

Environmental Impact Assessment

# Sandy Knowe Wind Farm Extension

Technical Appendix 6-2: National Vegetation  
Classification Survey

ERG UK Holding Ltd.



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## 1 Introduction

This Technical Appendix (TA) has been prepared in support of Volume 1, Chapter 6: Ecology report and as such, does not comprise an assessment of results, but information only. It should be read in conjunction with Chapter 8: Hydrology, Hydrogeology and Soils.

The National Vegetation Classification survey was undertaken during August 2020, and in October 2021. The 2020 survey comprised the western extension and the northern extension was surveyed in 2021 as this area was then incorporated into the Proposed Development Footprint.

The Proposed Development is approximately 9km west of Sanquhar and 1km southwest of Cumnock, Dumfries and Galloway (central grid reference NS 68721 11100) and lies adjacent to the Sandy Knowe Wind Farm which was consented in July 2020 and is currently under construction.

the Applicant commissioned the survey to identify any sensitive habitats are present and particularly to establish whether any sensitive and/or Ground Water Dependant Terrestrial Ecosystem (GWDTEs) habitats are likely to be negatively affected by the Proposed Development.

The survey methodology and results are detailed within this report and provide information on the communities that were recorded and their conservation status. NVC communities which are potentially groundwater dependent are identified, based on SEPA (2017) Guidance. Several vegetation communities were identified which are potential GWDTEs. Communities were also recorded in respect of their Annex 1 status as per the Habitats Regulations<sup>1</sup> and Scottish Biodiversity List status.

To confirm whether they are GWDTE and in what degree dependent, a hydrogeological risk assessment was undertaken and reported within the Hydrology Assessment: Chapter 8: Hydrology, Hydrogeology and Soils.

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<sup>1</sup> The Conservation (Natural Habitats, &c.) Regulations 2019 (as amended)

## 2 Methodology

### 2.1 NVC survey methods

The NVC survey on the western extension area (i.e., the area to the west of the Sandy Knowe Wind Farm comprising of turbines T25-28 and associated infrastructure) was carried out by Rory Whytock ACIEEM on the 18<sup>th</sup> of August 2020 in dry conditions with good visibility throughout. Survey for the northern extension area (i.e., the area to the north of the Sandy Knowe Wind Farm comprising of turbines T29 and T30 and associated infrastructure) was carried out by Max Carstairs on the 5<sup>th</sup> and 6<sup>th</sup> October 2021.

The NVC communities within the survey boundary were mapped by eye and classified according to Rodwell (1998a, 1998b, 2003). Where possible five 2 x 2m quadrats were set up for each habitat type where detailed floristic samples were recorded to allow the habitat to be categorised later into the appropriate NVC classification. Woodland quadrats were adapted to the size of the community and were preferentially 10m x 10m for assessment of the tree canopy and 2m x 2m for the ground flora. Small areas of interest and general descriptions of features were made using target notes as per Phase 1 survey methodology (JNCC, 2010). See Figure 6-5: NVC Survey and 6-6 GWDTE NVC Assessment.

Higher plant nomenclature follows that of Stace (2020), bryophyte nomenclature follows that of the Hill et al. (2008) and lichens follow Coppins (2002).

### 2.2 Limitations

The surveys were carried out in August and October, as such there were few limitations in August and some signs of forb die back in October. Some areas were surveyed remotely due to steep banks and dense stands of bracken which prevented access. A small area of the northern extension buffer zone was not surveyed due to site operations; however, these areas are on the west side of the Polneul Burn and as such are spatially and hydrologically isolated from the proposed new turbine locations.

### 3 Vegetation survey results

The vegetation survey recorded vegetation communities that are considered to be of potential conservation interest or potential GWDTEs (Figures 6-5 and 6-6). Where these communities were floristically distinct, they were assigned into corresponding sub-communities. The communities recorded during the survey were:

- Mires and flushes: Ja, Je, M6, M15, M23, M20 + M25
- Grasslands and tall herb communities: MG9 & MG10
- Woodland: W9

The communities U20 & U4 also occurred on site though have little conservation value and are not GWDTE. These communities are therefore not considered further in this report.

#### 3.1 NVC communities

##### MG9 *Juncus effusus* – *Holcus lanatus* rush pasture

This community occurred on sloping ground adjacent the northeast section of the northern extension area. *Deschampsia cespitosa* was dominant with occasional *Juncus effusus*, *Cirsium palustre*, *Holcus lanatus* and *Rumex acetosa*. This community is a variant of flood plain type, described in Rodwell (1988b), with the variant occurring on moderate slopes along the upland fringe.

##### MG10 *Juncus effusus* – *Holcus lanatus* rush pasture

This community is frequently recorded in the northern half of the western extension area. *Juncus effusus* tussocks are the most obvious feature of this community, though *Juncus acutiflorus* was also recorded occasionally. Between these tussocks is a species poor sward of *Holcus lanatus*, *Agrostis stolonifera* and *Poa trivialis*. Forb species included *Ranunculus repens*, *Ranunculus acris* and *Cardamine pratensis*. It is distinct from other rush dominated communities by the higher frequency of grasses that are frequently grazed which maintains the open, short sward of the grass pasture between the tussocks of rush species.

All MG10 communities were assigned to the MG10a typical sub-community.

##### M6 *Carex echinata* – *Sphagnum fallax/denticulatum* mire

This community was found in small to medium sized areas, located along the margins of small watercourses and depressions in the landscape in both the western and northern extensions areas. This community is a soligenous mire found on peat substrates that are fed primarily by base-deficient water. These mires are situated in valley bottoms, sloping valley sides or channels within the site where water flows slowly over a peaty surface. There are four sub-communities associated with M6 mires, three of which were recorded within the survey area. This community is defined by the dominance of base-intolerant *Sphagnum* species such as *S. fallax*, *S. cuspidatum* and *S. palustre*. Rushes and grasses are the other dominant species commonly found within this community. M6 can be differentiated from similar NVC communities such as M23 *Juncus effusus/acutiflorus* – *Galium palustre* mires as these typically lack the abundance of *Sphagnum* found in M6 communities.

M6c *Juncus effusus* and M6d *Juncus acutiflorus* sub-communities were widely recorded throughout the survey area but increased in frequency towards the southern side of each of the western and northern extensions areas. The M6c *Juncus effusus* sub-community is rather species poor with the nominate species dominating the vascular assemblage. The M6c *Juncus effusus* sub-community is dominated by rushes and contains a carpet of common *Sphagnum* species including *S. palustre* and *S. fallax*. Less frequently recorded species include *Ranunculus repens*, *Ranunculus acris* and *Myosotis secunda*.

The M6d *Juncus acutiflorus* community is slightly more varied in its species assemblage and often contained *Viola palustris* and occasional *Carex* species such as *C. echinata* and *C. nigra*. These sedge species are also an important component of M6a *Carex echinata* sub-community which was also recorded within the survey area. Though this sub-community differed from the M6c and M6d sub-communities as the *Carex* species were dominant or co-dominant with rushes.

### M15 *Trichophorum germanicum-Erica tetralix* wet heath

Typically, a community of shallow peat, though can also occur on peat over 50cm deep where it can be classified as bog. The community on site contained abundant *Trichophorum germanicum* and frequent *Calluna vulgaris* with occasional *Erica tetralix*, *Vaccinium myrtillus*, *Potentilla erecta*, *Narthecium ossifragum*, *Deschampsia flexuosa*, *Molinia caerulea*, *Eriophorum vaginatum*, *Sphagnum palustre*, *Sphagnum capillifolium* and *Polytrichum* sp. *Sphagnum papillosum* occurred rarely.

### M20 *Eriophorum vaginatum* raised and blanket mire

This is a community where *Eriophorum vaginatum* forms thick tussocks and is overwhelmingly dominant. This community increases in frequency towards the southern half of the Survey Area. They are located on gently sloping ground or hollows, where water is able to collect. It is a community that is characteristic of ombrogenous peatland habitats that have been negatively affected by long term grazing and burning management regimes.

There are two sub-communities associated with M20 mire, both were recorded within the survey area. The species poor sub-community M20a was the most frequently recorded of the two. *Eriophorum vaginatum* is overwhelmingly dominant and the large tussocks suppress the growth of many other species. The M20b *Calluna vulgaris* - *Cladonia* sub-community has a more varied floristic composition. Additional species such as *Empetrum nigrum* and *Cladonia arbuscula* are also found in M20b along with *Sphagnum* species such as *S. capillifolium*, *S. papillosum* and *S. medium*. Other bryophytes recorded within the community are dominated by common pleurocarpous mosses such as *Hylocomium splendens*, *Pleurozium schreberi* and *Hypnum jutlandicum*. *Polytrichum strictum* was also frequently recorded within this community which is a species indicative of a peat layer that exceeds 50cm in depth.

### M23 *Juncus effusus/acutiflorus-Galium palustre* rush-pasture

There are two sub-communities associated with this habitat type, both of which were recorded within the survey area. The M23a *Juncus acutiflorus* sub-community is the more floristically diverse of the two sub-communities. The community is dominated by *Juncus acutiflorus* but contains a range of forbs including *Viola palustris*, *Carex nigra*, *Rumex acetosa* and *Cardamine pratensis*. The composition of the vegetation was very

uniform throughout and lacked species that are typical of areas that are associated with base enrichment.

The M23b *Juncus effusus* sub-community is more impoverished and lacks the diversity of species seen in M23a communities. It is dominated by *Juncus effusus* and is often found in drier areas than M23a. Species that are recorded in higher frequency than M23a include *Holcus lanatus* and *Cirsium palustre*.

#### M25 *Molinia caerulea* – *Potentilla erecta* mire

This community occurs on moderately wet, shallow peat and is found where there is a transition from the areas of deeper peat (M20 communities) and the more improved marshy grasslands (MG10 communities). *Molinia caerulea* is the most dominant species within this community and can form large conspicuous tussocks. Bryophyte diversity is poor and restricted to robust common pleurocarpous mosses such as *Hylocomium splendens*, *Pleurozium schreberi* and *Hypnum jutlandicum*.

The M25a sub-community was the only one of its type to be recorded within the Survey Area. M25a contains a flora that is consistent of a community that is derived from peatland habitats and contained a similar range of species, though they are normally very restricted in their distribution. Typical peatland associates include *Erica tetralix*, *Calluna vulgaris*, *Trichophorum germanicum*, *Sphagnum palustre* and *Potentilla erecta*. The more floristically impoverished stands where *Molinia caerulea* was the overwhelmingly species cannot be assigned to a sub-community.

#### W9 *Fraxinus excelsior*-*Sorbus aucuparia*-*Mercurialis perennis* woodland

This woodland was recorded throughout the centre of the western extension along the length of an incised valley containing a small to medium sized stream. The community was ill defined throughout the survey area and could not be assigned to sub-community level. In the southern stretches of the site the woodland was thinly scattered and was mainly composed of *Sorbus aucuparia* and *Betula pubescens*. The ground layer contained a range of forbs including *Dryopteris filix-mas*, *Dryopteris affinis* agg., *Oreopteris limbosperma*, *Oxalis acetosella* and *Viola riviniana*.

As the woodland extends to northern parts of the survey area to increasingly lower altitudes, the woodland canopy becomes denser, and the tree assemblage becomes more typical of the type. *Fraxinus excelsior* becomes much more frequent along with *Corylus avellana*. *Acer pseudoplatanus* also becomes more frequent. The ground flora remains similar to that which is described for the southern reaches of the woodland, but also contains species such as *Hyacinthoides non-scripta* and *Mercurialis perennis*.

#### *Juncus acutiflorus* (Ja) and *Juncus effusus* (Je) acid grassland communities

Large areas of the northern extension were dominated separately by *Juncus acutiflorus* and *Juncus effusus* with a few associates including occasional *Holcus lanatus*, *Galium saxatile*, *Rumex acetosa*, *Molinia caerulea* and *Agrostis capillaris*. *Viola palustre* and *Carex panacea* occurred rarely and were absent from most areas. Moss species present were pleurocarpous and included *Rhytidiadelphus squarrosus*.

This vegetation does not fit an NVC community as it lacks the *Sphagnum* and *Polytrichum* component of M6c & d and the diverse array of fen forbs characteristic of M23a and to a lesser extent M23b. The vegetation is more acidophilous than MG10 and

is mapped following normal convention as 'Ja' and 'Je'. The Ja and Je vegetation on site is structurally patchy in the north of the site like MG10 but with a continuous thick sward like M23 in the south. It may be that much of the *Juncus* vegetation on site is intermediate between 'Ja/Je' and M23 thereby accounting for the paucity of forbs in combination with the physical structure of M23.

Ja and Je are botanically impoverished and fairly common in western Scotland.

Groundwater dependency ratings for these communities have not been published though they are widely considered to be partially dependent.

### 3.2 Vegetation community summary

A number of the recorded communities are considered to have conservation value at a European level (Annex 1) or at a national level (Scottish Biodiversity List). A summary of habitats which have conservation designations assigned to them can be found in table 1.

**Table 1: Annex 1 and Scottish Biodiversity List Habitats**

NVC Code	Annex 1	SBL Habitats
M6	N/A	Upland flush
M15	H7130 (Only applicable on peat >50cm deep)	Blanket bog
M20	H7130 stands on blanket bogs	Blanket bog
M25	H7130 (Only applicable on peat >50cm deep)	Blanket bog

For M20 and M25 peatland habitats, the communities are only classed as Annex 1 quality if they adhere to certain criteria. For the H7130 Annex 1 classification the peat layer should be greater than 50cm in depth and be capable of regeneration within a period of 30 years (European Commission, 2013). For the community to regenerate within a period of 30 years there needs to be a *Sphagnum* assemblage capable of generating a peat layer. The main peat building *Sphagnum* species that form the bulk of the peat layer are *S. medium*, *S. papillosum* and to a lesser extent *S. capillifolium*. Of the recorded communities within the survey area only M20b exhibited this suite of species. As such, M20b communities are considered to be classed as Annex 1 habitats, though a peat depth survey would confirm whether the peat layer exceeds 50cm in depth. Other peatland communities recorded within the survey area are considered too impoverished to meet the Annex 1 criteria.

## 4 Potential GWDTE

### 4.1 Ecological assessment

As described above, the NVC habitats were mapped according to their dominant NVC community, although many of these habitats were made up of mosaics of NVC communities. Hence when determining whether a particular habitat was potentially groundwater dependent, the composition of the mosaic was taken into account, as outlined in Table 2 and shown in Figure 6-6 Potential GWDTE NVC Assessment.

**Table 2: Potential GWDTE NVC Classification**

Potential GWDTE Classification	Habitat attributes (adapted from Appendix 4 Land Use Planning System SEPA Guidance Note 31)
5	All NVC communities present (regardless of number) are listed as being of high potential dependence on groundwater.
4	NVC community/mosaic with dominant community listed as of high potential dependence on groundwater with one or more communities of lesser dependence.
3	NVC community/mosaic with a sub-dominant community listed as high potential dependence on groundwater with the dominant community listed as lesser dependence.
2	NVC community/mosaic with dominant community listed as of moderate potential dependence on groundwater with other communities present of lesser dependence.
1	NVC community/mosaic with sub dominant community listed as low and dominant community not listed as potentially dependent on groundwater.
0	NVC community/mosaic supports no communities with potential dependence on groundwater.

Table 3 lists the vegetation communities found during surveys which have a potential for groundwater dependency based on floristics from NVC survey data alone. The table categorises each habitat type according to whether they are likely to be moderately or highly groundwater dependent. NVC which, if present, indicate that a wetland is likely to be groundwater dependent depending on the hydrogeological setting, are identified according to SEPA (2017) Land Use Planning System SEPA Guidance Note 31, 11/09/2017 Guidance on assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. In addition to the NVC communities 'Ja' and 'Je' habitats were recorded. These are not found within the NVC but comprise distinctive forms of NVC communities or sub-communities (Averis, 2020).

In total, there are six communities listed as moderate and two communities listed as having a potential for high groundwater dependency.

**Table 3: Potential GWDTE communities recorded within the survey area (western and northern extension areas)**

Community code	Community name	GWDTE potential
Ja	<i>Juncus acutiflorus</i> – acid grassland community	Moderate
Je	<i>Juncus effusus</i> – acid grassland community	Moderate

<b>MG9</b>	<i>Holcus Lanatus – Deschampsia cespitosa pasture</i>	Moderate
<b>MG10</b>	<i>Holcus lanatus - Juncus effusus rush pasture</i>	Moderate
<b>M15</b>	<i>Trichophorum germanicum – Erica tetralix wet heath</i>	Moderate
<b>M25</b>	<i>Molinia caerulea – Potentilla erecta mire</i>	Moderate
<b>M6</b>	<i>Carex echinata – Sphagnum fallax mire</i>	High
<b>M23</b>	<i>Juncus effusus/acutiflorus - Galium palustre rush pasture</i>	High

Figure 6.5 shows the spatial occurrence of these overlain with the proposed infrastructure.

## 4.2 Hydrogeological Assessment

Groundwater dependency is often linked to wetlands that contain flora that is dependent upon the chemical composition of the water fed from a groundwater source. SEPA defines the habitats with regard to their potential for groundwater dependency as identified above, However SEPA (2017) acknowledge that not all communities listed may be truly groundwater dependent.

SEPA note that where NVC communities identify a potential GWDTE a hydrogeological risk assessment is then required to confirm whether the community is actually groundwater dependent and in what degree. The hydrogeological assessment is carried out in Chapter 8.

As all turbines are likely to excavate >1m deep and are within 250m GWDTE, potential impacts will be addressed in both Chapter 6: Ecology and Chapter 8: Hydrology, Hydrogeology and Soils.

## 5 Summary

The NVC surveys were targeted to record communities of potential conservation value and/or potential groundwater dependency. An ecological assessment was carried out for potential GWDTE NVC categories on site.

Three potentially ground water dependant NVC communities found are listed within the Scottish Biodiversity Action Plan; M6, M15 and M25. Of these two Annex 1 habitats are derived:

- M15 - H4010 N Atlantic wet heaths with *Erica tetralix* (Annex 1) (where occurring on deep peat, >50cm) and
- M25 - H7120 Degraded raised bog still capable of natural regeneration (M25).

M25 on peat of 50cm depth or over can be classified as degraded bog and on shallower soils as a groundwater dependent terrestrial ecosystem.

M20 is a degraded form of bog which qualifies as Annex 1 habitat where it is capable of regenerating within 30 years (given suitable management). Sub-community M20b is slightly richer than M20a and therefore has greater potential to qualify for Annex 1 status. M20b recorded during the surveys is considered as Annex 1 habitat.

Eight communities were identified as potentially groundwater dependent. Six are considered to be potentially moderately dependent and two potentially highly dependent (M6 and M23) In accordance with SEPA methodology, where these are within 250m of excavations of >1m and within 100m of excavations <1m, A full hydrogeological investigation has been carried out within Chapter 8 Hydrology, Hydrogeology and Soils to define their actual groundwater dependency status.

## 6 References

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