>Galium palustre</i>	3	-	3	3	3	4
<i>Dryopteris dilatata</i>	1	-	-	-	-	1
<i>Holcus lanatus</i>	-	3	-	3	3	3
<i>Rumex acetosa</i>	-	4	4	4	3	4
<i>Ranunculus repens</i>	-	4	-	3	3	3
<i>Rhynchospora squarrosus</i>	-	5	5	5	5	4
<i>Epilobium palustre</i>	-	3	4	3	3	4
<i>Cirsium palustre</i>	-	-	4	-	3	2

Phase 1 habitat type	Acid grassland - unimproved					
NVC Community	U4a <i>Festuca ovina</i>-<i>Agrostis capillaris</i>-<i>Galium saxatile</i> grassland, typical sub-community					
Quadrats	Q1	Q2	Q3	Q4	Q5	
OS grid co-ordinates	NT 07844 24398	NT 07274 24260	NT 08204 24061	NT 09046 25308	NT 09416 25455	
Indicative peat depth (cm)	15	15	15	15	15	
Vegetation height (cm)	20	20	20	20	20	
Species	Cover					Constancy
<i>Anthoxanthem odoratum</i>	5	5	4	4	4	5
<i>Festuca ovina</i>	6	6	4	4	5	5
<i>Agrostis capillaris</i>	4	4	4	4	3	5
<i>Potentilla erecta</i>	5	6	6	4	5	5
<i>Galium saxatile</i>	5	5	7	5	4	5
<i>Rumex acetosa</i>	4	-	4	-	-	2
<i>Vaccinium myrtillus</i>	4	3	-	-	-	2
<i>Rhytiadelphus squarrosus</i>	5	5	5	6	5	5
<i>Pleurozium schreberi</i>	5	4	5	5	3	5
<i>Nardus stricta</i>	-	4	-	5	-	2
<i>Luzula multiflora</i>	-	-	5	3	3	3
<i>Veronica officianalis</i>	-	-	3	-	-	1
<i>Carex panicea</i>	-	-	-	5	-	1
<i>Deschampsia flexuosa</i>	-	-	-	4	4	2
<i>Holcus lanatus</i>	-	-	-	-	4	1
<i>Molinia caerulea</i>	-	-	-	-	3	1

Phase 1 habitat type	Acid grassland - unimproved					
NVC Community	U4a <i>Festuca ovina</i>-<i>Agrostis capillaris</i>-<i>Galium saxatile</i> grassland, typical sub-community					
Phase 1 habitat type	Acid grassland – semi-improved					
NVC Community	U4b <i>Festuca ovina</i> - <i>Agrostis capillaris</i> - <i>Galium saxatile</i> grassland, <i>Holcus lanatus</i> -<i>Trifolium repens</i> sub-community					
Quadrats	Q1	Q2	Q3	Q4	Q5	
OS grid co-ordinates	NT 08657 23301	NT 08743 23495	NT 09509 24154	NT 09861 24513	NT 09190 24403	
Indicative peat depth (cm)	10	10	10	10	10	
Vegetation height (cm)	20	15	15	15	15	
Species	Cover					Constancy
<i>Poa pratensis</i>	7	6	6	3	4	5
<i>Angelica sylvestris</i>	4	-	-	-	-	1
<i>Anthoxanthem odoratum</i>	4	5	5	4	5	5
<i>Agrostis canina</i>	5	3	5	7	6	5
<i>Luzula multiflora</i>	4	3	-	-	3	3
<i>Cirsium repens</i>	5	4	4	3	3	5
<i>Rumex acetosa</i>	4	4	4	3	3	5
<i>Holcus lanatus</i>	4	5	4	5	4	5
<i>Stellaria graminea</i>	4	3	4	3	3	5
<i>Potentilla erecta</i>	4	-	-	3	3	3
<i>Rhytiadelphus squarrosus</i>	4	3	3	3	3	5
<i>Achillea millefolium</i>	4	4	4	2	3	5
<i>Rhinanthus minor</i>	-	3	-	-	-	1

Phase 1 habitat type	Acid grassland - unimproved					
NVC Community	U4a <i>Festuca ovina</i>-<i>Agrostis capillaris</i>-<i>Galium saxatile</i> grassland, typical sub-community					
<i>Trifolium repens</i>	-	5	4	-	3	3
<i>Lotus corniculatus</i>	-	4	-	4	3	3
<i>Vicia cracca</i>	-	3	3	3	3	4
<i>Plantago lanceolata</i>	-	3	-	-	-	1
<i>Ranunculus repens</i>	-	3	4	4	4	4
<i>Veronica officianalis</i>	-	2	4	-	4	3
<i>Galium verum</i>	-	3	-	-	3	2
<i>Cerastium fontanum</i>	-	-	3	-	3	2
<i>Conopodium majus</i>	-	-	1	3	3	3

ANNEX D – PHOTOGRAPHS



Photo 1 Target Note 1



Photo 2 Target Note 2



Photo 3 Target Note 3



Photo 4 Target Note 4



Photo 5 Target Note 5



Photo 6 Target Note 6



Photo 7 Target Note 7



Photo 8 Target Note 8



Photo 9 Target Note 9



Photo 10 Target Note 10



Photo 11 Target Note 11



Photo 12 Target Note 12



Photo 13 Target Note 13

NVC Surveys Photographs




Photo 14 H10a *Calluna vulgaris-Erica cinerea* heath, typical sub-community



Photo 15 H12a *Calluna vulgaris-Vaccinium myrtillus* heath, *Calluna vulgaris* sub-community



<p>Photo 16 M19a <i>Calluna vulgaris</i>-<i>Eriophorum vaginatum</i> blanket mire, <i>Erica tetralix</i> sub-community</p>	<p>Photo 17 M23a – <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush pasture, <i>Juncus acutiflorus</i> sub-community</p>
	
<p>Photo 18 <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush pasture, <i>Juncus effusus</i> sub-community</p>	<p>Photo 19 M25 <i>Molinia caerulea</i> - <i>Potentilla erecta</i> mire, no sub-community assigned</p>
	
<p>Photo 20 M27 – <i>Filipendula ulmaria</i>-<i>Angelica sylvestris</i> mire</p>	<p>Photo 21 S9 <i>Carex rostrata</i> swamp</p>
	

<p>Photo 22 U4a <i>Festuca ovina</i>- <i>Agrostis capillaris</i> - <i>Galium saxatile</i> grassland, typical sub-community</p>	<p>Photo 23 U4b <i>Festuca ovina</i> - <i>Agrostis capillaris</i> - <i>Galium saxatile</i> grassland, <i>Holcus lanatus</i> -<i>Trifolium repens</i> sub-community</p>
	
<p>Photo 24 U20 <i>Pteridium aquilinum</i> – <i>Galium saxatile</i> community</p>	<p>Photo 25 W2 <i>Salix cinerea</i>-<i>Betula pubescens</i>-<i>Phragmites australis</i> woodland</p>
	
<p>Photo 26 W15 <i>Fagus sylvatica</i>-<i>Deschampsia flexuosa</i> woodland</p>	

ANNEX E – GLENMUCK BOG CONDITION ASSESSMENT

**Glenmuck Bog LBS Condition Assessment
 Blanket Bog and Valley Bog (Upland)**

Indicators	Target Met
<1 % cover of non-native species	X
<10 % cover of native trees and shrubs, including bramble, but excluding <i>Betula nana</i> and <i>Myrica gale</i> .	✓
<1 % cover, collectively, of <i>Agrostis capillaris</i> , <i>Holcus lanatus</i> , <i>Phragmites australis</i> , <i>Pteridium aquilinum</i> and <i>Ranunculus repens</i> .	✓
No signs of burning	✓
Extent of eroding peat should be less than stable re-deposited peat and new growth.	✓
<10 % of localised ground disturbance (e.g. drains, paths, tracks) resulting in bare disturbed ground and/or active drainage.	✓
Description	
<p>Blanket bog habitat dominated by <i>Eriophorum vaginatum</i> and pleurocarpus mosses, with abundant <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i>. <i>Sphagnum capillifolium</i> was locally abundant throughout, present in 3 of the 4 quadrats. <i>Sphagnum papillosum</i> limited to flatter areas in the north-west, where the ground is slightly wetter. However the ground is generally dry, with bog more dominated by pleurocarpus mosses rather than sphagnum, no pools, and no indicators of wetter ground such as <i>Drosera spp</i>, <i>Narthecium ossifragum</i> and <i>Eriophorum angustifolium</i>. This applies particularly to the areas of sloping ground. It may be that the ditch in the south and road cutting in the north have led to increased drainage. Blocking the ditch and measures to protect the peat in the road cutting may help this situation.</p> <p>There is little or no disturbed peat and / or sphagnum except for road cutting in the north, and a ditch crossing east-west in the south. Some deer trods were noted with slots going into peat, but no extensive damage. There were no signs of erosion.</p> <p>Undesirable native species including bramble formed less than 1% of the vegetation. However, the bog is surrounded on 3 sides by forestry and young and sapling Sitka spruce <i>Picea sitchensis</i> are scattered across the bog area, at 5% cover. These are likely to spread if not controlled.</p> <p>Browsing of the <i>Vaccinium myrtillus</i> by deer was widespread.</p>	

Glenmuck Bog LBS Condition Assessment: Quadrats Blanket Bog and Valley Bog (Upland)	
Date: 16/05/2023	Surveyor: CD/LG/ST
Quadrat Number: Q1	Grid Reference: NT 07864 24050

Targets	
At least 6 indicator species present (score each <i>Sphagnum</i> sp separately)	X
At least 50% of vegetation cover consisting of at least 3 indicator species.	✓
Sphagnum not consisting only of <i>S. fallax</i>	X
<i>Sphagnum papillosum</i> present	X
None of <ul style="list-style-type: none"> <i>Eriophorum vaginatum</i>, <i>Ericaceous spp</i> collectively <i>Trichophorum cespitosum</i> <i>Molinia caerulea</i> individually exceeding 75% cover.	✓
Less than 1% made up of collectively, <i>Agrostis capillaris</i> , <i>Holcus lanatus</i> , <i>Phragmites australis</i> , <i>Pteridium aquilinum</i> and <i>Ranunculus repens</i> .	✓
Less than 33% of the last full growing season's shoots of dwarf shrubs (collectively) showing signs of browsing. (Less than 66% for pioneer stage regrowth or any <i>Betula nana</i> and <i>Myrica gale</i> .)	X
Disturbed bare peat < 10%	✓
Crushed, broken, pulled up sphagnum <10%	n/a

<i>Sphagnum spp</i> :
None

Indicator Species Present	
<i>Andromeda polifolia</i>	
<i>Arctostaphylos spp.</i>	
<i>Betula nana</i>	
<i>Carex bigelowii</i>	
<i>Calluna vulgaris</i>	✓
<i>Cornus suecica</i>	
<i>Drosera spp.</i>	
<i>Erica spp.</i>	
<i>Empetrum nigrum</i>	
<i>Eriophorum angustifolium</i>	
<i>Eriophorum vaginatum</i>	✓
<i>Menyanthes trifoliata</i>	
<i>Myrica gale</i>	
<i>Narthecium ossifragum</i>	
<i>Non-crustose lichens</i>	
<i>Pleurocarpus mosses</i>	✓
<i>Racomitrium lanuginosum</i>	
<i>Rubus chamaemorus</i>	
<i>Rhynchospora alba</i>	
<i>Sphagnum spp</i>	
<i>Trichophorum cespitosum</i>	
<i>Vaccinium spp.</i>	✓

Glenmuck Bog LBS Condition Assessment: Quadrats Blanket Bog and Valley Bog (Upland)	
Date: 16/05/2023	Surveyor: CD/LG/ST
Quadrat Number: Q2	Grid Reference: NT 07762 24053

Targets	
At least 6 indicator species present (score each <i>Sphagnum</i> sp separately)	✓
At least 50% of vegetation cover consisting of at least 3 indicator species.	✓
<i>Sphagnum</i> not consisting only of <i>S. fallax</i>	✓
<i>Sphagnum papillosum</i> present	X
None of <ul style="list-style-type: none"> <i>Eriophorum vaginatum</i>, <i>Ericaceous spp</i> collectively <i>Trichophorum cespitosum</i> <i>Molinia caerulea</i> individually exceeding 75% cover.	✓
Less than 1% made up of collectively, <i>Agrostis capillaris</i> , <i>Holcus lanatus</i> , <i>Phragmites australis</i> , <i>Pteridium aquilinum</i> and <i>Ranunculus repens</i> .	✓
Less than 33% of the last full growing season's shoots of dwarf shrubs (collectively) showing signs of browsing. (Less than 66% for pioneer stage regrowth or any <i>Betula nana</i> and <i>Myrica gale</i> .)	X
Disturbed bare peat < 10%	✓
Crushed, broken, pulled up sphagnum <10%	✓

<i>Sphagnum spp</i> :
<i>Sphagnum capillifolium</i>

Indicator Species Present	
<i>Andromeda polifolia</i>	
<i>Arctostaphylos spp.</i>	
<i>Betula nana</i>	
<i>Carex bigelowii</i>	
<i>Calluna vulgaris</i>	✓
<i>Cornus suecica</i>	
<i>Drosera spp.</i>	
<i>Erica spp.</i>	✓
<i>Empetrum nigrum</i>	
<i>Eriophorum angustifolium</i>	
<i>Eriophorum vaginatum</i>	✓
<i>Menyanthes trifoliata</i>	
<i>Myrica gale</i>	
<i>Narthecium ossifragum</i>	
<i>Non-crustose lichens</i>	
<i>Pleurocarpus mosses</i>	✓
<i>Racomitrium lanuginosum</i>	
<i>Rubus chamaemorus</i>	
<i>Rhynchospora alba</i>	
<i>Sphagnum spp</i>	✓
<i>Trichophorum cespitosum</i>	
<i>Vaccinium spp.</i>	✓

Glenmuck Bog LBS Condition Assessment: Quadrats Blanket Bog and Valley Bog (Upland)	
Date: 16/05/2023	Surveyor: CD/LG/ST
Quadrat Number: Q3	Grid Reference: NT 077017 24086

Targets	
At least 6 indicator species present (score each <i>Sphagnum</i> sp separately)	✓
At least 50% of vegetation cover consisting of at least 3 indicator species.	✓
Sphagnum not consisting only of <i>S. fallax</i>	✓
<i>Sphagnum papillosum</i> present	X
None of <ul style="list-style-type: none"> • <i>Eriophorum vaginatum</i>, • <i>Ericaceous spp</i> collectively • <i>Trichophorum cespitosum</i> • <i>Molinia caerulea</i> individually exceeding 75% cover.	✓
Less than 1% made up of collectively, <i>Agrostis capillaris</i> , <i>Holcus lanatus</i> , <i>Phragmites australis</i> , <i>Pteridium aquilinum</i> and <i>Ranunculus repens</i> .	✓
Less than 33% of the last full growing season's shoots of dwarf shrubs (collectively) showing signs of browsing. (Less than 66% for pioneer stage regrowth or any <i>Betula nana</i> and <i>Myrica gale</i> .)	✓
Disturbed bare peat < 10%	✓
Crushed, broken, pulled up sphagnum <10%	✓

<i>Sphagnum spp:</i>
<i>Sphagnum capillifolium</i>

Indicator Species Present	
<i>Andromeda polifolia</i>	
<i>Arctostaphylos spp.</i>	
<i>Betula nana</i>	
<i>Carex bigelowii</i>	
<i>Calluna vulgaris</i>	✓
<i>Cornus suecica</i>	
<i>Drosera spp.</i>	
<i>Erica spp.</i>	✓
<i>Empetrum nigrum</i>	
<i>Eriophorum angustifolium</i>	
<i>Eriophorum vaginatum</i>	✓
<i>Menyanthes trifoliata</i>	
<i>Myrica gale</i>	
<i>Narthecium ossifragum</i>	
<i>Non-crustose lichens</i>	
<i>Pleurocarpus mosses</i>	✓
<i>Racomitrium lanuginosum</i>	
<i>Rubus chamaemorus</i>	
<i>Rhynchospora alba</i>	
<i>Sphagnum spp</i>	✓
<i>Trichophorum cespitosum</i>	
<i>Vaccinium spp.</i>	✓

Glenmuck Bog LBS Condition Assessment: Quadrats Blanket Bog and Valley Bog (Upland)	
Date: 16/05/2023	Surveyor: CD/LG/ST
Quadrat Number: Q4	Grid Reference: NT 07750 24181

Targets	
At least 6 indicator species present (score each <i>Sphagnum</i> sp separately)	✓
At least 50% of vegetation cover consisting of at least 3 indicator species.	✓
<i>Sphagnum</i> not consisting only of <i>S. fallax</i>	✓
<i>Sphagnum papillosum</i> present	X
None of <ul style="list-style-type: none"> • <i>Eriophorum vaginatum</i>, • <i>Ericaceous spp</i> collectively • <i>Trichophorum cespitosum</i> • <i>Molinia caerulea</i> individually exceeding 75% cover.	X
Less than 1% made up of collectively, <i>Agrostis capillaris</i> , <i>Holcus lanatus</i> , <i>Phragmites australis</i> , <i>Pteridium aquilinum</i> and <i>Ranunculus repens</i> .	✓
Less than 33% of the last full growing season's shoots of dwarf shrubs (collectively) showing signs of browsing. (Less than 66% for pioneer stage regrowth or any <i>Betula nana</i> and <i>Myrica gale</i> .)	
Disturbed bare peat < 10%	✓
Crushed, broken, pulled up sphagnum <10%	✓

<i>Sphagnum spp</i> :
<i>Sphagnum capillifolium</i>

Indicator Species Present	
<i>Andromeda polifolia</i>	
<i>Arctostaphylos spp.</i>	
<i>Betula nana</i>	
<i>Carex bigelowii</i>	
<i>Calluna vulgaris</i>	✓
<i>Cornus suecica</i>	
<i>Drosera spp.</i>	
<i>Erica spp.</i>	✓
<i>Empetrum nigrum</i>	
<i>Eriophorum angustifolium</i>	
<i>Eriophorum vaginatum</i>	✓
<i>Menyanthes trifoliata</i>	
<i>Myrica gale</i>	
<i>Narthecium ossifragum</i>	
<i>Non-crustose lichens</i>	
<i>Pleurocarpus mosses</i>	✓
<i>Racomitrium lanuginosum</i>	
<i>Rubus chamaemorus</i>	
<i>Rhynchospora alba</i>	
<i>Sphagnum spp</i>	✓
<i>Trichophorum cespitosum</i>	
<i>Vaccinium spp.</i>	✓

**Glenmuck Bog LBS Condition Assessment
 Acid Grassland**

Indicators	Targets Met?
Greater than 10 % of vegetation cover consisting of forbs	X
< 1 % cover of non-native species	✓
<10 % cover of bracken and / scattered native trees and shrubs	X
<25 % cover, collectively, of <i>Bellis perennis</i> and/or <i>Ranunculus repens</i>	✓
<1 % cover, collectively, of <i>Arrhenatherum elatius</i> , <i>Cirsium arvense</i> , <i>Cirsium vulgare</i> , <i>Cynosurus cristatus</i> , large docks, <i>Lolium perenne</i> , <i>Senecio jacobaea</i> , or <i>Urtica dioica</i> .	✓
< 10 % cover <i>Juncus effusus</i>	✓
< 10 % of the ground cover should be made up of disturbed bare ground.	✓
Description	
Patches of acid grassland within a habitat mosaic with dry heath and marshy grassland, located on steep valley sides. Key species include <i>Holcus lanatus</i> , <i>Anthoxanthum odoratum</i> , <i>Agrostis sp.</i> <i>Festuca sp.</i> <i>Rhytidiadelphus squarrosus</i> , <i>Luzula multiflora</i> , <i>Galium saxatile</i> , <i>Potentilla erecta</i> and <i>Rumex acetosella</i> . The habitat is being overtaken by bracken in places.	

**Glenmuck Bog LBS Condition Assessment
 Subalpine dry dwarf-shrub heath**

Indicators	Targets Met?
< 1 % cover of non-native species	✓
<10 % cover of bracken	✓
<10 % cover of native trees and shrubs, including bramble, but excluding <i>Betula nana</i> and <i>Myrica gale</i> .	✓
<1 % cover, collectively, of <i>Cirsium arvense</i> , <i>Cirsium vulgare</i> , large docks, <i>Ranunculus repens</i> or <i>Urtica dioica</i> .	✓
<10 % cover of <i>Juncus effusus</i>	✓
No signs of burning in sensitive areas (wind clipped, very thin soils, steep slopes, abundant bryophytes and lichens, uneven structure at small scale, adjacent to pools, gullies and watercourses)	✓
All growth phases of heather should occur with at least 10 % in late mature growth phase.	X
Less than 10% of the ground cover should be made up of disturbed bare ground,(excluding burnt ground)	✓
Description	
Heather <i>Calluna vulgaris</i> and bilberry <i>Vaccinium myrtillus</i> dry heath in mosaic with bracken and acid grassland on steep valley sides. There is little or no pioneer heather, although the other three phases were all present.	

Glenmuck Bog LBS Condition Assessment
Marshy grassland

Indicators	Target met?
<20 % <i>Juncus effusus</i>	X
<5 % agricultural weeds: <i>Anthriscus sylvestris</i> , <i>Cirsium arvense</i> , <i>Cirsium vulgare</i> , <i>Rumex crispus</i> , <i>Rumex obtusifolius</i> , <i>Urtica dioica</i>	✓
<10 % agriculturally favoured species: <i>Lolium perenne</i> , <i>Phleum pratense</i> , <i>Glyceria fluitans</i> , <i>Holcus lanatus</i> , <i>Poa trivialis</i> , <i>Ranunculus repens</i> , <i>Trifolium repens</i> .	✓
<5 % cover of bracken and /or scattered native trees and shrubs	X
<25 % dead litter	X
< 10 % of the ground cover should be made up of disturbed bare ground.	✓

Description

Narrow band of *Juncus effusus* dominated marshy grassland along the banks of a stream banks. The habitat is not particularly damaged or poached, however there is some bracken encroachment and occasional erosion of the stream into the underlying peat.

ANNEX F – PEATLAND CONDITION ASSESSMENT (OF M19A HABITAT)³

				Peat Depth (cm)		Criteria 1 Raised bog	Criteria 2 Montane bog	Criteria 3 Blanket bog											
Oliver Forest				as shown in ES	as measured during NaturScot site visit	Raised bog present supporting typical bog vegetation	Montane bog present supporting typical bog vegetation	Within a continuous unit of blanket bog (>25ha)	Blanket bog support vegetation capable of peat forming	Few drains/peat cutting?	Peat forming spp/low disturbance?	Natural surface pattern?	absence of invasion by woodland/scrub?	Abundant Sphagnum-rich ridges	Sphagnum-B.nana ridges	S.fuscum or S.austinii hummocks?*	Peat Mounds?	Rhynchospora fusca?	
						Yes is good Likely national interest	Yes is good Possible national interest	Yes is good	Yes is good	Yes is good Two or more yes = possible national interest				Rare features. Yes is very good. No is neutral. One or more yes = possible national interest					
Polygon number	Easting	Northing	NVC	depth >50 cm = carbon rich soil	No -> check for other type of bog	No -> check for other type of bog	No -> advise on mitigation measures	No -> check rare features					No -> advise on mitigation measures					assessment result	
1			M19		No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	Not a national interest
2			M19		No	No	No	Yes	No	Yes	No	Yes	No	No	No	No	No	No	Possible national interest - too small
3			M19		No	No	No	No	No	No	No	No	No	No	No	No	No	No	Not a national interest
4			M19		No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	Not a national interest
5			M19		No	No	No	Yes	Yes	No	No	Yes	No	No	No	No	No	No	Possible national interest
6			M19		No	No	No	Yes	Yes	Yes	No	Yes	No	No	No	No	No	No	Possible national interest - too small

³ Assessment spreadsheet from NatureScot website².