

Technical Appendix 8.5

Kirkton Energy Park

Outline Habitat Management Plan

Kirkton Wind Farm Ltd.

wind2

November 2022



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1 Introduction

1.1 Terms of Reference

This outline Habitat Management Plan (HMP) is provided in support of a planning application for Kirkton Energy Park, a proposed 11-turbine development located approximately 2.1km south of the village of Melvich, Sutherland. It has been informed by the results of baseline ecology, ornithology and peat studies.

This outline HMP will be finalised following the completion of the planning process in collaboration with The Highland Council (THC) and at this stage should be regarded as a first iteration.

1.2 Site Details and Project Description

The proposed development "site" is located approximately 2.1km south of the village of Melvich, in the Scottish Highlands with an approximate grid reference of NC 87999 59788 (Appendix A, Figure 8.5.1 refers).

The site is located in an area of grazing land, planted native woodland and blanket bog ranging in altitude from 30 to 120m Above Ordnance Datum (AOD). The highest area to the south comprises of large, nearly flat expanses of blanket bog.

The north of the site is roughly split into east and west sectors by the burn Allt na h-Eaglaise and its tributaries. The slopes to the west of this rise to a large block of commercial conifer plantation, and those to the east rise to a long hill at an altitude of approximately 100m AOD. An access track runs south from Kirkton Farm and along the eastern hill.

The south of the site is split by the burns Allt nan Gall and Allt an Tigh-choinneimh that drain east into the Halladale River.

The site is used mainly for sheep and cattle grazing, although there is also some planted and semi-natural woodland. There is some evidence of grazing pressure from deer. The survey area contains a variety of plant communities including blanket bog, wet heath, dry heath, acid grassland, acid flush, areas of continuous bracken, broad-leaved woodland, improved grassland and marshy grassland.

There are two fields located immediately adjacent to the A836 that have been identified as suitable for the creation of abnormal load turning areas: turning area A is located to the north west of the main site, adjacent to the building at Strathroy; and turning area B is located at the western edge of Melvich, adjacent to the road junction between the A836 and the road to Portskerra. Turning area A supports an improved grassland habitat and turning area B supports an improved grassland / marshy grassland mosaic.

The proposed development comprises up to eleven three-bladed horizontal axis wind turbines, each up to 149.9m above ground level (agl) maximum blade tip height and a rotor diameter of 133m.

The proposed development area equates to approximately 419.38 hectares (ha) (including the two potential abnormal load turning areas). The new development footprint of the wind farm including all associated permanent infrastructure such as

turbine bases, crane hardstandings, substation compound with control building and battery storage, internal access tracks, and site access equates to around 15.29ha or 3.65% of the total site area. This includes both proposed borrow pits and turning areas. Temporary infrastructure consisting of a construction compound equates to around 0.73ha or 0.17% of the total site area.

The outline HMP area covers the main development site as shown in Figure 8.5.1 in Appendix A.

1.3 Aims and Objectives

The main objective of the outline HMP is to enhance the habitats on site for described ecological receptors, particularly hen harriers and blanket bog habitats. This will be achieved through a programme of habitat management and enhancement with the aim of improving semi-natural habitats on site.

1.4 Scope of the Outline Habitat Management Plan

This is a framework document intended to be a work in progress, modified, developed and refined throughout the monitoring period of the HMP. The proposed methodologies will therefore be refined in light of emerging monitoring results.

The HMP considers the specific features of the site, the local area, existing and future land use, and the proposed development in making recommendations based on best information currently available. If aspects relating to the proposed development are altered, or new ecological information emerges, then the HMP will be required to be adapted accordingly. The HMP is an iterative document which will be revised, updated and re-issued throughout the construction and operational phases of the proposed development. In this way, the HMP through monitoring will take account of the successes and failures of the management measures; modifications to the management regime can then be proposed as necessary.

The HMP considers the management of the habitats and species over the expected thirty year lifespan of the proposed development. The geographical scope of the HMP is represented in Figure 8.5.1.

Issues relating to the construction period of the proposed development and the immediate re-instatement post-construction of infrastructure will be covered within the other elements of the Construction Environmental Management Plan (CEMP).

2 Ecological Features on Site

The background information presented in this section of the HMP has been sourced from the technical studies carried out to inform the proposed development EIA Report.

2.1 Habitats

2.1.1 Overview

Both a Phase 1 Habitat and National Vegetation Classification (NVC) survey were undertaken and included the whole site plus a buffer of 250m. For the purposes of this outline HMP, only Phase 1 habitats and NVC communities recorded within the site boundary are described, although habitat descriptions include some contextual information from the wider survey buffer where relevant. For further information on habitats and NVC communities recorded, please refer to the Kirkton Energy Park EIA Report Volume 4b, Technical Appendix 8.1.

The dominant Phase 1 habitat types recorded within the site are blanket bog, coniferous plantation woodland and wet dwarf shrub heath, representing 34.03%, 19.38% and 17.25% of the total site area respectively. A summary of the Phase 1 Habitat composition of the site, with habitats listed in decreasing order of abundance, is detailed in Table 1. Phase 1 habitats recorded within the site can be seen in Figure 8.5.2 (Appendix A refers).

Table 1: Phase 1 habitats recorded within the Site

Habitat	Area (m2)	Area (ha)	% of total
Blanket bog	1,427,139	142.71	34.03
Coniferous plantation woodland	812,545	81.25	19.38
Wet dwarf shrub heath	723,393	72.34	17.25
Wet dwarf shrub heath / marshy grassland	251,255	25.12	5.99
Marshy grassland	223,778	22.38	5.34
Semi-improved acid grassland / flush and spring – acid/neutral flush	133,188	13.32	3.18
Acid dry dwarf shrub heath	101,724	10.17	2.43
Improved grassland	93,212	9.32	2.22
Semi-improved acid grassland / wet dwarf shrub heath	55,549	5.56	1.33
Wet dwarf shrub heath / blanket bog	49,961	5.00	1.19
Bracken	49,753	4.98	1.19
Marshy grassland / semi-improved acid grassland	47,209	4.72	1.13
Semi-natural broad-leaved woodland	44,991	4.50	1.07
Flush and spring – acid/neutral flush / broad-leaved plantation woodland	40,098	4.01	0.96
Flush and spring – acid/neutral flush	32,476	3.25	0.77
Acid dry dwarf shrub heath / bracken	32,034	3.20	0.76
Wet dwarf shrub heath / acid dry dwarf shrub heath	22,982	2.30	0.55
Semi-improved acid grassland / bracken	20,694	2.07	0.49

Habitat	Area (m2)	Area (ha)	% of total
Broad-leaved plantation woodland	20,400	2.04	0.49
Marshy grassland / improved grassland	10,633	1.06	0.25
Marshy grassland / bracken	320	0.03	<0.01
Scrub	284	0.03	<0.01
Flush and spring – acid/neutral flush / acid dry dwarf shrub heath / bracken	152	0.02	<0.01
Total	4,193,782	419.38	100

A summary of the NVC vegetation communities recorded within the site are detailed in Table 2 and can be seen in Figure 8.5.3 (Appendix A refers).

Table 2: NVC communities recorded within the Site

NVC communities	Area (m2)	Area (ha)	% of total
Coniferous plantation woodland	812,226	81.22	19.37
M17a-b	586,315	58.63	13.98
M17b	548,517	54.85	13.08
<i>Juncus</i> pasture / M15	251,255	25.13	5.99
<i>Juncus</i> pasture	219,941	21.99	5.24
M15	210,331	21.03	5.02
M15b	205,290	20.53	4.90
M19a	191,059	19.11	4.56
M15 / U4	158,392	15.84	3.78
M15 – M19	136,146	13.61	3.25
U2 / M6c	133,188	13.32	3.18
M19	88,271	8.83	2.10
Improved grassland	77,205	7.72	1.84
M17 – M19	70,711	7.07	1.69
U2 / M15	55,549	5.55	1.32
H10a with planted broad-leaved trees	42,557	4.26	1.01
M6c / W4	40,098	4.01	0.96
H10 with planted broad-leaved trees	39,541	3.95	0.94
<i>Juncus</i> pasture / U4	38,316	3.83	0.91
H10 / U20	32,034	3.20	0.76
W4	28,526	2.85	0.68
U20a	27,358	2.74	0.65
M6a-b / U4 / H10	26,734	2.67	0.64
U20	22,395	2.24	0.53
M15 / H10	22,231	2.22	0.53
U2 / U20	20,694	2.07	0.49
H10 / M17	19,625	1.96	0.47
W17	16,784	1.68	0.40
Pasture	16,006	1.60	0.38
W4c	14,245	1.42	0.34
MG6	10,633	1.06	0.25
M28 / U20	8,892	0.89	0.21

NVC communities	Area (m2)	Area (ha)	% of total
Low woodland	6,155	0.62	0.15
M6c	5,742	0.57	0.14
M23	3,859	0.39	0.09
M17	2,795	0.28	0.07
M15 / M17	2,661	0.26	0.06
H10	750	0.08	0.02
M23 / U20	320	0.03	<0.01
W23	284	0.03	<0.01
M6c / H10 / U20	152	0.02	<0.01
Total	4,193,782	419.38	100

2.1.2 Blanket Bog (E1.6.1)

This habitat occupies the largest area of the site, with wide expanses made up of deergrass *Trichophorum germanicum* to the south west, plus some lower-lying valley bogs containing more heather *Calluna vulgaris*, cross-leaved heath *Erica tetralix* and hare's-tail cotton-grass *Eriophorum vaginatum* in other parts of the site.

A variety of *Sphagnum* species were found including the uncommon Austin's bog-moss *S. austinii* that was evident with its characteristically hard, orange hummocks. The best examples of high blanket bog on site contained three species of sundew: round-leaved *Drosera rotundifolia*; oblong-leaved *D. intermedia*; and great *D. anglica*.

Apart from heather, the commonest dwarf shrub was cross-leaved heath as well as bog-myrtle *Myrica gale*. There was very little crowberry *Empetrum nigrum* and even less bilberry *Vaccinium myrtillus*. Frequent in the high bogs was common cotton-grass *Eriophorum angustifolium*. Some of the high bogs were also notable for their abundant *Cladonia* lichens as well as woolly fringe-moss *Racomitrium lanuginosum*. The abundance of these species suggests bogs that are slightly drier than those with more *Sphagnum*.

The high, ochre bogs were all examples of the NVC community M17, whereas the greener valley bogs tended towards M19.

2.1.3 Wet Dwarf Shrub Heath (D2)

This habitat is also extensive on the site. Some examples occurred in mosaic with continuous bracken *Pteridium aquilinum*, dry heath, blanket bog, acid grassland and rush pasture. Heather was often co-dominant in these wet heaths, or at the very least, frequent. As with the bogs, both cross-leaved heath and bog-myrtle were frequent. *Cladonia* lichens were often abundant and the most frequent *Sphagnum* was acute-leaved bog-moss *S. capillifolium* subsp. *capillifolium*. Purple moor-grass *Molinia caerulea* was also frequent here as was wavy hair-grass *Deschampsia flexuosa* in some compartments.

All examples of this habitat translated to NVC community M15.

2.1.4 Acid / Neutral Flush / Spring (E2.1)

The largest area of this habitat was in the west where it occurred in mosaic with acid grassland, dry heath and bracken, and broadly followed the burn Allt nan Gall and its

tributaries draining the southern part of the site. Most of it was dominated by soft-rush *Juncus effusus* with star sedge *Carex echinata* becoming more prevalent locally. These two habitats correspond to NVC communities M6c and M6a respectively.

2.1.5 Continuous Bracken (C1.1)

Bracken was mainly found on the steeper, free-draining slopes of the site, usually in mosaic with wet heath, dry heath, acid flush, planted broad-leaved woodland, rush pasture, acid grassland and / or marshy grassland. There was abundant wavy hair-grass and frequent sweet vernal-grass *Anthoxanthum odoratum*, heath bedstraw *Galium saxatile*, Yorkshire-fog *Holcus lanatus*, soft-rush, wood-sorrel *Oxalis acetosella* and common haircap *Polytrichum commune*.

2.1.6 Acid Dry Dwarf Shrub Heath (D1.1)

This habitat tended to occupy steeper slopes on the site that were free-draining. All examples were dominated by heather, along with frequent wavy hair-grass and purple moor-grass. The pleurocarpous red-stemmed feather-moss *Pleurozium schreberi* was abundant. Many of these drier slopes had been planted with native broad-leaved trees, of which the dominant species was downy birch *Betula pubescens*.

All examples of this heath had small amounts of bell heather *Erica cinerea* and hardly any bilberry and therefore correspond to NVC community H10. It occurred in mosaic with acid flush, acid grassland, continuous bracken, wet heath and marshy grassland.

2.1.7 Improved Grassland (B4)

This habitat was found on the northern edge of the site and was being grazed by cattle and sheep at the time of survey. This example was dominated by common bent *Agrostis capillaris* along with white clover *Trifolium repens*. There was also frequent spear thistle *Cirsium vulgare*, Yorkshire-fog and soft-rush, but otherwise the grassland was species-poor.

2.1.8 Marshy Grassland (B5)

This habitat mostly takes the form of hard-grazed grassland dominated by soft-rush that is often co-dominant with heath-rush *Juncus squarrosus*. The ground can be wet but is not always so, and the vegetation has a speckled buff – green appearance. Wavy hair-grass is often abundant as well as frequent sweet vernal-grass and marsh thistle *Cirsium palustre*.

This habitat does not correspond with any recognisable NVC community. One small area also supported some yellow iris *Iris pseudacorus*, corresponding to NVC community M28.

2.1.9 Planted Broad-Leaved Woodland (A1.1.2)

Many of the watercourses and steeper, drier slopes on the site have been deer-fenced and planted with native broad-leaved woodland using the hinge-mounding technique. Some plantations were also found on areas of wet heath or towards the edges of blanket bog. Downy birch was normally dominant in the canopy and the shrub layer. The success of the planted trees is heavily dependent on the topography, with some

being very stunted as opposed to a canopy of approximately 6m as observed elsewhere on site.

Other species planted were rowan *Sorbus aucuparia*, alder *Alnus glutinosa*, grey willow *Salix cinerea*, goat willow *Salix caprea*, silver birch *Betula pendula*, and hazel *Corylus avellana*. Heather and red-stemmed feather-moss were typically dominant on the ground.

Owing to the man-made nature of many of these planted habitats, it was difficult to assign an NVC community, though possible W4 and W17 did both occur. Locally, the low cover of a canopy layer suggested H10 with planted broad-leaves.

2.1.10 Planted Coniferous Woodland (A1.2.2)

There were two occurrences of conifer plantation. The largest is situated in the north west corner of the site and is co-dominated by Sitka spruce *Picea sitchensis* and lodgepole pine *Pinus contorta*. Here there are also a few larch *Larix* sp.

The ground layer is dominated by heather with abundant common cotton-grass that are mainly found in the rides.

There is also a small, inverted L-shaped plantation of lodgepole pine at the extreme south of the site.

This habitat does not carry an NVC classification.

2.1.11 Semi-Improved Acid Grassland (B1.2)

These are largely areas dominated by wavy hair-grass, some of these with frequent heath bedstraw. There are few pure stands, and most occur in mosaics with acid flush, dry heath, bracken, rush pasture and wet heath. In general, these mosaics are relatively species-poor, and in many cases may indicate a history of burning of blanket bog or wet heath (Averis *et al.*, 2004).

Stands purely dominated by wavy hair-grass conform to NVC community U2, while those with some heath bedstraw tend to resemble U4.

2.1.12 Semi-Improved Neutral Grassland (B2.2)

This habitat is present on site as a mosaic with marshy grassland, semi-improved acid grassland and improved grassland in the south east corner around the properties at Bighouse. In general, the mosaic is relatively species-poor, dominated by soft-rush, heath-rush, common bent, wavy hair-grass, Yorkshire-fog, with frequent cock's-foot *Dactylis glomerata* and occasional false oat-grass *Arrhenatherum elatius*.

In stands where heath-rush is locally prominent, the habitat conforms to NVC community U6, while those with heath bedstraw and springy turf-moss *Rhytidiadelphus squarrosus* resemble U4.

2.1.13 Semi-Natural Broad-Leaved Woodland (A1.1.1)

There is one example of semi-natural broad-leaved woodland in the small gorge in the lower section of the Allt nan Gall burn. Here, downy birch dominates the rather sparse canopy, with heather and bracken being co-dominant in the ground layer. There is

frequent hard-fern *Blechnum spicant*, marsh thistle, big shaggy-moss *Rhytidiadelphus triquetrus* and also occasional eared willow *Salix aurita* in the shrub layer.

This habitat corresponds approximately with NVC community W17.

There is also some natural regeneration in the north of the site, along the channel of the Allt na h-Eaglaise watercourse, that comes under this category. This is hummocky woodland dominated by downy birch with frequent goat willow. The ground layer is very hummocky and is co-dominated by heather, purple moor-grass and red-stemmed feather-moss.

This habitat somewhat resembles NVC community W4.

2.1.14 Watercourses

There are two main watercourse systems on the site, both split into a number of tributaries. Their gradient varies considerably through the site, but tends to be flatter in the upper reaches though still with frequent riffle-pool systems. The steeper sections have rocks with the bryophytes fountain apple-moss *Philonotis fontana*, rusty feather-moss *Brachythecium plumosum* and yellow fringe-moss *Racomitrium aciculare*. The flatter sections are dominated by common water-starwort *Callitriche stagnalis* along with frequent unbranched bur-reed *Sparganium emersum* and bog pondweed *Potamogeton polygonifolius*.

2.1.15 Tracks

There is one track that runs from north to south into the site and terminates on the long hill in the east of the survey area. This consists of grassed-over hardcore and is approximately 4m wide.

2.2 Fauna

2.2.1 Mammals

Otter *Lutra lutra* spraint and feeding signs in the form of predated fish were identified at points along the lower reaches of the Allt na h-Eaglaise watercourse within the Survey Area. No resting places were discovered within the Survey Area. Although no direct evidence of otters was found within the site and only in the survey buffer, it is possible that otters could forage along the length of all tributaries which connect the site to the River Halladale.

With regards to **bats**, habitat assessments confirmed that the site and in particular the turbine envelope was of low value for commuting and foraging bats.

Very few relevant landscape features exist within the site itself. Deer and post-and-wire livestock fencing are scattered throughout. In the north of the site, the burn Allt na h-Eaglaise (and associated tributaries) divide the area into east and west sectors, with slopes to the west rising to a large block of commercial conifer plantation, and those to the east rising to a long hill at an altitude of approximately 100m AOD. In the south of the site, the burns Allt nan Gall and Allt an Tigh-choinneimh drain east into the Halladale River. Although such features may represent navigation aids for bats, they do not represent valuable foraging or commuting habitat.

Elements of broad-leaved woodland (plantation and semi-natural) are scattered about with the main elements located adjacent to the lower reaches of the Allt nan Gall watercourse in the east of the site, with further woodland adjacent to the lower reaches of the Allt na h-Eaglaise (and tributaries) in the north of the site.

The woodland is generally not mature in age meaning that the trees generally support little to no potential bat roost features such as upward developing rot holes. Nevertheless, and due to the relative scarcity of native woodland in Caithness and Sutherland, it is recognised that these woodland features may form a locally important foraging resource for bats.

The Halladale River is located outwith the site to the east and is generally a wide, meandering river with a number of scattered pools along its length. This provides sheltered foraging habitat for specialist aquatic foragers such as Daubenton's *Myotis daubentonii* as well as more generalist species such as pipistrelles *Pipistrellus* sp. Adjacent habitat along the river's corridor is generally agricultural fields with scattered farms and houses providing potential roosting and foraging habitat.

Activity surveys identified high levels of common pipistrelle *Pipistrellus pipistrellus* activity only during the summer deployment period, with relatively low numbers during the spring and autumn survey periods. No other species were recorded.

It is recognised that bat activity, in particular pass rates passed a fixed detector, are often highly variable between nights, with some nights having few or no passes and other nights having high activity. This is particularly pronounced on sites within the Scottish Highlands.

Although suitable habitat was present on site, no evidence of **water vole** *Arvicola amphibius* was recorded during the survey. Similarly, no evidence of **badger** *Meles meles*, **wildcat** *Felis silvestris*, or **pine marten** *Martes martes* was recorded.

2.2.2 Birds

Numerous bird species were observed during ornithology surveys undertaken between September 2019 and August 2021. These included greylag goose *Anser anser*, pink-footed goose *Anser brachyrhynchus*, hen harrier *Circus cyaneus*, merlin *Falco columbarius*, golden plover *Pluvialis apricaria*, curlew *Numenius arquata*, snipe *Gallinago gallinago* and whimbrel *Numenius phaeopus*. The ornithological baseline is presented in the Kirkton Energy Park EIA Report Volume 4b, Technical Appendices 9.1 and 9.2. Assessment of effects on ornithology receptors is presented in Kirkton Energy Park EIA Report Volume 2, Chapter 9: Ornithology.

2.2.3 Aquatic Fauna

There are four main watercourses within the study area, and from south to north are:

- Allt an Tigh-Choinneimh;
- Allt nan Gall;
- Allt na h-Eaglaise;
- Unnamed watercourse at Kirkton Farm.

All are tributaries of the River Halladale.

The un-named tributary and Allt na-h Eaglaise flow into a heavily canalised section which is approximately 2-3m wide. Fish were noted jumping during the November 2021

survey and predated salmon kelts were noted on the river bank, suggesting this watercourse has important spawning habitat (concealed by the high flows at the time of survey). The un-named tributary was considered to offer low quality fish habitat throughout its length due to various flow constrictions and the likely ephemeral nature of parts of the channel. The Allt na h-Eaglaise however, offered high quality fish habitat from the confluence with the River Halladale to lower-mid section within the main proposed windfarm site. Above this point the habitat was still considered good; however, the steeper gradient is likely to limit the usable habitat. The upper section of the southern tributary was considered to offer low quality habitat due to the steep overgrown channel which is likely to be ephemeral in the upper reaches. The majority of the Allt na h-Eaglaise is 2-3m wide and up to 30cm deep, forming long run sections. While bankside vegetation was generally sparse, consisting of gorse and scattered trees, the macro-invertebrate sample indicates excellent water quality.

The Allt nan Gall is approximately 2-3m wide and up to 30cm deep, reducing to approximately 1m wide in the upper reaches. The bankside vegetation varied from areas with tree / shrub cover to bare banks. The upper and lower sections were considered to offer high quality fish habitat while the steeper faster flowing mid-section provided good habitat.

Allt an Tigh-Choinneimh was generally 1-2m wide and 20-30cm deep, offering high quality fish habitat up to the gorge section. Above this point habitat was considered to be low quality, although usable habitat was still present. Bankside vegetation and tree cover was generally limited although more prevalent in the gorge section where grazing was limited.

2.2.4 Herptiles

The site contains dry and wet habitats, varied vegetation structure, open areas and ecotones and is considered generally suitable for a variety of reptile and amphibian species. No publicly available records were found for reptile or amphibian species within 2km of the site over the past 20 years.

No reptile or amphibian species were recorded during the surveys.

2.2.5 Deer

The proposed site lies within the Northern Deer Management Group area. The group covers a large area of Caithness and North Sutherland, much of which is within designated areas and forms a large part of the Caithness and Sutherland Peatlands SAC.

The majority of the site is a combination of blanket bog and heath. Shelter is limited to a relatively small area of coniferous plantation in the north of the site and very small stands of coniferous plantation in the south. There are areas of recent broad-leaf plantation, however these are immature and deer are excluded by fencing.

Surrounding the land at Kirkton Farm, Bighouse Estate extends to an approximate 14,754ha on either side of the Halladale River with an approximate equal divide between west and east. The Estate is primarily a sporting estate for salmon fishing, deer stalking and pheasant / partridge shooting. Much of the Estate is under crofting tenure. The bulk of the inbye land runs down Strath Halladale to the property at Trantlebeg and the River Dyke and has been ring-fenced with deer fencing to protect croft land from

losses to deer. Common grazings extend over some 90% of the hill land and a number of crofters continue to exercise these rights, putting a fair number of sheep to the hill for much of the year on both sides of the strath, but primarily on the East side.

The 2021 foot count data for Bighouse Estate (provided by NatureScot), showed 141 stags, 123 hinds and 50 calves across the 7,200ha to the west of the A897, and 38 stags, 119 hinds and 64 calves across the 7,188ha to the east of the A897 – this indicates a density of 4.7 per km² in the west and 3.1 per km² in the east.

3 Outline HMP

3.1 Outline HMP Area

It is proposed that the outline HMP area will be the red line development boundary (the 'site'). Within this, certain areas will be identified for specific management measures depending on their particular characteristics.

3.2 Outline HMP Heads of Terms

With consideration of the habitats and species present and the aim for no net loss of biodiversity, the following broad heads of terms are identified at this stage.

3.3 Reduce Peatland Degradation

3.3.1 Aim

To increase the extent and diversity of blanket bog habitat in areas where suitable hydrological regimes can be created to support bog habitat. The ultimate aim of increasing blanket bog extent is to buffer the adjacent Caithness and Sutherland Peatlands Special Area of Conservation (SAC) land, and provide opportunities for expansion of peatland floral species while returning former forested areas to a more natural landscape.

3.3.2 Background and Justification

Blanket bog is a priority habitat under Annex I of the EU Habitats Directive. Blanket bog also has priority status in the UK Biodiversity Action Plan. Although much of the area within the site and outwith the SAC is not identified as active blanket bog, the areas identified for bog restoration are considered capable of reverting back to active bog under the correct hydrological regimes.

The Joint Nature Conservation Committee (JNCC) define 'active' as supporting a significant area of vegetation that is normally peat-forming. Typical species include the important peat-forming species, such as bog-mosses *Sphagnum* spp. and cotton-grasses *Eriophorum* spp., or purple moor-grass *Molinia caerulea* in certain circumstances, together with heather *Calluna vulgaris* and other ericaceous species. It is worth noting that the assessments of habitats being capable of reverting to bog are made within the context of the lifespan of the wind farm or potentially longer.

Much of the adjacent land falls within the Caithness and Sutherland Peatlands SAC which is designated partly for blanket bog communities. At present, the relatively large block of commercial conifer plantation in the north west corner of the site is immediately adjacent to the SAC with a small overlap along the south western edge, and is likely to be resulting in some degree of negative impact on the hydrological regime of the adjacent SAC habitats.

3.3.3 Outline Prescriptions

Forest Removal and Ground Preparations

Kirk1: Within areas targeted for blanket bog restoration, forest removal of the mature plantation block in the north west corner of the site (approximately 87.75ha) will be undertaken. Forest clearance work will need to be undertaken outside of the bird breeding season (March to August inclusive) or otherwise breeding bird surveys undertaken in advance of clearance.

Standard practice on wind farm sites to date, where bog restoration is a management goal, is for mature trees with commercially viable timber to be harvested through whole tree harvesting techniques with all timber and brash removed from site.

Some brash material may temporarily be used for providing a protective barrier for machinery operations. Once forest removal has been completed all brash should be removed from the site. In addition, larger sections of brash or sections of timber will be used to fill or block drains and reduce drainage of the area. Use of mulch chippings within drainage ditches will be avoided to reduce the potential negative impacts on water quality of the adjacent Halladale River system. Retaining mulched brash on site is not advised as although this may restrict undesirable vegetation colonisation, the mulch will also reduce the colonisation of bog species and increase acidification of adjacent watercourses. The areas identified for peat restoration generally do not display great variation in micro-topography and it is not expected that ground works to flatten areas (to prevent excessive variations in moisture content of soils) will be required.

This approach must be combined with raised water tables which will allow for the management of the site towards a restored bog habitat while maintaining as little intermediary shrubby growth as possible, reducing the potential use of the area by raptors.

Figure 8.5.4 (Appendix A refers) shows the extent of woodland to be felled. As a result of the felling of the northern conifer forestry block, approximately 9.7ha of compensatory planting will be required. All of the approximately 87.75ha (net area of 70.75ha bearing trees) of felled conifer woodland is scheduled for blanket bog restoration.

As the majority of the HMP works for the Kirkton forestry areas relate to peatland habitat restoration, there is expected to be limited restocking obligation for the felled areas (other than the previously outlined compensatory planting). With this in mind there is less time pressure on the felling operations for this work and it will be of no consequence to the overall success of the HMP whether the felling works are carried out before or after the development has been carried out. Therefore the felling operation can be carried out by either the landowner or the developer depending on the silvicultural and operational timescales.

Given the current legislation and supporting guidance, it is expected that if the landowner does choose to fell the timber ahead of the development that there will be no restocking carried out. This will allow for the peatland restoration works to be carried out once development of the windfarm has started without the need for further tree removal.

In the case of no development, if the landowner has already felled the trees on site they will need to enter in to discussions with Scottish Forestry to agree a methodology for either compensatory planting or restocking of any felled area outwith any agreed holdback area from the SPA. It is expected that NatureScot and Scottish Forestry will request that the area is restored to peat bog due to their earlier correspondence on this.

Hydrological Management

Kirk2: Within ditches which are hydrologically linked to the management area, a system of blocking using a variety of techniques will be employed to increase the water retention of the area, thereby increasing the level of the water table.

The ground underneath the coniferous plantation block currently supports a ridge and furrow topography with interspersed with larger surface drains. These will be blocked to encourage the collection of standing water within the newly-created open ground and aid re-hydration of the underlying peat.

As detailed within **Kirk1**, drain blocking will use a combination of material and blocking techniques. Wherever possible natural materials in the form of peat turves and, in small quantities, timber or brash from site will be used. Use of peat turves is recommended both in terms of its effectiveness and also to reduce the quantity of excess peat. Use of mulch chippings within drainage ditches will be avoided, although small amounts of brash may be used within small ditches to aid water retention. Larger ditches or drains will, where possible, use large sections of brash or timber in combination with peat turves.

Throughout the process, hydrological management techniques will be assessed for their effectiveness through water table monitoring and, if required, strategies may be redesigned to increase rate and / or coverage of water table recovery.

On-going Management of Areas to reduce Collision Risk

Kirk3: Blanket bog restoration areas will be closely monitored on a regular basis to assess the success of the restoration and to undertake on-going management practices such as tree removal, sward cutting and hydrological management as required to reduce sward height and subsequent suitability for nesting by raptors.

Management of the colonisation of the newly-created blanket bog restoration areas will be undertaken to minimise the suitability of the area to nesting raptors. This will be undertaken through cutting of the sward and removal of non-native tree species. Maintaining a successful hydrological regime will also be paramount to maintaining low sward heights.

3.4 Habitat Enhancement for Golden Plover and Hen Harrier

3.4.1 Aim

Conserve, enhance and restore important habitats suitable for golden plover and hen harrier.

3.4.2 Background and Justification

Golden plover *Pluvialis apricaria* is a threatened Annex 1 species and is on the Scottish Biodiversity List. It is also a qualifying species of the adjacent Caithness and Sutherland Peatlands Special Protection Area (SPA).

The hen harrier *Circus cyaneus* is a threatened and declining Annex I, Schedule 1, Red-listed bird species, and is on both the Scottish Biodiversity List and NatureScot's Species Action Framework. It is also a qualifying species of the adjacent Caithness and Sutherland Peatlands Special Protection Area.

3.4.3 Outline Prescriptions

Kirk4: Habitat monitoring to assess suitability of management practices to aid golden plover and hen harrier colonisation.

In order to better understand the value of existing habitats on site and the specific enhancement measures which could be enacted, targeted golden plover and hen harrier habitat suitability study would be undertaken following commissioning of the proposed development (**Kirk4**). This would consist of undertaking of Common Standards Monitoring (CSM) at predefined survey points across the entirety of the proposed development site. A full range of CSM criteria would be measured at each CSM survey point, including the percentage cover of each plant and moss species and vegetation heights. In addition to habitat surveys, and specifically in relation to hen harrier, prey abundance surveys would also be carried out to provide further information of the importance of habitats within the site for hen harrier. This survey information would be used to assess the suitability of habitats present for nesting and foraging golden plover and hen harrier, to assess any processes or pressures affecting suitability and to define any supplementary habitat management prescriptions required to facilitate improvements.

3.5 Monitoring the effect of the Proposed Development

3.5.1 Aim

To ensure the effect of the proposed development is measured.

3.5.2 Outline Prescriptions

Kirk5: Post-construction breeding bird surveys to monitor effect of the wind farm.

Kirk6: Post-construction breeding raptor surveys to monitor effect of the wind farm.

Kirk7: Post-construction habitat monitoring through a programme of fixed point photography and quadrat monitoring to document blanket bog restoration in the north west corner of the site.

Although the effect of wind farms on flora and fauna is relatively well understood, it is important that models and understanding of the effect is continuously refined in order to inform future developments.

Ornithological post-construction monitoring should be undertaken in years 1, 3 and 5 following the commencement of operation, with a review being undertaken as to the need for any further monitoring following year 5 (**Kirk5** and **Kirk6**).

The aim of monitoring would be to monitor bird populations within the proposed development to ensure that the wind farm is not having unpredicted adverse effects on the bird populations present, and to ensure that the HMP is effective in supporting the bird populations on site.

Although the detailed scope of the monitoring will be agreed with THC, NatureScot and RSPB Scotland, the following surveys will be carried out:

- Breeding bird surveys (using a Brown and Shepherd approach (Brown, 1993) to allow breeding waders to be monitored across the site and 500m buffer (**Kirk5**); and
- Breeding raptor surveys within the proposed development boundary and where access permits to a distance of 2km from the site boundary (**Kirk6**).

The outline monitoring scheme should be reviewed on a 5-yearly basis. On-going monitoring commitments will be reviewed and, if necessary, any adjustments to the HMP will be carried out.

In order to assess the effectiveness of the blanket bog restoration within the north west corner of the site, long term vegetation / habitat monitoring will be undertaken post felling and completion of all ground preparation works (refer **Kirk1**), with the aim being to monitor the long term condition of the site through a programme of fixed point photography and quadrat monitoring (**Kirk3** and **Kirk7**) in years 1, 3 and 5. The monitoring will be used to assess the effectiveness of the HMP, which can be updated in relation to these data if required. These surveys will be undertaken for the life of the project and target the areas of bog restoration.

3.6 Outline Prescription Summary

Table 3 summarises the outline prescriptions and proposed monitoring schedules.

Table 3: Outline Prescriptions and Proposed Monitoring Schedules

ID	Target Feature	Survey Type	Timing	Programme	Responsibility
Kirk1	Forest removal and ground preparations		Post construction, outwith bird breeding season (unless breeding bird surveys are undertaken in advance)	During construction	Applicant
Kirk2	Restoration of blanket bog habitats through suitable hydrological management, typically through ditch blocking		Post construction, outwith bird breeding season (unless breeding bird surveys are undertaken in advance)	During construction	Applicant / Suitably Qualified Ecologist

ID	Target Feature	Survey Type	Timing	Programme	Responsibility
Kirk3	On-going management of felled area to reduce suitability for nesting by raptors to reduce collision risk	Habitat monitoring	Summer / Autumn	Years 1, 3, and 5 and every 5 years thereafter (frequency of subsequent monitoring dependent on initial monitoring results)	Applicant / Suitably Qualified Ecologist
Kirk4	Golden plover and hen harrier habitat suitability study	CSM monitoring and (for hen harrier only) prey abundance surveys	Summer	Years 1, 3, and 5 and every 5 years thereafter (frequency of subsequent monitoring dependent on initial monitoring results)	Applicant / Suitably Qualified Ecologist
Kirk5	Across site and 500m buffer	Breeding birds (Brown and Shepherd)	April - July	Years 1, 3, and 5 (frequency of subsequent monitoring dependent on initial monitoring results)	Applicant / Suitably Qualified Ecologist
Kirk6	Across site and 2km buffer	Raptor Monitoring	March - July	Years 1, 3, and 5 (frequency of subsequent monitoring dependent on initial monitoring results)	Applicant / Suitably Qualified Ecologist
Kirk7	Post-construction monitoring of restored habitat	Fixed point photography and quadrat monitoring	Summer / Autumn	Years 1, 3, and 5 (frequency of subsequent monitoring dependent on initial monitoring results)	Applicant / Suitably Qualified Ecologist

3.7 Management

In accordance with good land management practice, a register of management works undertaken on site will be maintained to monitor that such works are consistent with the agreed objectives of the HMP.

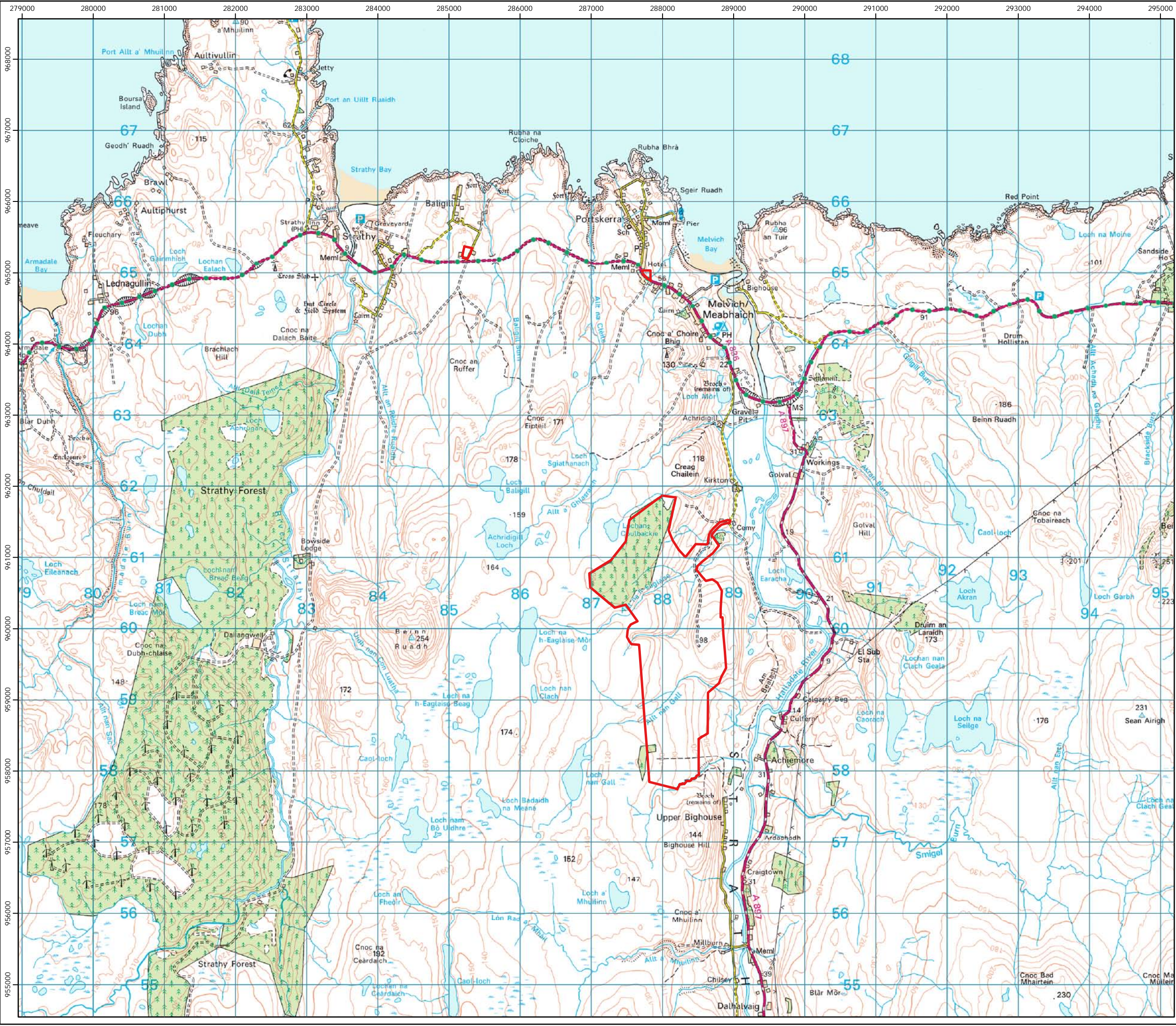
3.8 Development and Implementation of Final HMP

It is proposed that once the proposed development is granted planning permission, a suitably worded condition will be attached requiring the development of a full HMP.

Appendices

Appendix A. Figures

- Figure 8.5.1 - Site Location
- Figure 8.5.2 - Phase 1 Habitat Survey Results
- Figure 8.5.3 - NVC Survey Results
- Figure 8.5.4 - Areas of Felling and Peatland Restoration



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Figure 8.5.1 Site Location

Key

Site boundary





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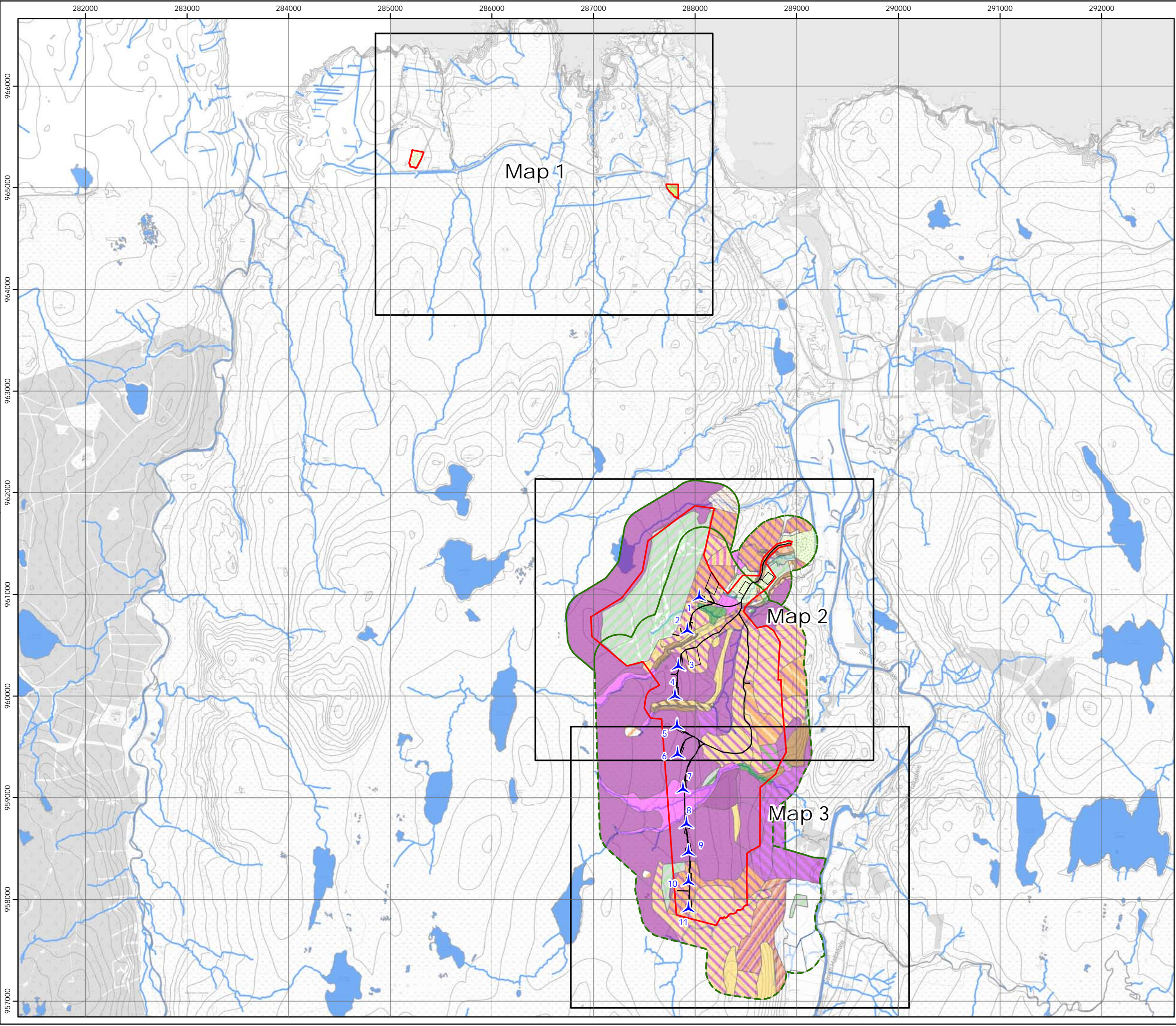
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Figure 8.5.2
Phase 1 Habitat Survey Results
Overview

Key

- Proposed turbine
- Proposed infrastructure
- Site boundary
- Survey area

Phase 1 Habitats

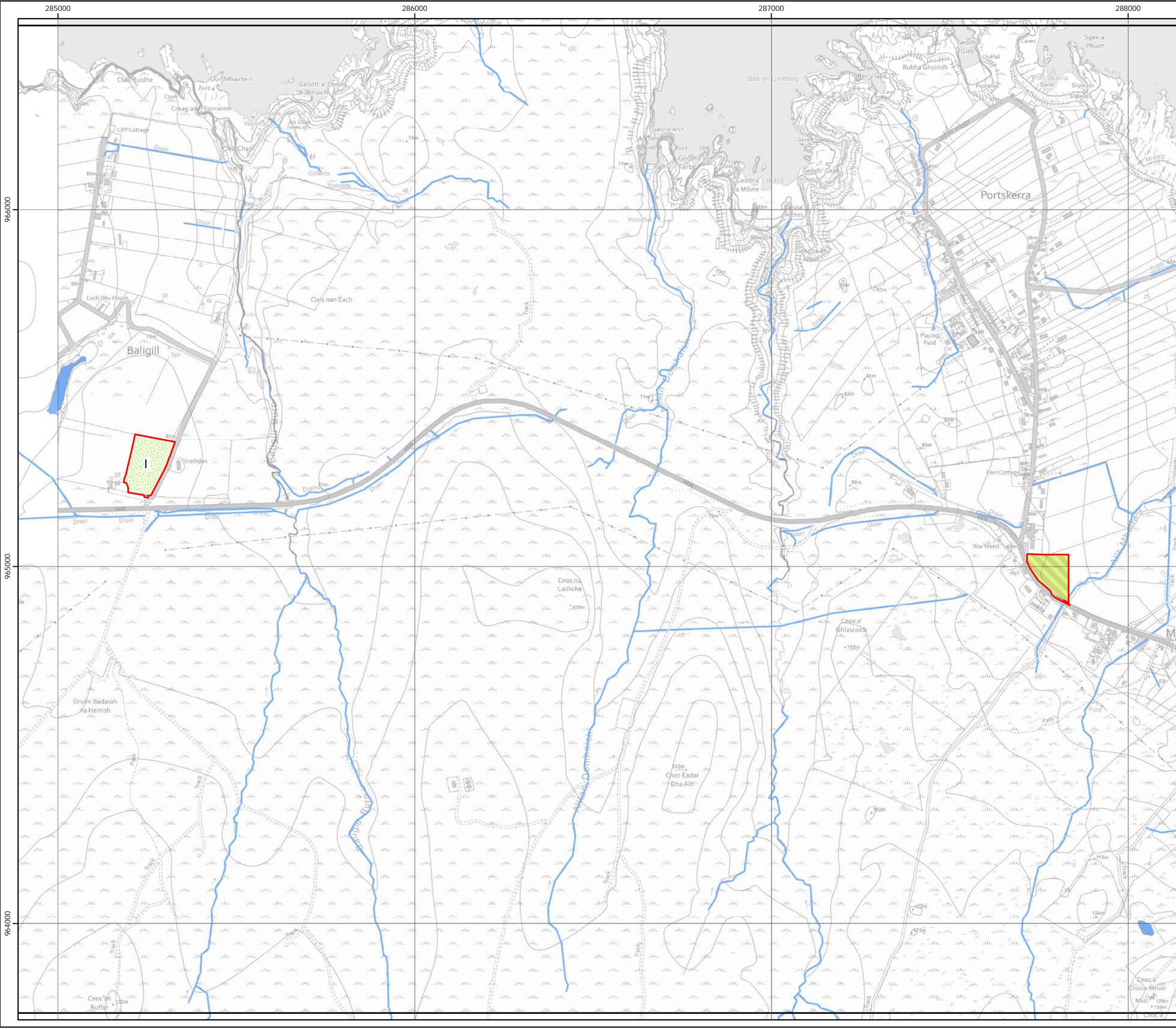
Acid/neutral flush / Broadleaved woodland - plantation	Semi-improved acid grassland / Wet dwarf shrub heath
Marsh/marshy grassland / Wet dwarf shrub heath	Semi-improved acid grassland / Bracken
Marshy Grassland (B5) / Improved Grassland (B4)	Semi-improved acid grassland / Acid/neutral flush
Acid/neutral flush / Dry dwarf shrub heath - acid / Bracken	Scattered Broadleaved trees
Marsh/marshy grassland / Acid grassland - semi-improved	Broadleaved woodland - semi-natural
Acid grassland - semi-improved / Marsh/marshy grassland / Wet Dwarf shrub heath	Broadleaved woodland - plantation
Acid Grassland semi-improved/ Wet dwarf shrub heath	Coniferous woodland - plantation
Dry dwarf shrub heath - acid / Bracken	Scrub Gorse
Dry dwarf shrub health acid / Wet dwarf shrub health	Acid grassland - semi-improved
Wet dwarf shrub heath / Blanket sphagnum bog	Improved grassland
Wet dwarf shrub heath / Dry dwarf shrub heath - acid	Marsh/marshy grassland
Wet dwarf shrub heath / Marsh/marshy grassland	Marsh/marshy grassland / Bracken - continuous
	Bracken - continuous
	Dry dwarf shrub heath - acid
	Wet dwarf shrub heath
	Blanket sphagnum bog
	Flush and spring - acid/neutral flush
	Neutral grassland - semi-improved
	Cultivated/disturbed land - arable

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Figure 8.5.2
Phase 1 Habitat Survey Results
Map 1

Key

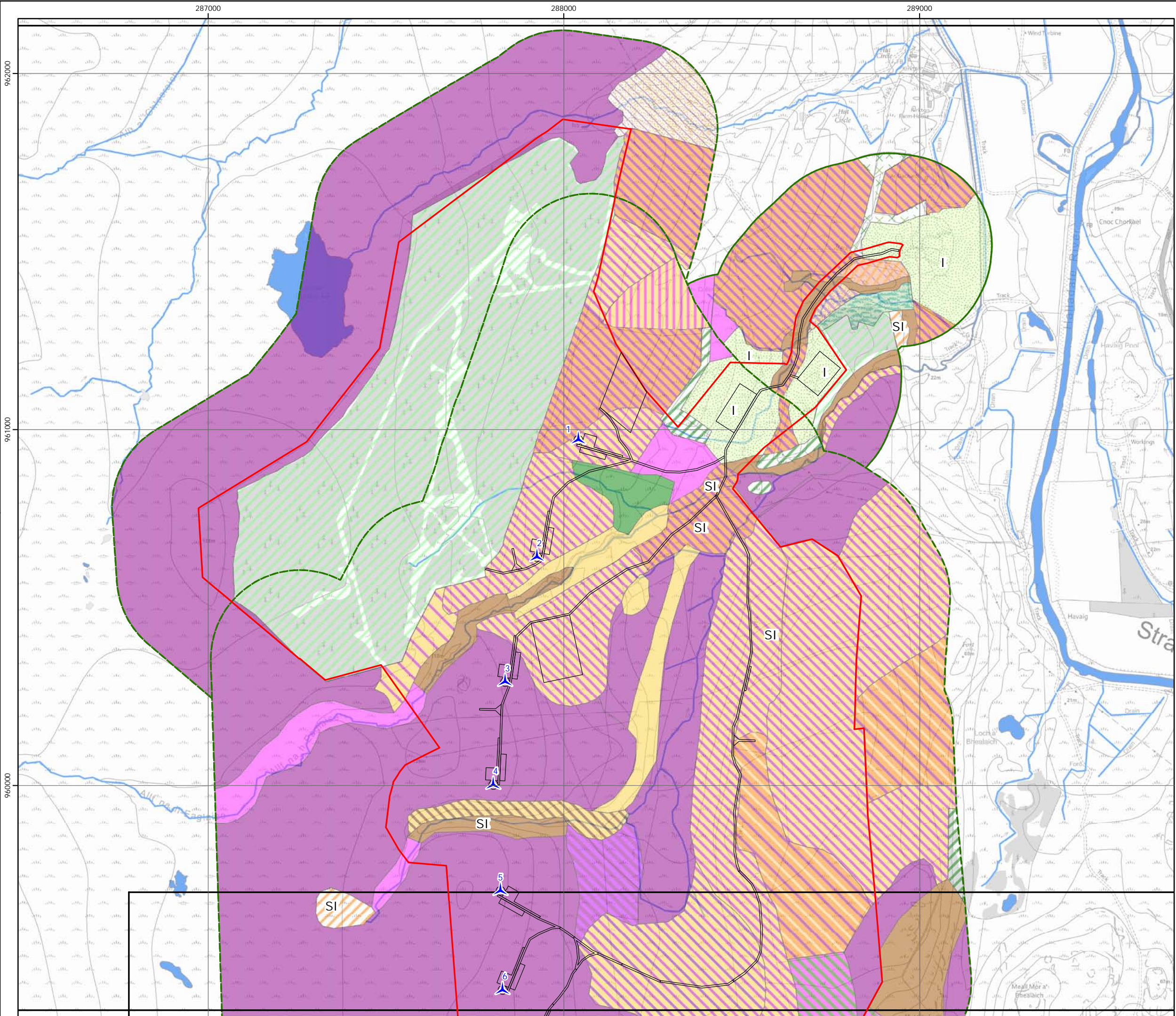
- Proposed turbine
- Proposed infrastructure
- Site boundary
- Survey area

Phase 1 Habitats

Acid/neutral flush / Broadleaved woodland - plantation	Semi-improved acid grassland / Wet dwarf shrub heath
Marsh/marshy grassland / Wet dwarf shrub heath	Semi-improved acid grassland / Bracken
Marshy Grassland (B5) / Improved Grassland (B4)	Semi-improved acid grassland / Acid/neutral flush
Acid/neutral flush / Dry dwarf shrub heath - acid / Bracken	Scattered Broadleaved trees
Marsh/marshy grassland / Acid grassland - semi-improved	Broadleaved woodland - semi-natural
Acid grassland - semi-improved / Marsh/marshy grassland / Wet Dwarf shrub heath	Broadleaved woodland - plantation
Acid Grassland semi-improved/ Wet dwarf shrub heath	Coniferous woodland - plantation
Dry dwarf shrub heath - acid / Bracken	Scrub Gorse
Dry dwarf shrub heath acid / Wet dwarf shrub heath	Acid grassland - semi-improved
Wet dwarf shrub heath / Blanket sphagnum bog	Improved grassland
Wet dwarf shrub heath / Dry dwarf shrub heath - acid	Marsh/marshy grassland
Wet dwarf shrub heath / Marsh/marshy grassland	Marsh/marshy grassland / Bracken - continuous
	Bracken - continuous
	Dry dwarf shrub heath - acid
	Wet dwarf shrub heath
	Blanket sphagnum bog
	Flush and spring - acid/neutral flush
	Neutral grassland - semi-improved
	Cultivated/disturbed land - arable

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Figure 8.5.2
Phase 1 Habitat Survey Results
Map 2

Key

- Proposed turbine
- Proposed infrastructure
- Site boundary
- Survey area

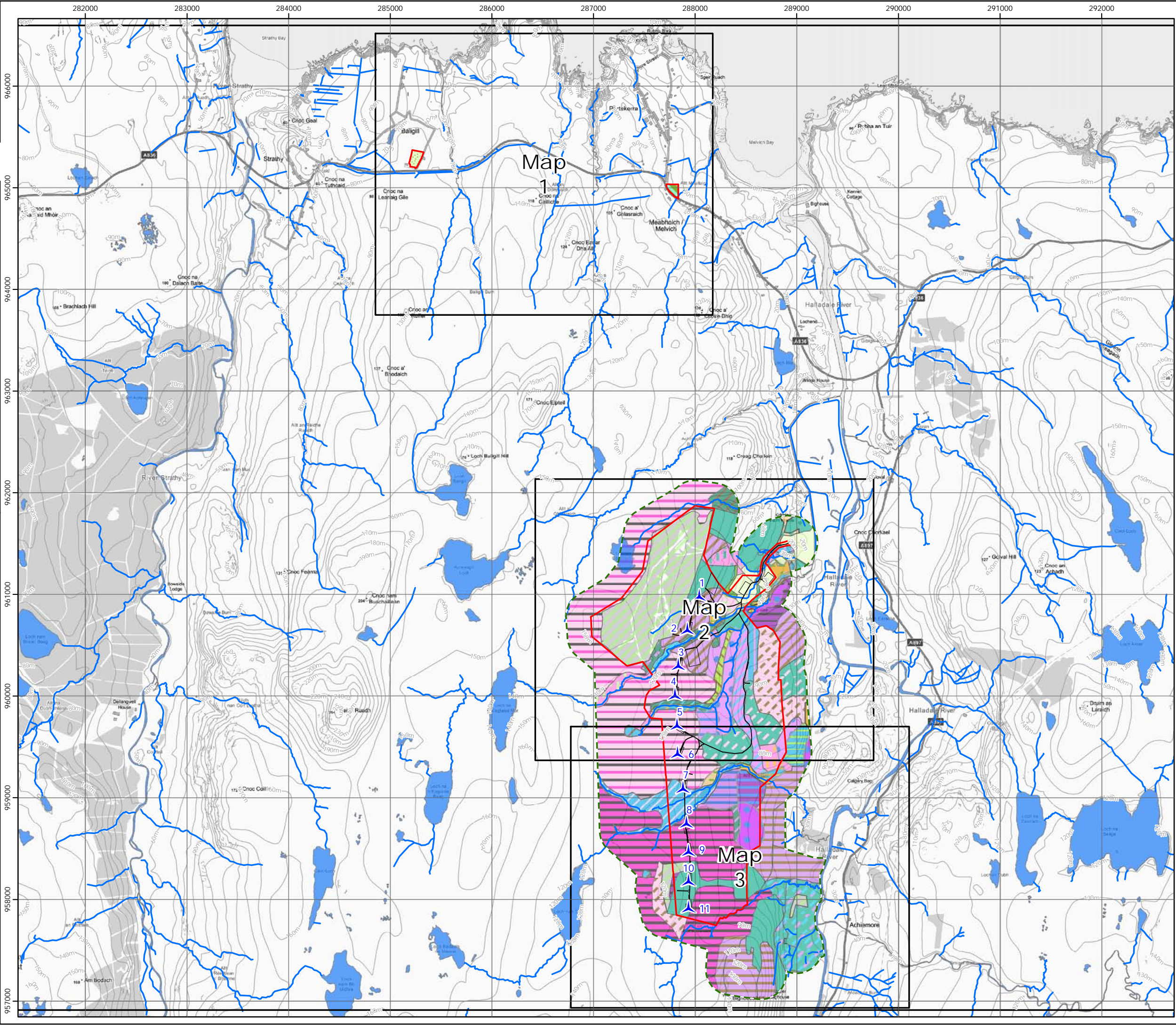
Phase 1 Habitats

Acid/neutral flush / Broadleaved woodland - plantation	Semi-improved acid grassland / Wet dwarf shrub heath
Marsh/marshy grassland / Wet dwarf shrub heath	Semi-improved acid grassland / Bracken
Marshy Grassland (B5) / Improved Grassland (B4)	Semi-improved acid grassland / Acid/neutral flush
Acid/neutral flush / Dry dwarf shrub heath - acid / Bracken	Scattered Broadleaved trees
Marsh/marshy grassland / Acid grassland - semi-improved	Broadleaved woodland - semi-natural
Acid grassland - semi-improved / Marsh/marshy grassland / Wet Dwarf shrub heath	Broadleaved woodland - plantation
Acid Grassland semi-improved/ Wet dwarf shrub health	Coniferous woodland - plantation
Dry dwarf shrub heath - acid / Bracken	Scrub Gorse
Dry dwarf shrub health acid / Wet dwarf shrub health	Acid grassland - semi-improved
Wet dwarf shrub heath / Blanket sphagnum bog	Improved grassland
Wet dwarf shrub heath / Dry dwarf shrub heath - acid	Marsh/marshy grassland
Wet dwarf shrub heath / Marsh/marshy grassland	Marsh/marshy grassland / Bracken - continuous
Neutral grassland - semi-improved	Bracken - continuous
Cultivated/disturbed land - arable	Dry dwarf shrub heath - acid
	Wet dwarf shrub heath
	Blanket sphagnum bog
	Flush and spring - acid/neutral flush

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Figure 8.5.3
NVC Survey Results
- Overview

- Key
- Proposed turbine
 - Proposed infrastructure
 - Site boundary
 - Survey area
- Dominant NVC Community

Arable land	M15/M17
Planted conifer	M15-M19
Mixed Woodland	M15/H10
Low woodland	M15/U4
Improved grassland	M17
Juncus pasture	M17a-b
Pasture	M17b
Juncus pasture/M15	M17-M19
Juncus pasture/U4	M19
Juncus pasture/U4b/U6d	M19a
H10	M23
H10 with planted broadleaves	M23/U20
H10/M17	M28/U20
H10/U20	S27
H10a with planted broadleaves	U2
MG6	U2/M6c
M6a	U2/M15
M6a-b/U4/H10	U2/U20
M6c	U20
M6c/W4	U20/H10
M6c/H10/U20 low woodland	U20a
M15	W4
M15b	W4c
	W17
	W23



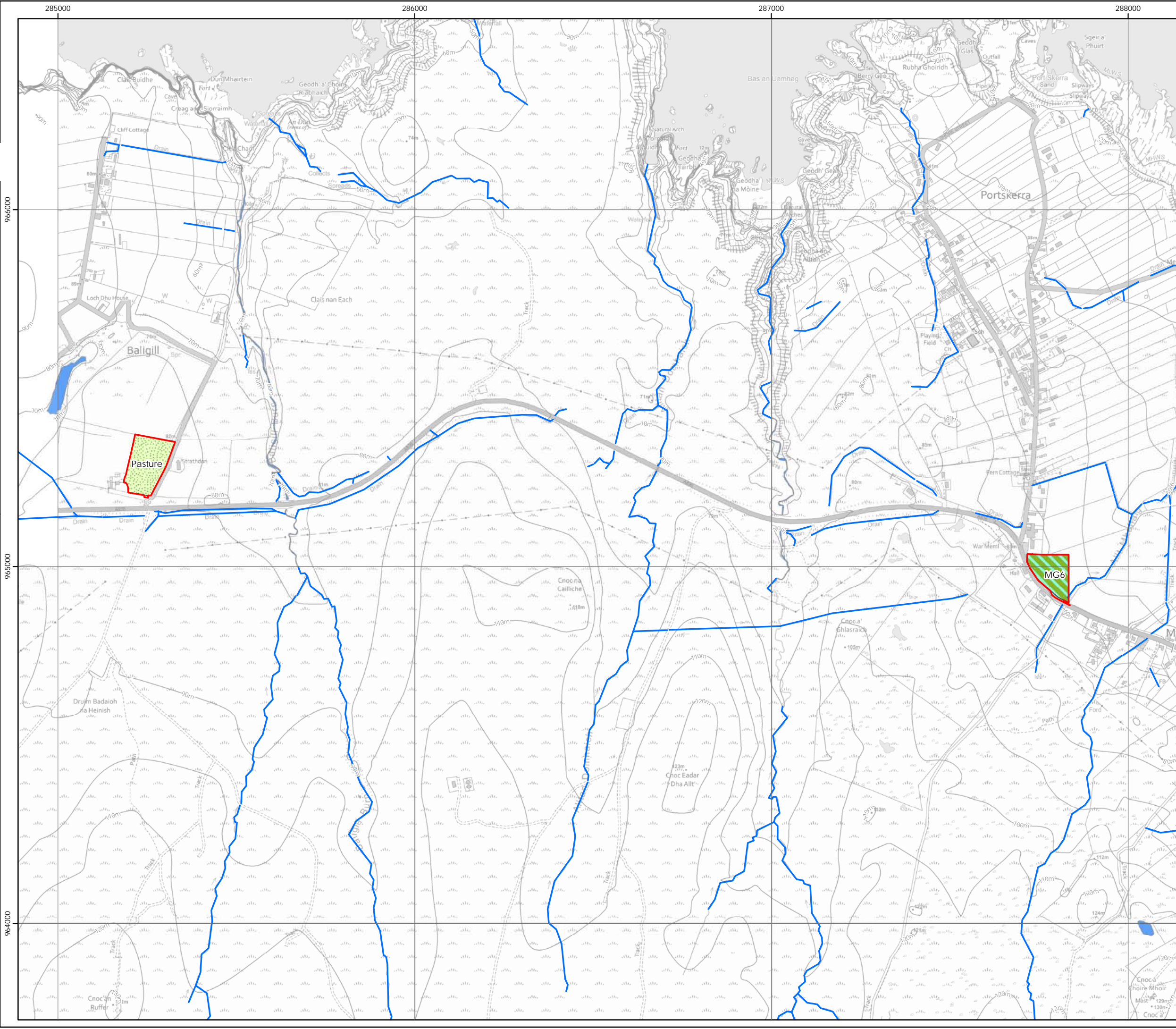
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Figure 8.5.3
NVC Survey Results
- Map 1

Key

- Proposed turbine
- Proposed infrastructure
- Site boundary
- Survey area

Dominant NVC Community

Arable land	M15/M17
Planted conifer	M15-M19
Mixed Woodland	M15/H10
Low woodland	M15/U4
Improved grassland	M17
Juncus pasture	M17a-b
Pasture	M17b
Juncus pasture/M15	M17-M19
Juncus pasture/U4	M19
Juncus pasture/U4b/U6d	M19a
H10	M23
H10 with planted broadleaves	M23/U20
H10/M17	M28/U20
H10/U20	S27
H10a with planted broadleaves	U2
MG6	U2/M6c
M6a	U2/M15
M6a-b/U4/H10	U2/U20
M6c	U20
M6c/W4	U20/H10
M6c/H10/U20 low woodland	U20a
M15	W4
M15b	W4c
	W17
	W23



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Figure 8.5.3
NVC Survey Results
- Map 2

Key

- Proposed turbine
- Proposed infrastructure
- Site boundary
- Survey area

Dominant NVC Community

Arable land	M15/M17
Planted conifer	M15-M19
Mixed Woodland	M15/H10
Low woodland	M15/U4
Improved grassland	M17
Juncus pasture	M17a-b
Pasture	M17b
Juncus pasture/M15	M17-M19
Juncus pasture/U4	M19
Juncus pasture/U4b/U6d	M19a
H10	M23
H10 with planted broadleaves	M23/U20
H10/M17	M28/U20
H10/U20	S27
H10a with planted broadleaves	U2
MG6	U2/M6c
M6a	U2/M15
M6a-b/U4/H10	U2/U20
M6c	U20
M6c/W4	U20/H10
M6c/H10/U20 low woodland	U20a
M15	W4
M15b	W4c
	W17
	W23

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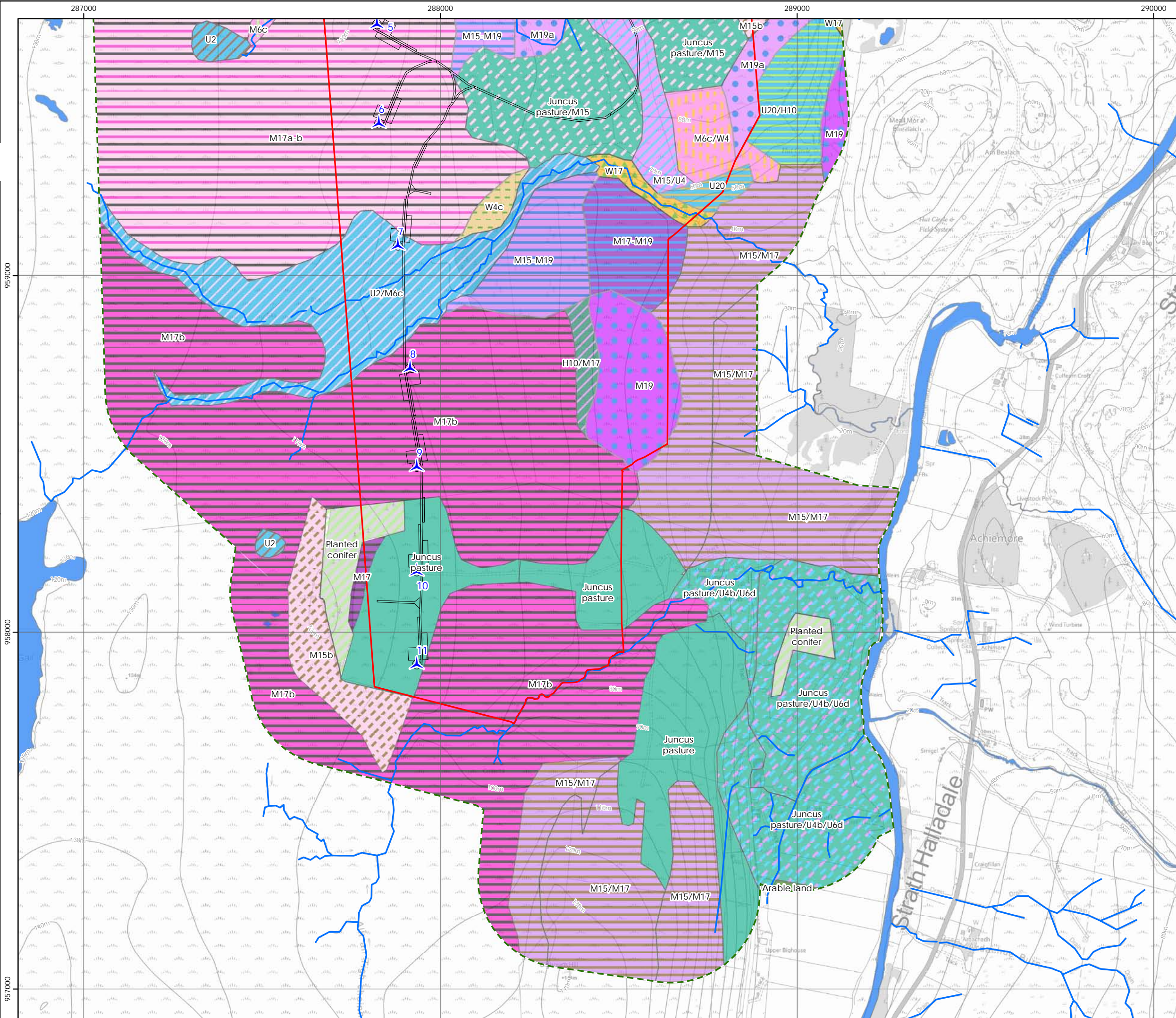


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Figure 8.5.3
NVC Survey Results
- Map 3

Key

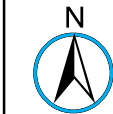
- Proposed turbine
- Proposed infrastructure
- Site boundary
- Survey area

Dominant NVC Community

Arable land	M15/M17
Planted conifer	M15-M19
Mixed Woodland	M15/H10
Low woodland	M15/U4
Improved grassland	M17
Juncus pasture	M17a-b
Pasture	M17b
Juncus pasture/M15	M17-M19
Juncus pasture/U4	M19
Juncus pasture/U4b/U6d	M19a
H10	M23
H10 with planted broadleaves	M23/U20
H10/M17	M28/U20
H10/U20	S27
H10a with planted broadleaves	U2
MG6	U2/M6c
M6a	U2/M15
M6a-b/U4/H10	U2/U20
M6c	U20
M6c/W4	U20/H10
M6c/H10/U20 low woodland	U20a
M15	W4
M15b	W4c
	W17
	W23



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Kirkton Energy Park

Kirkton Wind Farm Ltd

Figure 8.5.4
Areas of Felling,
Peatland Restoration

Key

- Site boundary
- Turbines
- Proposed Infrastructure**
 - Borrow pit
 - Onsite access track - floated
 - Crane hardstanding
 - Substation
 - Turbine foundation
 - Turning head
 - Working area
 - Construction compound
 - New access track
 - Area of peatland restoration
 - Existing Native Woodland

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