



Appendix 11.A
Tom na Clach Wind Farm Extension:
Habitat and vegetation survey

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EXECUTIVE SUMMARY

Background

A survey of the habitats and types of vegetation within the proposed area for an extension to the Tom na Clach Wind Farm near Tomatin was carried out on the 13th and 14th August 2020. This was carried out to help inform the most suitable siting of wind turbines and tracks and to help minimize the damage to semi-natural habitats and ground-water dependent terrestrial ecosystems.

Methods

The habitats within particular areas were outlined on to base maps in the field with the aid of digital aerial imagery freely available from the internet. In some areas there are intimate mosaics of two or more habitats. For these areas the proportion occupied by each habitat was placed into one of the following class intervals based on the Domin scale: <1%; 1-5%; 5-10%; 10-25%; 25-50%; 50-75%; 75-95% and 95-100%. The habitat classes follow those described in the Phase 1 habitat classification manual.

Areas of homogeneous vegetation within a 300 metre radius of the proposed locations for each wind turbine were mapped and classified into different types using the National Vegetation Classification (NVC) system using the methods described by Rodwell (2006). Where an area comprised an intimate mixture of different plant communities that could not be readily be separated these were mapped as ‘mosaic polygons’ in the same way as that described above for habitats. Where there were very small stands of notable plant communities or species these were recorded as target notes and the grid references from a hand-held GPS receiver used to ascertain the OS grid reference.

Particular attention was paid to the presence of ground-water dependent terrestrial ecosystems when the mapping was carried out. Extra notes of these were made where necessary when they were within the 300 metre radius area of potential impact around the proposed location for each wind turbine. Areas between the 300 metre radius circles of the proposed wind turbines and existing wind farm tracks were also surveyed so that the total area surveyed was 303 hectares.

Results

The vast majority of the area (82 to 93%) surveyed is covered by blanket bog habitat. All of this habitat has been modified through drainage, burning and grazing by sheep. Most of it is relatively dry due to the combination of gully erosion and the effects of drainage ditches. It has a type of the heather – hare’s-tail cotton-grass blanket mire community (M19) on it that is for the most part relatively dry with a significant cover of reindeer lichens. There are no areas of relatively intact blanket bog vegetation present within the survey area.

The blanket bog habitat is dissected by a number of small stream valleys which have dry heath communities on the slopes, acid flush habitat along the bottom and acid grassland communities where the soils are more freely drained.

A total of 15 different plant communities were found that matched the descriptions in the NVC and within these a total of 12 sub-communities were recognized. None of the plant communities or sub-communities are particularly rare at the national or regional level.

The acid flushes within the stream valleys at the base of depressions within the blanket bog habitat are ground-water dependent ecosystems. These flushes are mostly dominated by soft rush, but in some areas are dominated by carpets of the commonest bog-moss in Britain, *Sphagnum fallax*.

Small areas of lichen heath were found on the top of small hillocks and the tops of slopes towards the west of the survey area. These had either the heather – reindeer lichen (H13) or heather – bearberry (H16) heath communities on them. Other heath communities present in small quantities are the heather - blaeberry - bog-moss heath (H21) and blaeberry – cloudberry heath (H22). These are generally located on slopes with northerly aspects where they are shaded and/or accumulate significant quantities of snow in winter.

A small area of juniper scrub (W19) is present in the valley which has the headwaters of the Allt Seileach in the far south-western part of the survey area.

Contents

1.	INTRODUCTION	4
1.1	Background	4
2.	METHODS.....	4
2.1	Survey Area	4
2.2	Habitat Survey	4
2.3	Plant Community Survey	5
2.4	Characterisation of the site's ecohydrology	5
2.1	Nomenclature	5
3.	TOPOGRAPHIC AND GEOLOGICAL SETTING.....	5
4.	HYDROLOGICAL SETTING	6
5.	LAND USES.....	6
6.	HABITATS	6
7.	PLANT COMMUNITIES	7
8.	GROUND-WATER DEPENDENT TERRESTRIAL ECOSYSTEMS.....	8
9.	REFERENCES	9
10.	TABLES	10
11.	FIGURES.....	13

1. INTRODUCTION

1.1 Background

Infinergy developed the Tom na Clach Wind Farm in 2017. This 13 wind turbine facility is located on moorland approximately 8 km north-east of the village of Tomatin. Plantecol Limited was commissioned by BSG Ecology to carry out a habitat and vegetation survey of about 250 ha of ground around the existing wind farm in advance of an application for the extension of the existing wind farm with a further 10 turbines (Figure 1).

This report describes the results of the survey of the habitats, vegetation types and ground-water dependent terrestrial ecosystems (GWDTEs) within the area of the proposed extension to the Tom na Clach Wind Farm.

2. METHODS

2.1 Survey Area

The survey was carried out on the 13th and 14th August 2020 and involved carrying out a walk-over survey of the areas within a 300 metre buffer around each location of the proposed turbine locations shown in Figure 1. In addition, areas that are between existing wind farm tracks and these areas was also surveyed to account for access tracks that would need to be constructed. The whole of the area surveyed is also shown in Figure 1. This includes some ground between the 300 m buffers around the proposed locations of the new wind turbines and the existing wind farm tracks to take account of access tracks. Publicly available aerial images, were used to help outline the extent of particular habitats and plant communities onto paper maps.

2.2 Habitat Survey

The habitats within particular areas were outlined on to the maps with the aerial imagery as a backdrop in the field. Each of these defined areas, termed polygons, were assigned a unique number and one or more habitats using the classification system and descriptions given in the Phase 1 habitat manual (Nature Conservancy Council 1990). In some areas there are intimate mosaics of two or more habitats. For these areas the proportion occupied by each habitat was placed into one of the class intervals shown in Table 1 that are based on the Domin scale. The use of an interval scale with broad intervals is important in minimizing observer error in estimating the area covered by habitats and communities as well as species (Hurford 2007).

The habitats are mapped with my own colour scheme rather than the suggested colour schema suggested in the Phase 1 habitat manual. A Garmin GPS map 62s receiver was used to help identify locations of boundaries and to record the grid reference for any target notes on particularly small and unique habitats, e.g. flushes.

2.3 Plant Community Survey

The plant communities were mapped and assigned to each of the same polygons used to map the habitats. The plant communities were classified based on the dominance of key plant species and the consistency with which particular species of plant occur throughout the apparently homogeneous stands of vegetation. The mapping and identification of each different plant community present largely followed the general approach described in Rodwell (2006). The National Vegetation Classification (NVC) plant community classification of Rodwell *et al.* (1991a, 1991b and 1992) was used.

2.4 Characterisation of the site's ecohydrology

Groundwater dependent terrestrial ecosystems (GWDTEs) were largely identified from the plant communities present, but also from the topography of the area being surveyed, the geological setting and the type of drainage (natural and artificial)¹. It was not possible to examine the soil types present, but for the most part they are types of blanket bog peat.

2.1 Nomenclature

The names for bryophytes follow those in Hill *et al.* (2008) and the names for vascular plants follow those of Stace (2019).

3. TOPOGRAPHIC AND GEOLOGICAL SETTING

The survey area is at 420 to 560 metres above sea-level. Consequently the site has cool summers and cold winters where there is the potential for significant quantities of snow to accumulate in winter. The ground is at the headwaters of a number of small watercourses (Allt an t-Slugain Mhòir, Caochan Tom nan Clach, Allt Carn an t-Sean-Liathanaich and their tributaries) that flow through small narrow valleys between the gentle to modest hill slopes.

Virtually all of the survey area is underlain by a type of Semipelite and Migmatitic metamorphosed rock of the Creag Buidhe Semipelite Formation. There is one small exposure of a microgranitic rock of the Quilichan Granodiorite Vein Complex on the Caochan Tom nan Clach. There are couple of other small exposures of this same rock on the Allt an t-Slugain Mhòir, but they are just upstream, i.e. to the west, and outside the survey area around turbine 1.

The main superficial deposit across the survey area is peat which overlays a variety of till and fluvio-glacial deposits. There are gravel deposits in the larger stream valleys and an area of sand and gravel close to the first junction of the extant wind farm that was presumably excavated and used in the construction of the original wind farm.

¹ Scottish Environment Protection Agency 2017. *Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems*. Land Use Planning System SEPA Guidance Note 31.

4. HYDROLOGICAL SETTING

At the time there was water-flow in all of the watercourses. These mostly drain in an easterly or north-easterly direction where they eventually feed into the Findhorn River. There are a number of drains (grips) cut into the peat, especially in the eastern part of the survey area. There is also a lot of gully erosion into the peat throughout most of the survey area, and in some areas the erosion has gone down to the bedrock or underlying glacial and fluvio-glacial deposits.

5. LAND USES

The area surveyed is used primarily for shooting grouse and rearing hill sheep (Scottish blackface). There is a Sitka spruce (*Picea sitchensis*) plantation (Balvraid) immediately to the west of the most westerly part of the survey area.

6. HABITATS

Table 2 lists the various habitats found within the survey area and the range in area calculated from the area of each polygon and the range in cover (Table 1) estimated for each habitat within each of these polygons.

The blanket bog habitat is by far the most extensive habitat, and accounts for between 82 and 94% of the 303 ha of ground surveyed (Table 2). This calculation includes the areas of bare peat as well as the areas of wet and dry modified bog. There are no areas of relatively intact blanket bog habitat within the survey area. The combination of moor-drains, erosion, muir-burning and sheep grazing has resulted in the blanket bog habitat being significantly modified, and especially dried-out. Virtually all of the ground between the stream valleys have modified blanket bog habitat (Figures 3 and 4).

The second most abundant habitat (5.3 to 7.2%) within the survey area is acid dry heathland (Table 2). This habitat is largely confined to the sides of the small valleys (Figure 5). There are scattered small patches of dry heath and wet heath on steeper slopes within the large expanses of the blanket bog habitat (Figures 3 and 5). The small patches of lichen/bryophyte heathland were found on the summits of small hillocks on the higher ground towards the west of the survey area (Figures 3 and 5).

The bottom of the small valleys are dominated by acid flush habitat (Figure 6) and the dominant plant in these is soft rush (*Juncus effusus*). Where the soils are better drained there are small patches of unimproved acid grassland (Figure 7).

Probably the most significant habitat in terms of nature conservation value in the area surveyed was the scattered scrub dominated by moderately large juniper (*Juniperus communis*) bushes in the valley at the far western part of the survey area (Figure 7).

7. PLANT COMMUNITIES

A total of 15 different plant communities and 12 sub-communities were found in this survey and they are listed in Table 3 along with the range in area calculated from the cover values assigned to each community that was mapped. The conifer plantations were not assigned to a plant community as these are not covered in the NVC system.

The heather (*Calluna vulgaris*) - hare's-tail cotton-grass (*Eriophorum vaginatum*) blanket mire (M25a) was by far the most widespread plant community covering between 234 and 305 ha of the ground surveyed (Table 3). Most of this community had a high abundance of the reindeer lichens *Cladonia arbuscula* and *C. uncialis*, which gives the bog habitat a distinctive whitish/grey hue. The stands of this vegetation type are probably best placed in the cowberry (*Vaccinium vitis-idaea*) – glittering wood-moss (*Hylocomium splendens*) sub-community (M19c) and possibly the crowberry (*Empetrum nigrum nigrum*) variant as described in Rodwell *et al.* (1991). The remaining areas of the M19 vegetation are not easily placed in either the cross-leaved heath (*Empetrum nigrum*) or crowberry sub-communities (M19a and M19b, respectively). This is because the preferential species for these two sub-communities were not always consistently present, especially cross-leaved heath, crowberry or deer-grass (*Trichophorum germanicum*). Some of the stands of this vegetation were on shallow peat, i.e. less than 50 cm thick, and were therefore classified as wet heathland rather than blanket bog, even though the species composition was indicative of blanket bog habitat. Figure 8 shows the distribution and cover of the various sub-communities of this type of mire community.

The next most widespread plant community, the heather - blaeberry (*Vaccinium myrtillus*) heath (H12), covered less than 10% of the ground at between 12 and 17 ha (Table 3). This community is represented by the heather sub-community (H12a), which has a high cover of heather (Rodwell *et al.* 1991). Figure 10 shows that this community is most abundant on the slopes of the various valleys within the survey area.

The small area of the heather – wavy hair-grass (*Deschampsia flexuosa*) heath is in an area where there has been a recent heavy fire around the areas of bare peat in the eastern part of the survey area (Figure 11).

The heather - blaeberry - bog-moss (*Sphagnum capillifolium*) heath (H22) was found on north to east facing slopes of the stream valleys and was limited in extent. This community was of the less species-rich sub-community, the heather – bracken (*Pteridium aquilinum*) sub-community (H21a), which does not have the abundance of oceanic hepatic mat species.

The blaeberry – cloudberry (*Rubus chamaemorus*) heath (H22) was found on north to north-west facing slopes at the western end of the survey area (Figure 11). This is typically a community of moderate to high altitudes on slopes with significant accumulation of snow in the Grampian mountains (Rodwell *et al.* 1991). The community here is probably represented by the hair-cap moss (*Polytrichum commune*) – heath bedstraw (*Galium saxatile*) sub-community (H22a).

Both the heather – reindeer lichen (*Cladonia arbuscula*) heath (H13) and heather – bearberry (*Vaccinium uva-ursi*) heath (H16) were found on the summits of small hillocks on the higher ground towards the west of the survey area (Figure 12) where the lack of snow-cover in winter probably favours these two communities. Because of the abundance of lichens in these two communities at this site these areas were placed in the lichen heath habitat, even though the correspondence table (Appendix 8) in the Phase 1 habitat manual suggests that the H16 community is characteristic of dry heathland habitat. It has to be remembered that plant communities do not completely define habitats and that it states in the Phase 1 manual in the caption to the correspondence table (page 99) that ‘This table is not definitive, but gives provisional guidance only. Few of the correspondences are exact and many NVC communities correspond to more than one Phase 1 category.’ These two plant communities will be particularly sensitive to trampling damage by humans and vehicles, given the thin nature of the soils and their location.

The areas of star sedge (*Carex echinata*) – bog-moss (*Sphagnum recurvum*/*S. auriculatum*) mire are dominated by soft rush and consequently best placed in the M6c sub-community. This plant community is common throughout upland Britain where acidic ground-waters seep out from blanket bog and heathland habitats. In some places the acid flushes have relatively extensive carpets of *Sphagnum fallax* where soft rush is totally absent. These areas are probably best placed in the feathery/flat-topped (*S. cuspidatum*/*S. fallax*) bog-moss bog pool (M2) community. This community is widely dispersed in some of the bog pools which have more stable water-levels, but they are particularly widespread in the area immediately to the east of the conifer plantation and west of the proposed location for turbine 9 (Figure 9). This area of blanket bog is significantly wetter than other areas of blanket bog covered by this survey. Bog pools with only common cotton-grass (*Eriophorum angustifolium*) present in them are relatively rare and consequently the estimated area for this plant community is very low (Table 3). The very small amount of the cross-leaved heath – papillose bog-moss (*S. papillosum*) mire (M18) was only found in the partly drained lochan at grid reference NH 8707,3496 (Figure 9).

The sheep's fescue (*Festuca ovina*) - common bent (*Agrostis capillaris*) - heath bedstraw (U4) and mat-grass (*Nardus stricta*) - heath bedstraw (U5) grassland communities are common types of acid grassland community found in the uplands of Britain. Again, these communities are restricted to the better drained soils within the stream valleys (Figure 14).

The only stand of juniper bushes of any significance that were found during the survey were located at the top of the valley that has the Allt Seileach in the south-west of the survey area (Figure 7). Juniper bushes were found elsewhere around the site, typically on the slopes of the stream valleys (Figure 7).

8. GROUND-WATER DEPENDENT TERRESTRIAL ECOSYSTEMS

The only plant community found in this survey that is highly dependent on ground-water is the M6c mire and acid flush habitat. This type of GWDTE is restricted for the most part to the stream valleys (Figure 13). It must be remembered that the area of the GWDTEs within the stream valleys will be significantly smaller than those areas highlighted in green in Figure 13.

Given the location of most of this community is in the stream valleys it is likely to be relatively resilient to the proposed development as they are dependent on ground-water and surface water flows coming from the streams in the various valleys. Some of the smaller acid flushes within the blanket bog habitat are dependent on seepage from the peat. They may be affected to some extent by any tracks constructed across the blanket bog habitat immediately upslope, but again it is anticipated that any impacts are likely to be relatively minimal. The M6c type of vegetation is a common and widespread community in the uplands of Britain and therefore any impacts on the integrity of this vegetation type and habitat type should be considered to be of only a local importance.

9. REFERENCES

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10. TABLES

Table 1. Class intervals used for assessing the proportion of a polygon occupied by the component habitats or plant communities.

Proportion of polygon	Score
Less than 1%	1
1 to 5%	2
5 to 10%	3
10 to 25%	4
25 to 50%	5
50 to 75%	6
75 to 95%	7
95 to 100%	8

Table 2. The estimated range in area (ha) for each of the habitats mapped within the area surveyed for the proposed extension to the Tom na Clach Wind Farm. Letters in parentheses are those used in the Phase 1 handbook and in Figures 3 to x.

Habitat	Area (ha)	
	minimum	maximum
Plantation coniferous woodland (PCW)	2.64	2.78
Scattered scrub (SS)	0.10	0.26
Unimproved acid grassland (AG)	0.29	0.81
Acid dry heathland (ADH)	16.2	21.8
Wet heathland (WH)	1.57	3.74
Lichen/bryophyte heath (LH)	2.12	2.94
Wet modified bog (WB)	7.75	12.6
Dry modified bog (DB)	236.1	258.1
Acid flush (AF)	3.85	8.80
Bare peat (P)	5.95	13.5
Bare ground (including tracks) (BG)	2.69	3.49
Dystrophic standing water (SWD)	0.004	0.01
Oligotrophic running water (RWO)	0.01	0.15

Table 3. The estimated range in area (ha) for each of the plant communities mapped within the 303 ha survey area at Tom na Clach shown in Figure 1. Communities highlighted in red are GWDTEs that are highly groundwater dependent (SEPA 2017).

Plant community name	sub-community	NVC alpha-numeric code	Area (ha)	
			minimum	maximum
sheep's fescue - common bent - heath bedstraw grassland	typical	U4a	0.02	0.10
mat-grass - heath bedstraw grassland	species-poor	U5a	0.27	0.73
heather – wavy hair-grass heath	unassigned	H9	1.80	2.33
heather - blaeberry heath	heather	H12a	11.86	16.75
heather – reindeer lichen heath	reindeer lichen	H13a	1.34	2.23
heather – bearberry heath	blaeberry - cowberry	H16b	1.12	1.31
heather - blaeberry - bog-moss heath	heather - bracken	H21a	0.31	0.86
blaeberry – cloudberry heath	hair-cap moss – heath bedstraw	H22a	0.85	1.22
bog-moss bog pool	flat-topped bog-moss	M2b	0.23	2.10
common cotton-grass bog pool	n/a	M3	0.14	1.43
star sedge – bog-moss mire	soft rush	M6c	3.83	7.36
cross-leaved heath – bog-moss mire	unassigned	M18	<0.001	0.002
heather - hare's-tail cotton-grass blanket mire	unassigned	M19	5.55	6.89
	cross-leaved heath/cowberry	M19a/b	64.54	95.78
	cowberry	M19c	164.03	201.86
hare's-tail cotton-grass blanket and raised mire	species-poor	M20a	0.02	0.03
juniper – wood sorrel woodland	common dog violet – wood anemone	W19b	0.05	0.10

Table 4. Target notes taken during the survey.

UID	Easting	Northing	Date	Habitat	NVC	Species	Notes
1	87301	34431	13/08/2020		U5c		
2	87047	34037	13/08/2020			<i>Arctostaphylos uva-ursi</i>	at end of track edge
3	86579	33742	13/08/2020			<i>Juniperus communis</i>	large bush
4	86548	33743	13/08/2020			<i>Salix aurita</i>	small bush
5	86506	33640	13/08/2020			<i>Pinus sylvestris</i>	small tree
6	86264	33710	13/08/2020				erosion gullies
7	86316	33698	13/08/2020			<i>Arctostaphylos uva-ursi</i>	primary feather golden eagle
8	85707	33775	13/08/2020		M2		pool system
9	86143	33749	13/08/2020			<i>Sphagnum fuscum</i>	hummock
10	85574	34642	13/08/2020			<i>Juniperus communis</i>	small bush
11	85331	34471	13/08/2020			<i>Juniperus communis</i>	small bush
12	85274	34417	13/08/2020			<i>Juniperus communis</i>	bush
13	85194	34385	14/08/2020	alpine heath	H13		
14	85149	34369	14/08/2020	alpine heath	H13		
15	85123	34382	14/08/2020	alpine heath	H13		
16	85140	34428	14/08/2020	alpine heath	H13		
17	87225	35381	14/08/2020	wet heath	M19c/H13		
18	86958	35496	14/08/2020			<i>Juniperus communis</i> + <i>Betula pubescens</i>	small bush/tree
19	87404	34690	14/08/2020			<i>Juniperus communis</i>	small bush
20	87413	34267	14/08/2020			<i>Juniperus communis</i>	small bush
21	87416	34001	14/08/2020		M6 flush		
22	87324	33789	14/08/2020			<i>Juniperus communis</i>	large bush

11. FIGURES

Figure 1. Location of the survey area in relation to Inverness and the surrounding area.



Figure 2. Map showing the survey area and the location of the proposed turbines and the 300 metre buffer zone drawn around each of these at Tom na Clach Wind Farm.

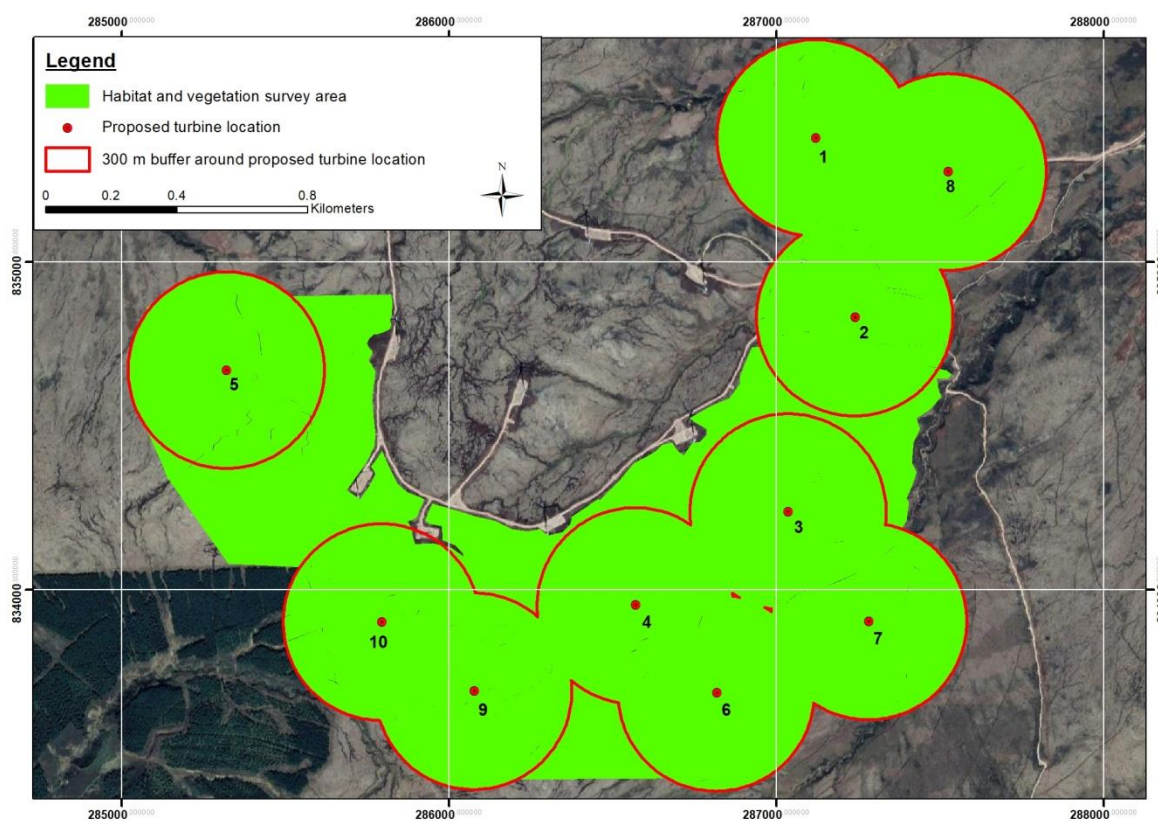


Figure 3. Map showing the dominant habitats present across the area of the proposed extension to Tom na Clach Wind Farm.

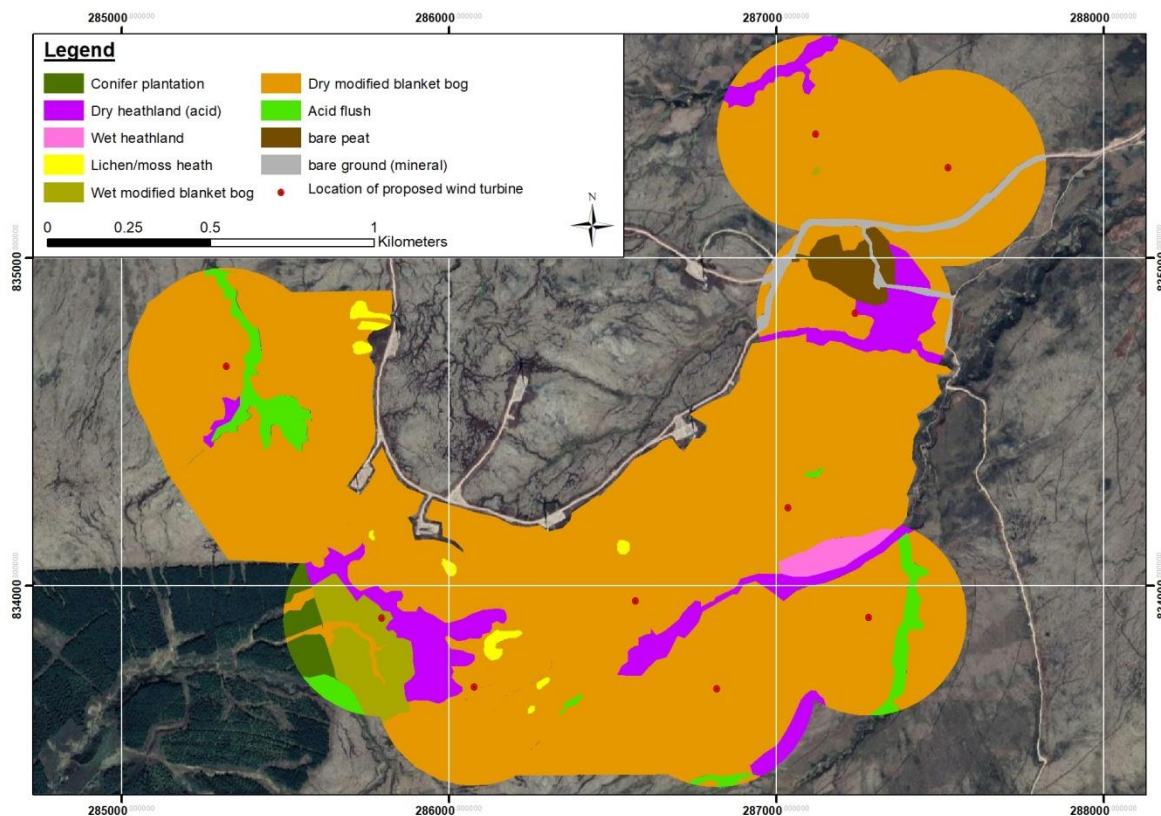


Figure 4. The cover of wet modified bog (WB), dry modified bog (DB) and bare peat (P) across the area surveyed at Tom na Clach Wind Farm. The intervals for cover values are those given in Table 1.

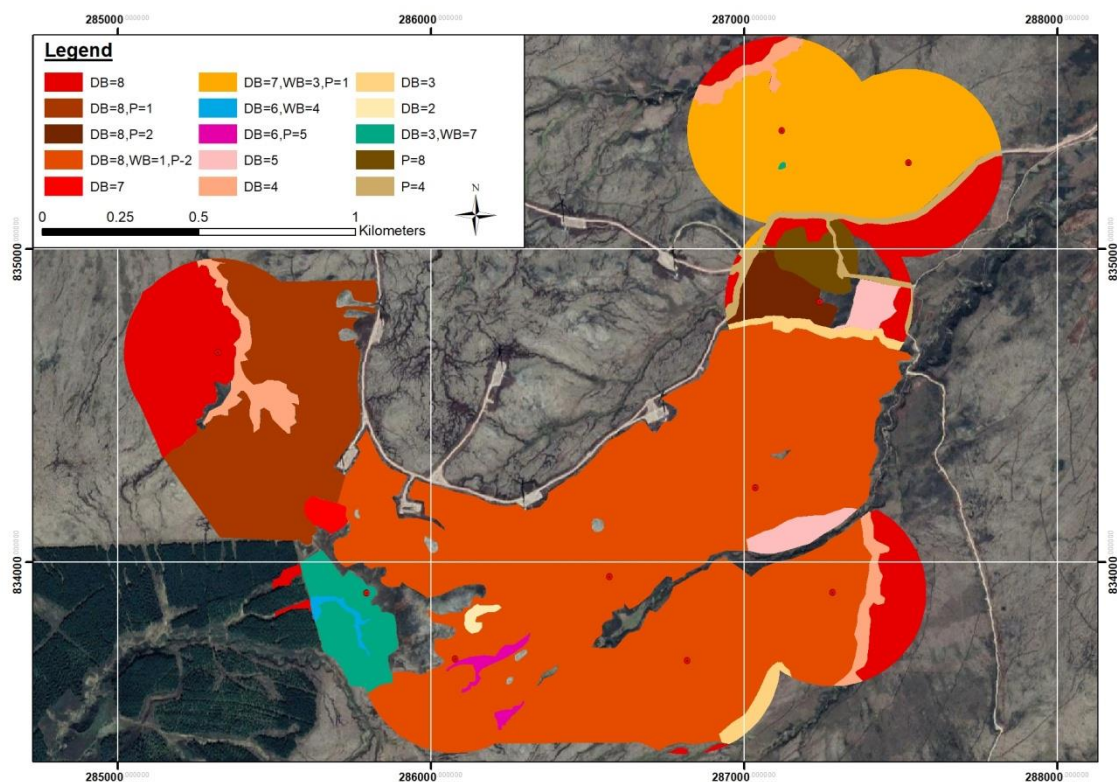


Figure 5. The cover of acid dry heath (ADH), wet heath (WH) and lichen heath (LH) across the area surveyed at Tom na Clach Wind Farm. The intervals for cover values are those given in Table 1.

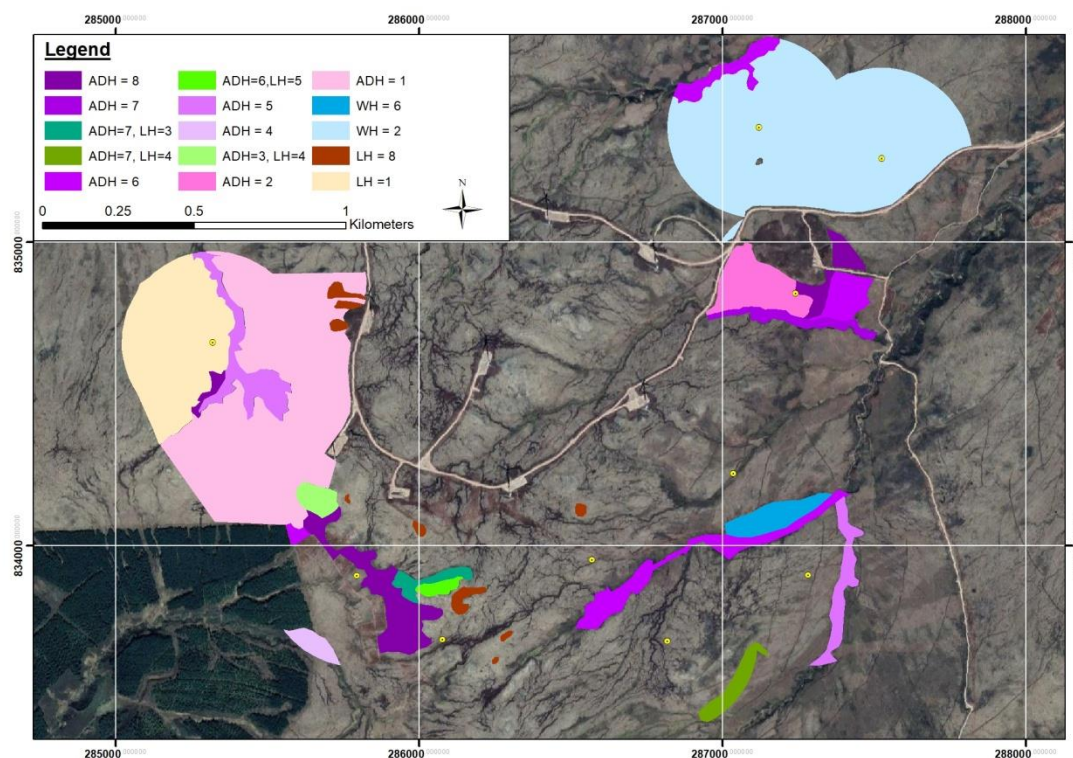


Figure 6. The cover of acid flush (AF), dystrophic standing water (SWD) and oligotrophic running water (RWO) across the area surveyed at Tom na Clach Wind Farm. The intervals for cover values are those given in Table 1.

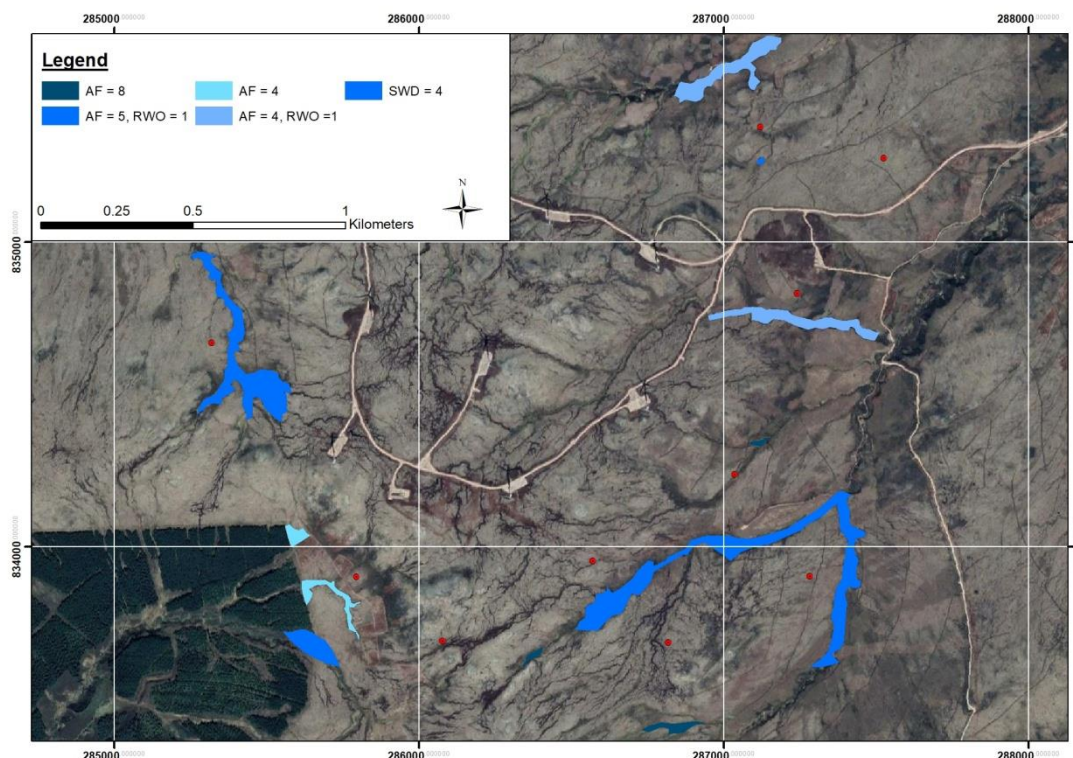


Figure 7. The location of individual trees as well as the cover of conifer plantations (PCW), scattered scrub (SS) and unimproved acid grassland (AG) across the area surveyed at Tom na Clach Wind Farm. The intervals for cover values are those given in Table 1.

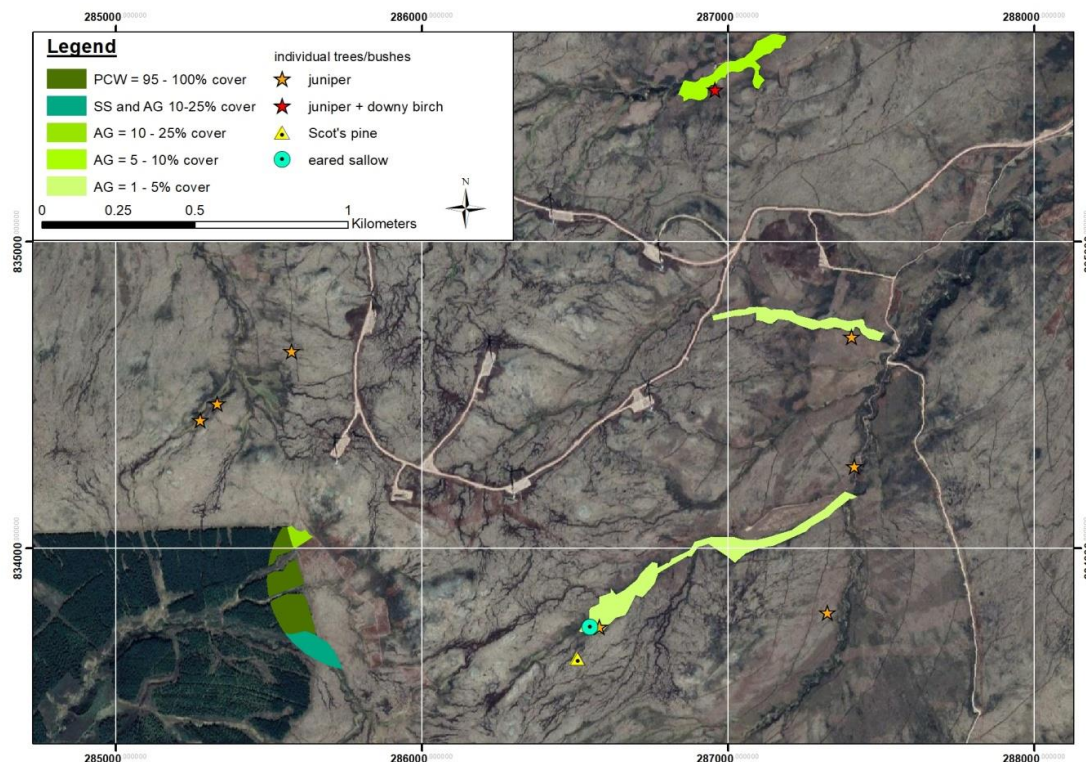


Figure 8. The distribution and cover of the various sub-communities of the heather - hare's-tail cotton-grass blanket mire (M19) community within the survey area. The intervals for cover values are those given in Table 1.

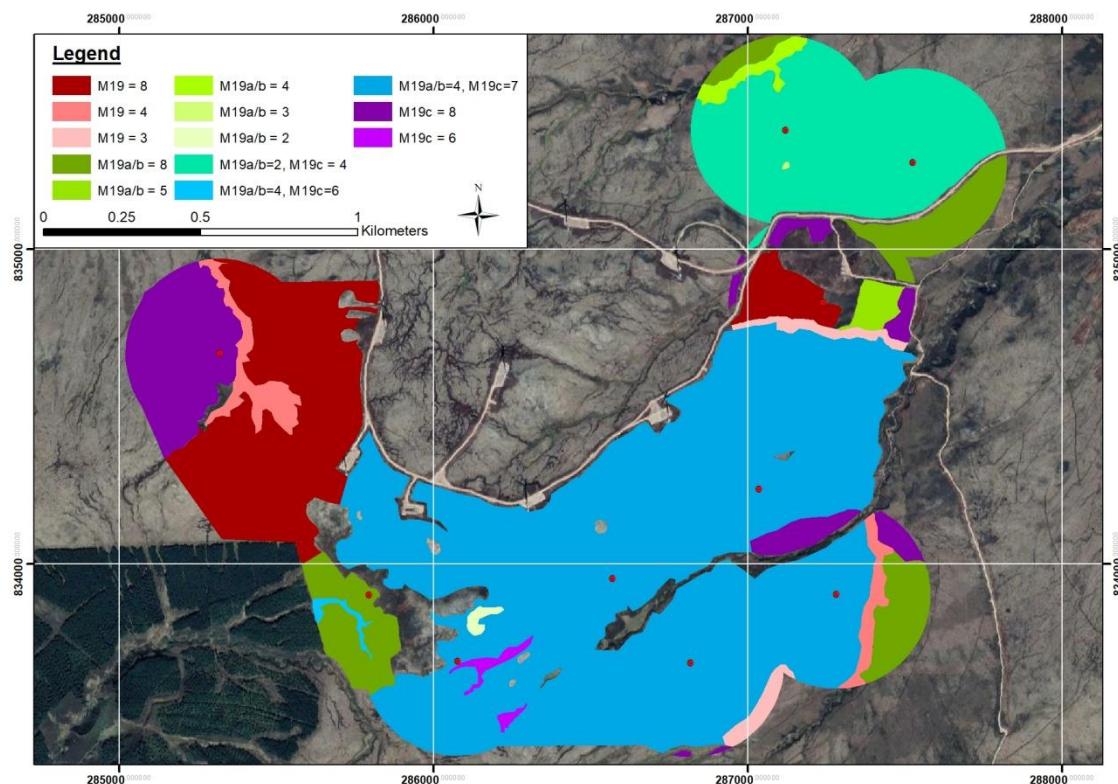


Figure 9. The distribution of the bog-moss (M2) and common cotton-grass (M3) bog pool and cross-leaved heath – bog-moss mire (M18) communities within the survey area.

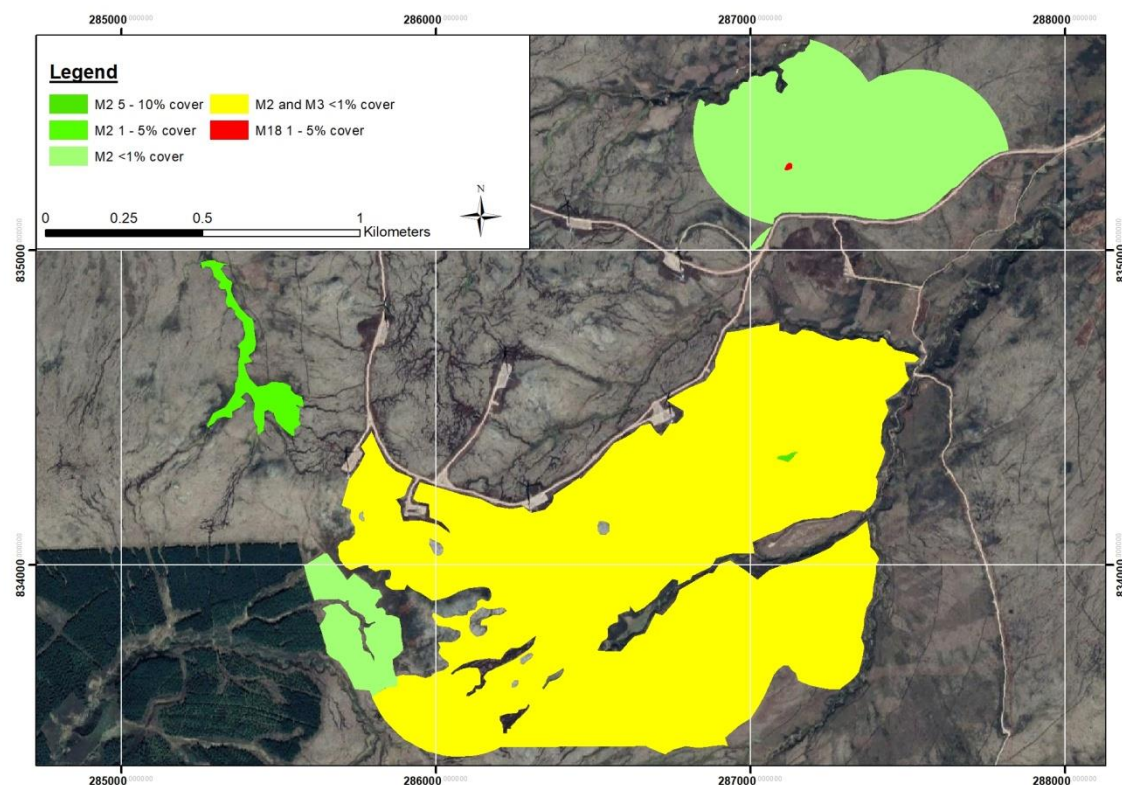


Figure 10. The distribution and cover of the heather - blaeberry heath (H12) community within the survey area.

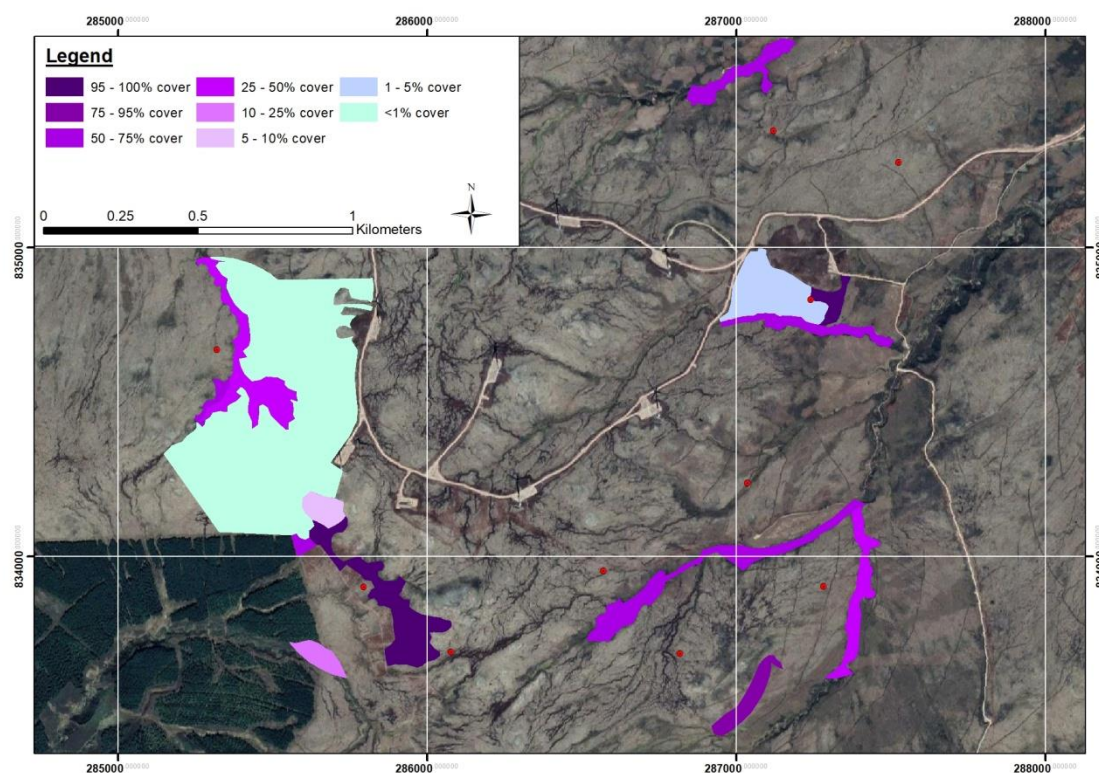


Figure 11. The distribution and cover of the heather – wavy hair-grass (H9), heather – blaeberry - bog-moss (H21a) and blaeberry – cloudberry (H22) heath communities within the survey area.

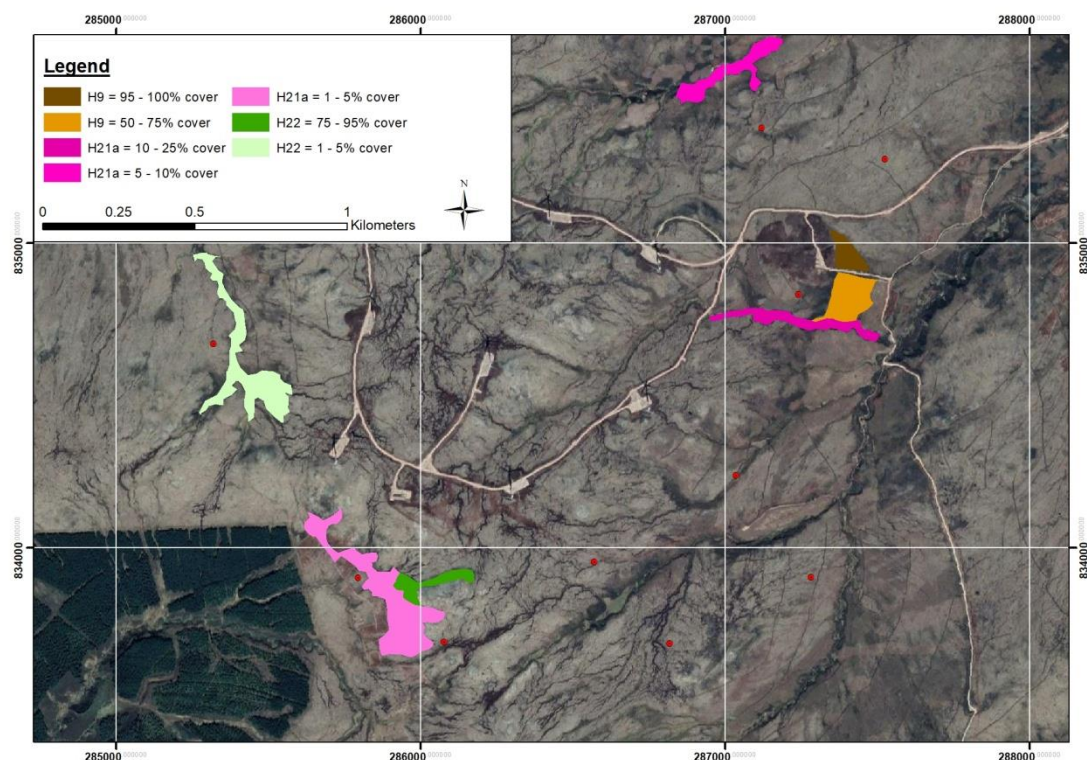


Figure 12. The distribution and cover of the heather – reindeer lichen (H13) and heather – bearberry (H16) heath and juniper – wood sorrel woodland (W19) communities within the survey area.

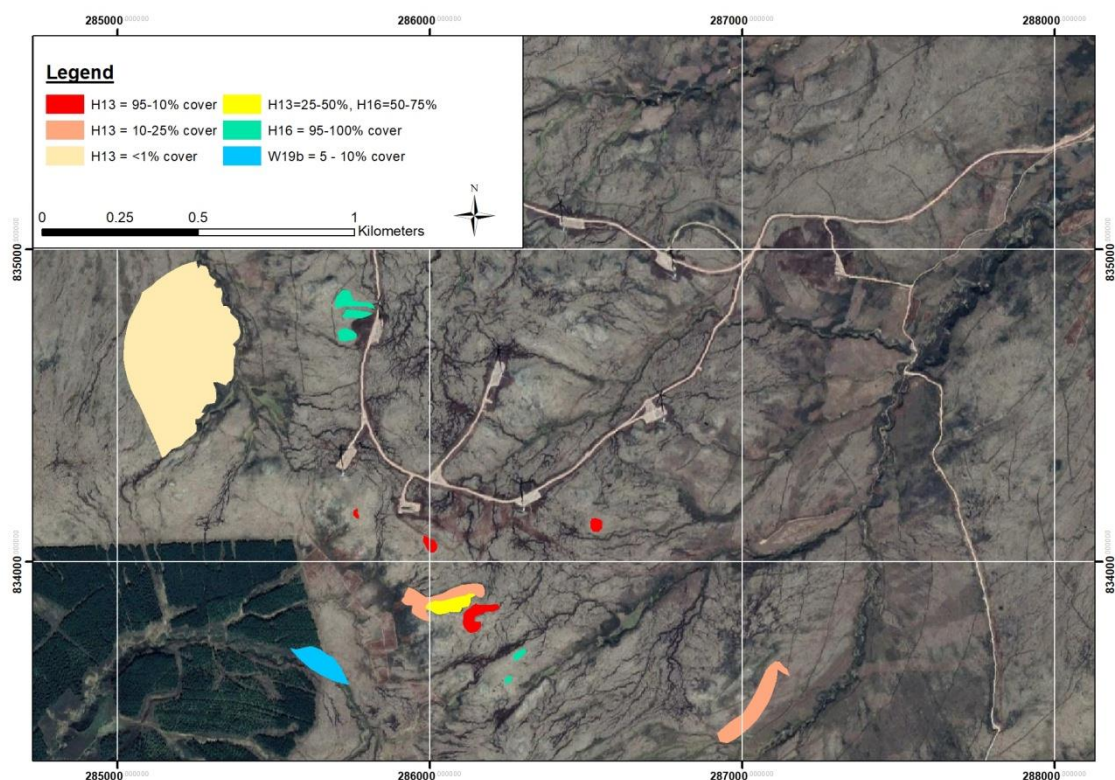


Figure 13. The distribution and cover of the soft rush sub-community of the star sedge – bog-moss mire (M6c) community within the survey area.

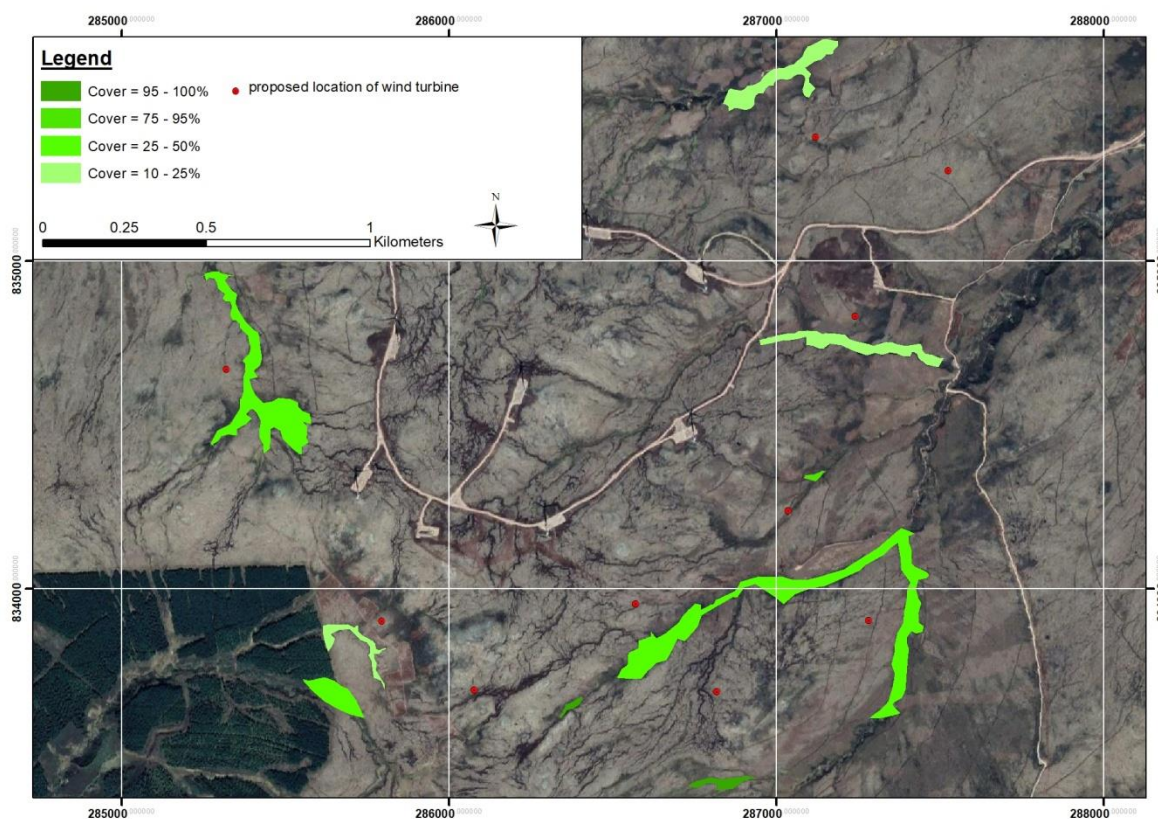


Figure 14. The distribution and cover of the sheep's fescue - common bent - heath bedstraw (U4) and mat-grass - heath bedstraw (U5) grassland communities within the survey area.

