



APPENDIX 6-1

BOTANICAL STUDY

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1. INTRODUCTION

1.1 Introduction

Detailed botanical surveys were undertaken by MKO at target locations within the development footprint of the Proposed Ballivor Wind Farm Development Site. The detailed assessments focused on the Proposed Development footprint including the turbine bases, proposed access roads, proposed substation, construction compounds, amenity trails, associated car-parks, haul route land-take areas and associated infrastructure. The detailed botanical surveys were undertaken on the 26th and 27th May 2021, 8th and 15th of July 2021, 27th September 2021, 26th September 2022 and 26th February 2023. The aim of the surveys was to verify and ground truth the detailed habitat mapping that had been undertaken by Bord na Móna in their evaluation and assessments of the cutaway peatlands at Ballivor Bog. Habitats were originally classified by Bord na Móna using the Bord na Móna habitat classification system and codes (Appendix 1) and cross referenced with '*A Guide to Habitats in Ireland*' (Fossitt, 2000). During the MKO surveys, all habitats were classified in accordance with Fossitt (2000).

2. SURVEY METHODS

The vegetation and habitats within the Proposed Development footprint were sampled by taking botanical relevés (i.e. list of plants in a delimited plot). Relevés were 4x4 metres for all habitats except for woodland which were 10x10 metres (Smith and Crowley 2020). A representative photograph was also taken for each of the habitats recorded on site, including all relevés.

In addition to the habitats within the Proposed Development footprint, representative samples of habitats outside the proposed development footprint, which had potential to conform to Annex I habitats, were also selected for detailed survey. Each area described below was chosen to provide as accurate a description of the habitat types recorded within the development footprint as possible.

The relevés undertaken within the Proposed Development footprint are shown on Figure 1-1. Those relevés that were undertaken followed methods that were set out in the following documents:

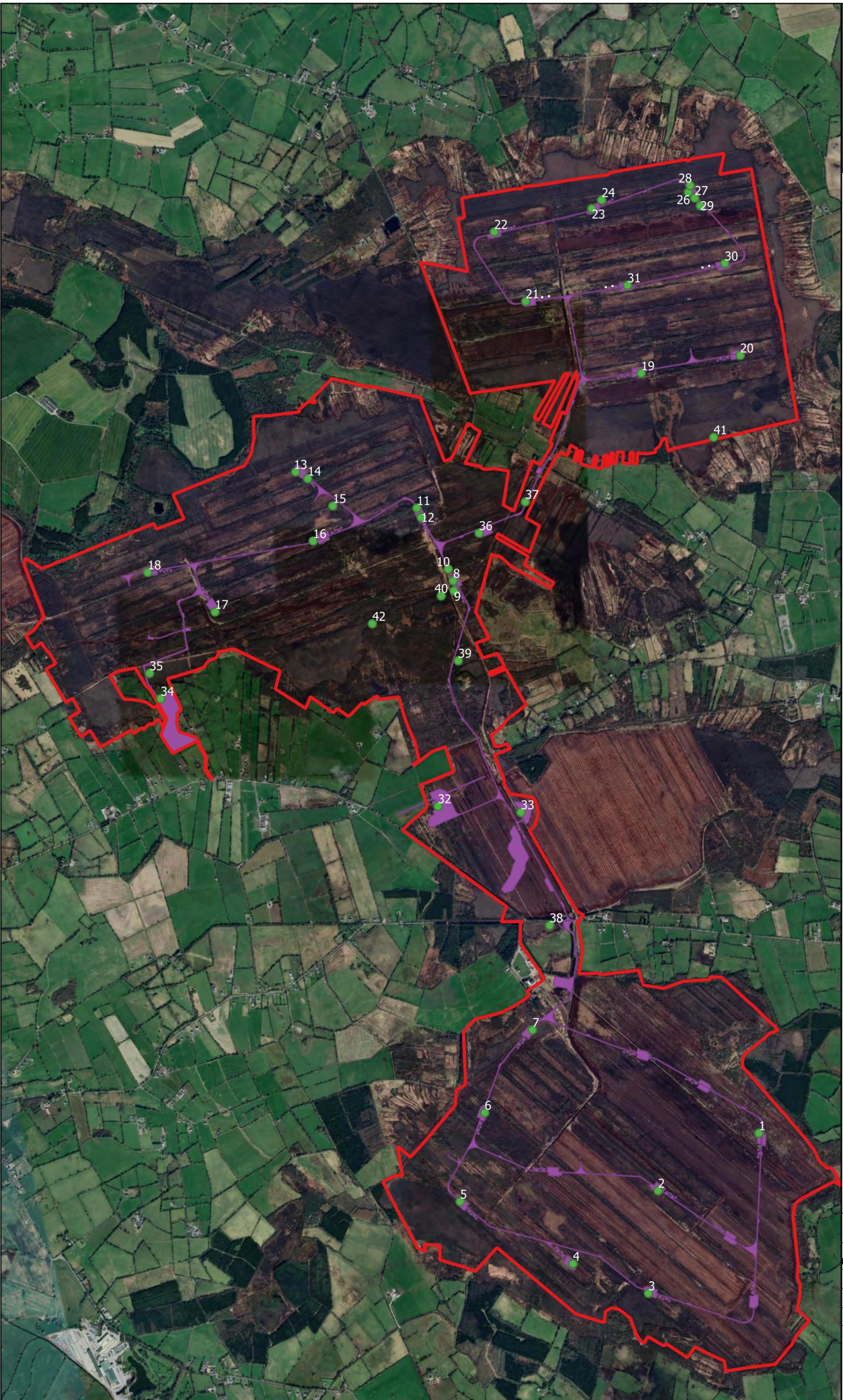
- Cross, J. & Lynn, D. (2013) *Results of a monitoring survey of bog woodland. Irish Wildlife Manuals, No. 69. National Parks and Wildlife Service*
- Fernandez, F., Connolly K., Crowley W., Denyer J., Duff K. & Smith G. (2014) *Raised Bog Monitoring and Assessment Survey 2013. Irish Wildlife Manuals, No. 81. National Parks and Wildlife Service, Department of Arts, Heritage and Gaeltacht, Dublin, Ireland.*
- Smith, G.F. & Crowley, W. (2020) *The habitats of cutover raised bog. Irish Wildlife Manuals, No. 128. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.*

All species were readily identifiable during the survey. Plant nomenclature for vascular plants follows '*New Flora of the British Isles*' (Stace, 2010), while mosses and liverworts nomenclature follows '*Mosses and Liverworts of Britain and Ireland - a field guide*' (British Bryological Society, 2010). Habitats were classified in accordance with '*A Guide to Habitats in Ireland*' (Fossitt, 2000).

Botanical surveys were undertaken by Sarah Mullen (B.Sc., M.Sc., Ph.D., ACIEEM), Inga Reich (B.Sc., Ph.D.), Patrick Ellison (B.Sc., M.Sc., ACIEEM), Rachel Walsh (B.Sc.), Georgina Mooney (B.Sc.), Neil Campbell (B.Sc., M.Sc.), Laoise Kelly (B.Sc.), Rudraksh Gupta (B.Sc.) and Kailan Mitchell (B.Sc.) of MKO.



All surveyors have relevant academic qualifications and experience in botanical survey and assessment and are competent experts in undertaking the ecological surveys to inform the habitat classification



Map Legend

- Internal Infrastructure
- Releve Locations

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Relevé Locations

Project Title
Ballivor Wind Farm Development

Drawn By SM	Checked PR
Project No. 191137	Drawing No. Figure 1-1
Scale 1:25000	Date 24.03.2023



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3. RESULTS

3.1 Turbine 1

Turbine 1 is located on an area of Cutover bog (PB4) dominated by bare peat as a result of recent industrial peat extraction. Occasional soft rush (*Juncus effusus*) and toad rush (*Juncus bufonius*) were also recorded. No table of vegetative composition is provided here due to the bare peat dominated nature of the habitat within the proposed turbine footprint. The ground was dry and firm underfoot.



Plate 3-1: Example of bare peat cutover bog habitat present at the location of T1.

3.2 Turbine 2

Area of Cutover bog (PB4) dominated by bare peat as a result of recent industrial peat extraction. No table of vegetative composition is provided here due to the bare peat dominated nature of the habitat within the proposed turbine footprint. The ground was dry and firm underfoot. Plants associated with the nearby drain included downy birch (*Betula pubescens*), hare's tail cottongrass (*Eriophorum vaginatum*), common cottongrass (*Eriophorum angustifolium*), and soft rush (*Juncus effusus*).



Plate 3-2 Example of bare peat dominated cutover bog at the location of Turbine 2



Plate 3-3 Example of bare peat dominated cutover bog at the location of Turbine 2, with vegetation associated largely with parallel drainage ditches

3.3 Turbine 3

An area of Cutover bog (PB4) characterised by predominantly bare peat. The ground was firm and dry underfoot. Scattered vegetation included common cottongrass (*Eriophorum angustifolium*) and scattered willow (*Salix* sp.).

Table 3-1 Botanical Survey at the location of Turbine 3

Turbine 3	ITM Co-ordinates: X 665978 Y 752961	Date: 26/05/2021
Relevé No. 1		
Species	Common Name	% Cover
Vascular Plants		
<i>Betula pubescens</i>	Downy birch	<1
<i>Salix</i> sp.	Willow	<5
<i>Eriophorum angustifolium</i>	Common cottongrass	<5
<i>Holcus lanatus</i>	Yorkshire fog	<1
<i>Juncus effusus</i>	Soft rush	<1
<i>Cirsium palustre</i>	Marsh thistle	<1
Non-vascular Plants		
% Bare ground		95
Habitat Classification		Cutover bog (PB4) dominated by bare peat



Plate 3-4 Bare peat dominated cutover bog, with some cover of common cottongrass and emerging scrub at Turbine 3

3.4 Turbine 4

Area of Cutover bog (PB4) dominated by bare peat as a result of recent industrial peat extraction. No table of vegetative composition provided here due to the bare peat dominated nature of the habitat within the proposed turbine footprint. The ground was dry and firm underfoot. Plants associated with the nearby drain included willowherb (*Epilobium*) species.



Plate 3-5 Bare peat dominated Cutover bog at the location of T4

3.5 Turbine 5

Turbine 5 is located in an area of Cutover bog (PB4) dominated by ling heather (*Calluna vulgaris*), with cottongrass species and areas of bare cutover peat also present. The ground was dry and firm underfoot and no *Sphagnum* species were recorded.

Table 3-2 Botanical Survey at the location of Turbine 5

Turbine 5	ITM Co-ordinates: X 665241 Y752540	Date: 26/05/2021
Relevé No. 2		
Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	70
<i>Erica tetralix</i>	Cross-leaved heath	5
<i>Eriophorum vaginatum</i>	Hare's tail cottongrass	30
<i>Eriophorum angustifolium</i>	Common cottongrass	30
Non-vascular Plants		
<i>Dicranum sp.</i>		<5
<i>Campylopus introflexus</i>		20
<i>Cladonia portentosa</i>		15
<i>Cladonia ramulosa</i>		<5
% Bare ground		
		15
Habitat Classification	Cutover bog (PB4) with pioneer open cutaway habitats including ling heather dominated Dry heath (HH1) and pioneer Poor fen (PF2)	



Plate 3-6 Example of Cutover bog colonised dry heath (HH1) at the location of Turbine 5

3.6 Turbine 6

Area of Cutover bog (PB4) consisting of bare peat with no vegetation cover. No table of vegetative composition is provided here due to the bare peat dominated nature of the habitat within the proposed turbine footprint. The ground was dry and firm underfoot. Plant species associated with the nearby drain included willow species (*Salix* sp.), downy birch (*Betula pubescens*), common cottongrass (*E. angustifolium*), ling heather (*C. vulgaris*), soft rush (*J. effusus*) and willowherb (*Epilobium* sp.). An area of birch-dominated Scrub (WS1) is present to the east, outside the turbine hardstand footprint.



Plate 3-7 Bare peat dominated cutover bog with vegetation associated with parallel drainage ditches



Plate 3-8 Vegetation including birch and soft rush associated with bog drainage channel

3.7 Turbine 7

Area of Cutover bog (PB4) dominated by bare peat as a result of recent industrial peat extraction. No table of vegetative composition provided here due to the bare peat dominated nature of the habitat within the proposed turbine footprint. The ground was dry and firm underfoot. Plant species growing adjacent to the nearby drains included downy birch and common cottongrass.



Plate 3-9 Bare peat dominated cutover bog at the location of T7

3.8 Turbine 8

An area of Cutover bog (PB4) characterised by a mix of bare peat and ling heather, with common cottongrass also present. Sphagnum cover was absent. The ground was firm and dry underfoot. An area of downy birch dominated scrub lies partially within the footprint of the proposed turbine infrastructure.

Table 3-3 Botanical Survey at the location of Turbine 8

Turbine 8	ITM Co-ordinates: X 665170 Y 751789	Date: 26/05/2021
Relevé No. 3		
Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	40
<i>Eriophorum vaginatum</i>	Hare's tail cottongrass	30
<i>Eriophorum angustifolium</i>	Common cottongrass	10
<i>Drosera rotundifolia</i>	Round-leaved sundew	<1
Non-vascular Plants		
<i>Cladonia floerkeana</i>		10
<i>Cladonia portentosa</i>		1
<i>Racomitrium lanuginosum</i>		5
% Bare ground		
		40
Habitat Classification		Cutover Bog (PB4) with pioneer cutaway bog communities (PF2)

3.9 Turbine 9

Area of Cutover bog (PB4) characterised by a mix of bare peat and ling heather, with common cottongrass also present. Sphagnum cover was absent. The ground was firm and dry underfoot.

Table 3-4 Botanical Survey at the location of Turbine 9

Turbine 9	ITM Co-ordinates: X 664618 Y 752005	Date: 26/05/2021
Relevé No. 1		
Species	Common Name	% Cover
Vascular Plants		

<i>Calluna vulgaris</i>	Ling heather	30
<i>Eriophorum angustifolium</i>	Common cottongrass	25
<i>Betula pubescens</i>	Downy birch	2
Non-vascular Plants		
<i>Cladonia floerkeana</i>		10
<i>Racomitrium lanuginosum</i>		5
% Bare ground		30
Habitat Classification	Cutover bog (PB4) with <i>Calluna</i> dominated Dry heath (HH1)	



Plate 3-10: Example of cutover bog habitat present at the location of T9.

3.10 Turbine 10

Turbine 10 is located in an area of Cutover bog (PB4) characterised by a mosaic of bare peat, ling heather dominated Dry heath (HH1) and downy birch dominated Scrub (WS1). Sphagnum cover was absent. The ground was firm and dry underfoot and peat depth was >2m and the area has been subject to fire damage.

Table 3-5 Botanical Survey at the location of Turbine 10

Turbine 10	ITM Co-ordinates: X 663794 Y 752460	Date: 26/05/2021
Relevé No. 5		
Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	40
<i>Eriophorum vaginatum</i>	Hare's tail cottongrass	10
<i>Rumex acetosella</i>	Common sorrel	10
<i>Betula pubescens</i>	Downy birch	<1
Non-vascular Plants		
<i>Sphagnum denticulatum</i>		10
<i>Pteridium aquilinum</i>		1
<i>Pellia sp.</i>		2
% Bare ground		40
Habitat Classification	Cutover bog (PB4) with <i>Calluna</i> dominated Dry heath (HH1) and Scrub (WS1)	

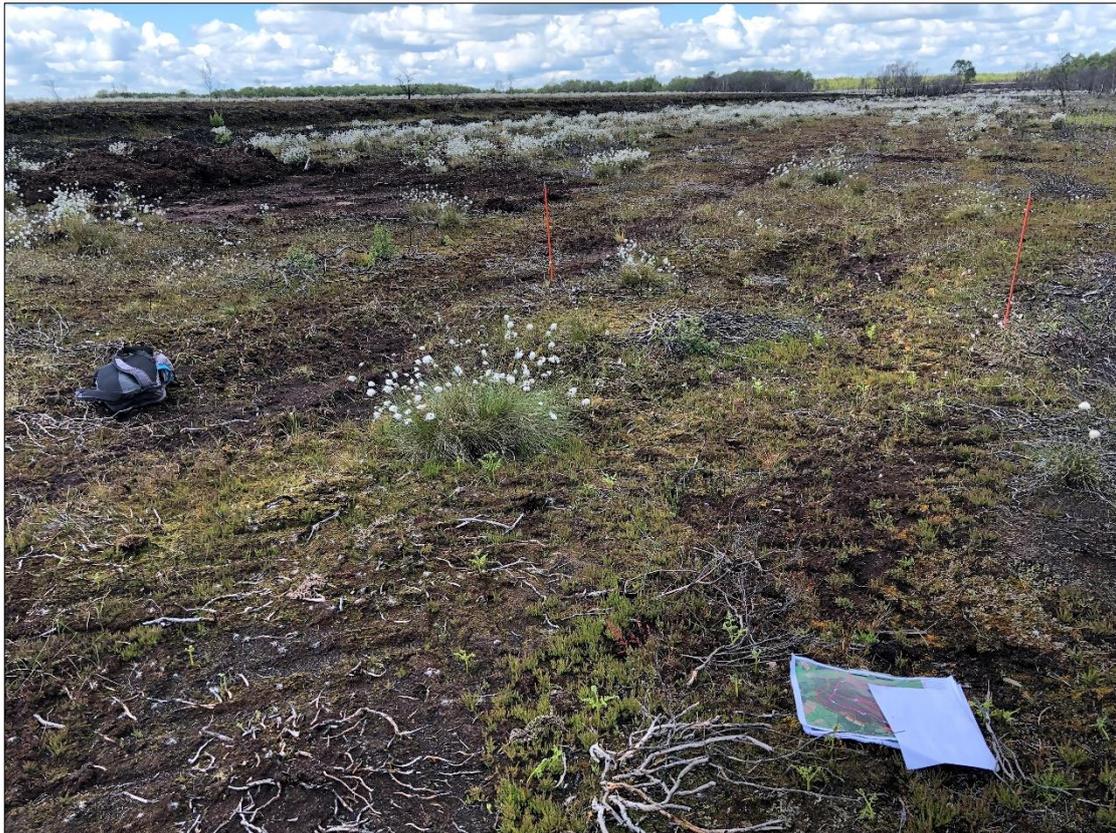


Plate 3-11 Cutover bog which had been subject to fire damage at the location of T10

3.11 Turbine 11

Turbine 11 is located in an area of Cutover bog (PB4) characterised by a mosaic of establishing dry heath (HH1) and Scrub (WS1) communities. Vegetation was dominated by a mix of ling heath and common cottongrass. Downy birch (*Betula pubescens*) and sitka spruce (*Picea sitchensis*) saplings were also present. Sphagnum cover was absent. The ground was dry and firm underfoot with peat depth of > 1m.

Table 3-6 Botanical Survey at the location of Turbine 11

Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	65
<i>Drosera rotundifolia</i>	Round-leaved sundew	<1
<i>Erica tetralix</i>	Cross-leaved heath	<5
<i>Eriophorum angustifolium</i>	Common cottongrass	80
<i>Eriophorum vaginatum</i>	Hare's tail cottongrass	10
<i>Trichophorum germanicum</i>	Deergrass	<5

<i>Picea sitchensis</i> (sapling)	Sitka spruce	<5
<i>Betula pubescens</i> (sapling)	Downy Birch	<5
Non-vascular Plants		
<i>Pleurozium schreberi</i>		10
<i>Campylopus introflexus</i>		80
<i>Cladonia portentosa</i>		<5
% Bare ground		0
Habitat Classification	Cutover bog (PB4) with pioneer ling heather dominated Dry heath (HH1) and Scrub (WS1)	



Plate 3-12 Cutover bog colonised by dry heath and scrub at the location of Turbine 11

3.12 Turbine 12

Turbine 12 is located in an area of Cutover bog (PB4) dominated by Dry heath (HH1) type vegetation with ling heather (*Calluna vulgaris*) and hare's tail cottongrass (*Eriophorum angustifolium*). Wetter areas were characterised by bog asphodel (*Narthecium ossifragum*) and deergrass (*Trichophorum*)

germanicum). While the ground was predominantly firm and dry underfoot at this location, smaller wet areas were also present.

Table 3-7 Botanical Survey at the location of Turbine 12

Turbine 12	ITM Co-ordinates: X 664322 Y 753716	Date: 26/05/2021
Relevé No. 7		
Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	40
<i>Erica tetralix</i>	Cross-leaved heath	20
<i>Eriophorum vaginatum</i>	Hare's tail cottongrass	30
<i>Eriophorum angustifolium</i>	Common cottongrass	15
<i>Narthecium ossifragum</i>	Bog asphodel	10
<i>Trichophorum germanicum</i>	Deergrass	<5
Non-vascular Plants		
<i>Sphagnum papillosum</i>		20
<i>Sphagnum subnitens</i>		10
<i>Pleurozium schreberi</i>		< 5%
<i>Cladonia portentosa</i>		15
% Bare ground		
% Bare ground		5 (plus 20% under water)
Habitat Classification		Cutover bog (PB4) with pioneer ling heather dominated Dry heath (HH1)



Plate 3-13 Cutover bog colonised by heath type vegetation at the location of T12

3.13 Turbine 13

T13 is predominantly located in an area of Cutover bog (PB4) characterised by abundant purple moor grass (*Molinia caerulea*) with ling heather (relevé 1). The northern section of the turbine infrastructure is located in an area of Cutover bog (PB4) characterised by a mix of Poor fen (PF2), Dry heath (HH1) and Scrub (WS1) vegetation while the southern section and associated access road are located in a very small remnant of highly degraded uncut Raised bog (PB1) remnant which is less than 1ha in size. Relevés were taken at each of these locations and are presented below. The access road to the north also traverses an area of dry birch-dominated bog woodland. A relevé was also taken in the woodland habitat.

3.13.1.1 Relevé 1

The majority of the turbine infrastructure is located in a low-lying area dominated by purple moor grass with frequent ling heather, classified as Poor fen (PF2). Birch and bog myrtle (*Myrica gale*) were also present. Sphagnum cover was absent and the ground was firm and dry underfoot.

Table 3-8 Botanical Survey at the location of T13

Turbine 13	ITM Co-ordinates: X 663743 Y 757001	Date: 27/05/2021
Relevé No. 8		
Species	Common Name	% Cover

Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	30
<i>Molinia caerulea</i>	Purple moor grass	100
<i>Vaccinium myrtillus</i>	Bilberry	<5
<i>Betula pubescens</i>	Downy birch	5
Non-vascular Plants		
% Bare ground		0
Habitat Classification	Cutover bog (PB4) characterised by <i>Molinia</i> dominated Poor fen (PF2) and Dry heath (HH1)	



Plate 3-14 *Molinia* dominated poor fen with birch scrub and *Calluna* dominated dry heath in the background

3.13.1.2 Relevé 2

The southern-most section of the T13 infrastructure is located in a small fragment of uncut remnant Raised bog (PB1). This section of uncut bog is highly fragmented and surrounded on all sides by highly drained cutover bog or machine passes. Sphagnum cover was 5% and the ground was firm and dry underfoot. The vegetation was characteristic of Raised Bog 'Marginal' ecotope vegetation, i.e. Sphagnum cover <10% and ling heather cover <50% (Fernandez et al. 2014).

Table 3-9 Botanical Survey at the location of Turbine 13

Turbine 13	ITM Co-ordinates: X 663749 Y 756928	Date: 27/05/2021
Relevé No. 19		
Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	25
<i>Erica tetralix</i>	Cross-leaved heath	10
<i>Eriophorum angustifolium</i>	Common cottongrass	10
<i>Eriophorum vaginatum</i>	Hare's tail cottongrass	5
<i>Molinia caerulea</i>	Purple moor grass	15
<i>Trichophorum germanicum</i>	Deergrass	10
Non-vascular Plants		
<i>Cladonia portentosa</i>		15
<i>Racomitrium lanuginosum</i>		20
<i>Sphagnum denticulatum</i>		5
% Bare ground		<5
Habitat Classification		Raised bog (PB1)



Plate 3-15 Degraded Raised bog at the location of T13

3.13.1.3 Relevé 3 – Access track to north of Turbine 13

The access road to the north also traverses an area of dry birch-dominated bog woodland (WN7). Sphagnum cover was absent and the ground was firm and dry underfoot.

Table 3-10 Botanical Survey at the location of Turbine 13

Species	Common Name	% Cover
Access Track to Turbine 13		
ITM Co-ordinates: X 663706 Y 757087		Date: 27/05/2022
Relevé No. 10		
Species	Common Name	% Cover
Canopy		
<i>Betula pubescens</i>	Downy birch	70
<i>Salix</i> sp.	Willow species	10
Understorey/Ground flora		
<i>Anthoxanthum odoratum</i>	Sweet vernal grass	70
<i>Epilobium</i> sp.	Willowherb	5
<i>Hedera hibernica</i>	Ivy	5

<i>Ilex aquifolium</i>	Holly	<5
<i>Geranium robertianum</i>	Herb robert	<1
<i>Viola riviniana</i>	Common dog violet	<1
Non-vascular Plants		
<i>Thuidium tamariscinum</i>		80
% Bare ground		0
Habitat Classification		Bog woodland

3.14 Turbine 14

The footprint of T14 spans an area of dry birch-dominated Bog woodland (WN7) at its northern extent and an area of Cutover bog comprising a mosaic of Dry heath (HH1), Scrub (WS1), Pioneer poor fen (PF2) and bare peat at its southern extent.

Relevés were taken at each of these locations and are presented below.

3.14.1.1 Relevé 1

The northern section of the T14 infrastructure is located in an area of dry downy birch dominated Bog woodland (WN7). Ground flora was dominated by bramble (*Rubus fruticosus* agg.) The ground was dry and firm underfoot and *Sphagnum* cover was absent.

Table 3-11 Botanical Survey at the location of Turbine 14

Turbine 14	ITM Co-ordinates: X 663477 757534	Date: 27/05/2021
Relevé No. 11		
Species	Common Name	% Cover
Canopy		
<i>Betula pubescens</i>	Downy birch	70
Ground flora		
<i>Fragaria vesca</i>	Wild strawberry	5
<i>Luzula campestris</i>	Field wood-rush	<1
<i>Pteridium aquilinum</i>	Bracken	<1
<i>Rubus fruticosus</i> agg.	Bramble	60
Non-vascular Plants		
<i>Thuidium tamariscinum</i>		30
Leaf litter		100
% Bare ground		0
Habitat Classification	Non-annex dry Bog Woodland (WN7)	



Plate 3-16 Dry Bog woodland at the location of T14

3.14.1.2 Relevé 2

The southern part of the T14 infrastructure is located in an area of Cutover bog (PB4) comprising a mosaic of ling heather-dominated Dry heath (HH1) and scattered Scrub (WS1) with common cottongrass dominated pioneer Poor fen (PF2) and areas of bare peat. The ground was firm and mostly dry underfoot with some small puddles of standing water in the wider area.

Table 3-12 Botanical Survey at the location of Turbine 14

Turbine 14	ITM Co-ordinates: X 663508 Y 757465	Date: 27/05/2021
Relevé No. 12		
Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	40
<i>Eriophorum angustifolium</i>	Common cottongrass	50
<i>Juncus effusus</i>	Soft rush	10
<i>Molinia caerulea</i>	Purple moor grass	<5
<i>Betula pubescens</i>	Downy birch	<5
Non-vascular Plants		

<i>Cladonia portentosa</i>	<5
% Bare ground	30%
Habitat Classification	Cutover bog (PB4) with colonising Dry heath (HH1), Scrub (WS1) and Poor fen (PF2)



Plate 3-17 Cutover bog colonised by dry heath and scrub at the location of T14

3.15 Turbine 15

The area around T15 is comprised of recolonising Cutover bog (PB4), dominated by a mosaic of Dry establishing heath (HH1), Pioneer poor fen (PF2) and Scrub (WS1) vegetation. Vegetation is dominated by cottongrass and heather, with patches of birch and Scot's pine scrub. The southern section of the T15 infrastructure traverses an area of dry birch-dominated Bog woodland (WN7).

The peat is mainly dry and firm underfoot, with some wetter areas containing *Sphagnum* near to the north of T15, close to an area of drained but uncut remnant raised bog (PB1). The raised bog remnant lies entirely outside the infrastructure footprint.

3.15.1.1 Relevé 1

Table 3-13 Botanical Survey at the location of Turbine 15

Turbine 15	ITM: X 662590 Y 757798	Date: 27/05/2021
Relevé No. 13		
Species	Common Name	% Cover
Vascular Plants		
<i>Betula pendula</i>	Birch	7
<i>Eriophorum vaginatum</i>	Hare's-tail Cottongrass	80
<i>Calluna vulgaris</i>	Ling heather	20
<i>Drosera rotundifolia</i>	Round-leaved sundew	+
Non-vascular Plants		
<i>Campylopus introflexus</i>	Heath star moss	20
<i>Sphagnum spp.</i>		0
% Bare peat		
		10
Habitat Classification		Cutover bog (PB4) with recolonising Dry heath (HH1), Pioneer poor fen (PF2) and Scrub (WS1).



Plate 3-18 T15 area, dominated by cottongrass with patches of heather and birch. Mature birch woodland is found to the south.



Plate 3-19 A drain is found to the north of T15 alongside a higher area of bog.

3.15.1.2 Relevé 2

A relevé was taken within the woodland south of T15 through which the access road is proposed. This is an area of mature birch woodland (WN7). The ground is dry and dominated by leaf litter and ivy.

Table 3-14 Botanical Survey at the location of T15

Turbine 15	ITM: X662679 Y757749	Date: 27/05/2021
Relevé No. 14		
Species	Common Name	% Cover
Vascular Plants		
Canopy		
<i>Betula pendula</i>	Birch	70
<i>Salix</i> sp.	Willow	1
<i>Sorbus aucuparia</i>	Rowan	1

Ground layer		
<i>Rubus fruticosus</i> agg.	Bramble	20
<i>Hedera hibernica</i>	Ivy	50
<i>Vaccinium myrtillus</i>	Bilberry	1
<i>Geranium robertianum</i>	Herb Robert	3
<i>Crataegus monogyna</i>	Hawthorn	+
<i>Asplenium scolopendrium</i>	Hart's tongue fern	+
<i>Dryopteris</i> spp.	Male fern	10
Non-vascular Plants		
<i>Thuidium tamariscinum</i>		5
% Leaf Litter		50
Habitat Classification		Bog woodland (WN7)



Plate 3-20 Birch dominated bog woodland south of T15.

3.16 Woodland along Access track between T15 and T16

A small section of the access road between T15 and T16 traverses an area of dry birch-dominated Bog woodland (WN7). Ground flora was dominated by bramble and no Sphagnum species were recorded. The ground was dry and firm underfoot.

Table 3-15 Botanical Survey of woodland along access track between T15 and T16

Species	Common Name	% Cover
Access track between T15 and T16		
ITM: X662862 Y757549		Date: 26/05/2021
Relevé No. 15		
Canopy		
<i>Betula pubescens</i>	Downy birch	70%
<i>Salix sp.</i>	Willow	5%
<i>Ulmus glabra</i>	Elm	1%
<i>Pinus contorta</i>	Lodgepole pine	1%
Understorey/Ground flora		
<i>Rubus fruticosus agg.</i>	Bramble	50
<i>Vaccinium myrtillus</i>	Bilberry	5%
<i>Hedera hibernica</i>	Ivy	10%
<i>Pteridium aquilinum</i>	Bracken	20%
<i>Juncus effusus</i>	Soft rush	3%
<i>Fragaria vesca</i>	Wild strawberry	3%
<i>Equisetum sp.</i>	Horsetail sp.	2%
Non vascular plants		
<i>Thuidium tamariscinum</i>		30%
<i>Kindbergia praelonga</i>		1%

% Bare peat	40
Habitat Classification	Non-Annex dry Bog woodland (WN7).



Plate 3-21 Example of dry bog woodland along access track between T15 and T16

3.17 Turbine 16

The location of T16 is in Cutover bog (PB4) with ling heather (*Calluna vulgaris*) dominated Dry heath (HH1) with establishing birch (*Betula pubescens*) and Scot's pine (*Pinus sylvestris*) Scrub (WS1). Small patches of *Sphagnum* were recorded. The ground was dry and firm underfoot.

Turbine 16	ITM Co-ordinates: X 662718 Y 757292	Date: 26/05/2021
Relevé No. 16		
Species	Common Name	% Cover
Vascular Plants		
<i>Betula pubescens</i>	Downy birch	10
<i>Calluna vulgaris</i>	Ling heather	80
<i>Erica tetralix</i>	Cross-leaved heath	1

<i>Eriophorum vaginatum</i>	Hare's-tail Cottongrass	40
Non-vascular Plants		
<i>Campylopus introflexus</i>	Heath star moss	1
<i>Sphagnum spp.</i>		2
% Bare peat		0
Habitat Classification		Cutover bog (PB4) with establishing Dry heath (HH1) and Scrub (WS1) vegetation.



Plate 3-22 Turbine 16 location within cutover bog (PB4) dominated by heath-type vegetation.

3.18 Turbine 17

T17 is located in an area of cutover bog (PB4) with establishing ling heather dominated Dry heath (HH1) type vegetation and Scrub (WS1). No *Sphagnum* mosses were recorded.

Table 3-16 Botanical Survey at the location of Turbine 17

Turbine 17	ITM Co-ordinates: X 662001 Y 756774	Date: 26/05/2021
Relevé No. 17		
Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	80
<i>Betula sp.</i>	Birch	10
<i>Eriophorum angustifolium</i>	Common cottongrass	50
<i>Juncus effusus</i>	Soft rush	5
<i>Molinia caerulea</i>	Purple moor grass	5
Non-vascular Plants		
<i>Hypnum jutlandicum</i>		10
% Bare ground		
		5
Habitat Classification	Cutover bog (PB4) with establishing Dry Heath (HH1) and Scrub (WS1)	



Plate 3-23 Example of Dry heath and scrub vegetation at the location of T17

3.19 Turbine 18

Turbine 18 is located in an area of Cutover bog (PB4) dominated by hare's tail cottongrass alongside ling heather and smaller quantities of birch scrub and areas of bare peat. Sphagnum cover was absent and the ground was dry and firm underfoot.

Table 3-17 Botanical Survey at the location of Turbine 18

Turbine 18	ITM Co-ordinates: X 661509 Y 757063	Date: 26/05/2021
Relevé No. 18		
Species	Common Name	% Cover
Vascular Plants		
<i>Betula pubescens</i>	Downy birch	+
<i>Calluna vulgaris</i>	Ling heather	20
<i>Eriophorum vaginatum</i>	Hare's-tail Cottongrass	70
Non-vascular Plants		
<i>Campylopus introflexus</i>		+
% Bare peat		30
Habitat Classification		
		Cutover bog (PB4) characterised by pioneering Poor fen (PF2), Dry heath (HH1), Scrub (WS1)

3.20 Turbine 19

T19 is located in an area of recolonising cutover bog (PB4) dominated by ling heather and hare's tail cottongrass, with areas of bare peat, and small quantities of immature birch. Sphagnum cover was absent and the ground was firm and dry underfoot.

Table 3-18 Botanical Survey at the location of T19

Turbine 19	ITM Co-ordinates: X 665117 Y 758520	Date: 27/05/2021
Relevé No. 19		
Species	Common Name	% Cover
Vascular Plants		
<i>Betula pubescens</i>	Downy birch	+
<i>Calluna vulgaris</i>	Ling heather	50
<i>Eriophorum vaginatum</i>	Hare's-tail Cottongrass	25
Non-vascular Plants		
<i>Campylopus introflexus</i>	Heath star moss	15
<i>Sphagnum spp.</i>		0
<i>Cladonia spp.</i>		5
% Bare peat		
		15
Habitat Classification		Cutover bog (PB4) characterised by Pioneering poor fen (PF2), Dry heath (HH1) and Scrub (WS1)



Plate 3-24 Location of Turbine 19. Cutover bog (PB4) dominated by heather and cottongrass.

3.21 Turbine 20

T20 is located in an area of Cutover bog (PB4) which is species poor and characterised by large areas of bare peat, and recently colonising ling heather and hare's tail cottongrass, with small quantities of birch. Sphagnum cover was absent and the ground firm and dry underfoot.

Table 3-19 Botanical Survey at the location of T20

Turbine 20	ITM Co-ordinates: X 665841 Y 758650	Date: 27/05/2021
Relevé No. 20		
Species	Common Name	% Cover
Vascular Plants		
<i>Betula pubescens</i>	Downy birch	1
<i>Calluna vulgaris</i>	Ling heather	20
<i>Eriophorum vaginatum</i>	Hare's-tail Cottongrass	25
Non-vascular Plants		
<i>Campylopus introflexus</i>	Heath star moss	40
<i>Sphagnum spp.</i>		0
% Bare peat		
		50
Habitat Classification		Cutover bog (PB4) with Pioneering Poor fen (PF2), Dry heath (HH1) and Scrub (WS1)



Plate 3-25 Turbine 20 area. Bare peat cutover (PB4) with recently colonised cottongrass, heath star moss and heather.

3.22 Turbine 21

The location of T21 is dominated by bare, milled peat with small patches of pioneering poor fen (PF2) dominated by hare's tail cottongrass and birch dominated scrub to the east and north. A large drain (FW4) is also present to the north of the proposed T21 with banks vegetated with willows (*Salix spp.*), birch (*Betula pubescens*), bulrush (*Typha latifolia*), creeping buttercup (*Ranunculus repens*) and silverweed (*Potentilla anserina*). Sphagnum was not recorded at the location of T21 and the ground was firm and dry underfoot.

Table 3-20 Botanical Survey at the location of Turbine 21

Turbine 21	ITM Co-ordinates: X 664273 Y 759046	Date: 27/05/2021
Relevé No. 21		
Species	Common Name	% Cover
Vascular Plants		
<i>Betula pubescens</i>	Downy birch	2
<i>Calluna vulgaris</i>	Ling heather	5
<i>Eriophorum vaginatum</i>	Hare's-tail Cottongrass	25
<i>Potentilla erecta</i>	Tormentil	+
Non-vascular Plants		
<i>Campylopus introflexus</i>	Heath star moss	40
<i>Sphagnum spp.</i>		0
% Bare peat		
% Bare peat		50
Habitat Classification		Cutover bog (PB4) characterised by bare peat, Pioneering poor fen (PF2)



Plate 3-26 T21 footprint area, looking east towards birch scrub and treelines.



Plate 3-27 T21 area, looking west across a strip of bare, milled peat, with patches of cottongrass.



Plate 3-28 Large drain (FW4) north of T21, running east to west.

3.23 Turbine 22

T22 is located in an area of dry Cutover bog (PB4) dominated by ling heather (*Calluna vulgaris*) and common cottongrass with areas of Scrub (WS1) characterised by downy birch and lodgepole pine (*Pinus contorta*). The ground was dry and firm underfoot and no Sphagnum species were recorded.

Table 3-21 Botanical Survey at the location of Turbine 22

Turbine 22	ITM: X664043 Y759554	Date: 27/05/2021
Relevé No. 22		
Species	Common Name	% Cover
Vascular Plants		
<i>Pinus contorta</i>	Lodgepole pine	5-10%
<i>Betula pubescens</i>	Downy birch	5%
<i>Calluna vulgaris</i>	Ling heather	40
<i>Eriophorum angustifolium</i>	Common cottongrass	25
Non-vascular Plants		
<i>Campylopus introflexus</i>		5
% Bare ground		
		10-15%
Habitat Classification	Cutover bog (PB4) characterised by Pioneering poor fen (PF2), Dry heath (HH1) and Scrub (WS1)	



Plate 3-29 Cutover bog with establishing dry heath, poor fen and scrub

3.24 Turbine 23

T23 is located in an area of dry Cutover bog (PB4) dominated by abundant ling heather (*Calluna vulgaris*) Dry heath (HH1) vegetation. The ground was dry and firm underfoot and no Sphagnum species were recorded. A small section of the northern extent of the infrastructure is located in highly degraded and disturbed Raised bog (PB1). Two relevés were taken at this location.

A drain bordered by dry woodland and scrub with birch (*Betula pubescens*) and lodgepole pine (*Pinus contorta*) is present to the south of the proposed turbine location.

3.24.1 Relevé 1

The majority of the infrastructure is located in an area of disturbed Cutover bog (PB4) with ling heather-dominated Dry heath (HH1) vegetation with sizeable areas bare ground.

Table 3-22 Botanical Survey at the location of Turbine 23

Turbine 23	ITM: 664756 Y759724	Date: 27/05/2021
Relevé No. 23		
Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	80
<i>Eriophorum angustifolium</i>	Common cottongrass	5

Non-vascular Plants	
<i>Cladonia portentosa</i>	3
<i>Cladonia sp.</i>	+
% Bare ground	25
Habitat Classification	Cutover bog (PB4) characterised by <i>Calluna</i> dominated Dry heath (HH1) type vegetation



Plate 3-30 Cutover bog characterised by Dry heath at the location of T23

3.24.2 Relevé 2

A small section of the northern extent of the turbine infrastructure is located in an area of highly degraded dry uncut Raised bog (PB1), also dominated by ling heather, with common cottongrass, larch (*Larix* sp.) and downy birch saplings growing throughout. Sphagnum was absent from this area of uncut raised bog.

The vegetation was characteristic of Raised Bog 'Facebank' ecotope vegetation, i.e. tall robust ling heather characterised by >50% cover and no Sphagnum (Fernandez et al. 2014).

Table 3-23 Botanical survey at the location of T23

Turbine 23 Relevé No. 24	Grid reference: X664828 Y759787	Date: 27/05/2021
Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	80
<i>Eriophorum vaginatum</i>	Common cottongrass	5
<i>Betula pubescens</i>	Downy birch (saplings)	1
<i>Larix sp.</i>	Larch (saplings)	<1
Non-vascular Plants		
<i>Cladonia portentosa</i>		3
% Bare ground		
		10
Habitat Classification		Dry Degraded Raised bog (PB1)



Plate 3-31 Example of highly degraded uncut raised bog at the location of T23

3.25 Access Track between Turbine 23 and Turbine 24

The proposed access track between T24 and T25 traverses an area of heavily drained and very dry uncut Raised bog (PB1). Vegetation is dominated by ling heather with abundant hare's tail cottongrass. Larch and birch saplings are present throughout as well as areas of disturbed bare ground.



Plate 3-32 Highly degraded uncut Raised bog along the access track between T23 and T24

3.26 Turbine 24

The footprint of T24 spans a mosaic of Cutover bog (PB4) habitats including Dry heath (HH1), Scrub (WS1) and Bog woodland (WN7). A number of relevés were taken and are included below. No Sphagnum species were recorded and the ground was firm and dry underfoot.

The very northern section of the infrastructure for T24 is located in an area of highly degraded, dry uncut Raised bog (PB1) dominated by common cottongrass, with ling heather and areas of bare ground. No Sphagnum species were recorded and the ground was firm and dry underfoot at this location.

3.26.1.1 Relevé 1

A section of the T24 infrastructure is located in an area of Cutover bog (PB4) characterised by a mix of downy birch dominated Scrub (WS1) and ling heather dominated Dry heath (HH1) type vegetation. Sphagnum cover was absent and the ground was dry and firm underfoot.

Table 3-24 Botanical Survey at the location of T24

Turbine 24	ITM: X665462 Y 759843	Date: 27/05/2021
Relevé No. 26		
Species	Common Name	% Cover
Vascular Plants		
<i>Betula pubescens</i>	Downy birch	50%
<i>Pinus contorta</i>	Lodgepole pine	2%
<i>Calluna vulgaris</i>	Ling heather	50%
<i>Erica tetralix</i>	Cross-leaved heath	<5%
<i>Molinia caerulea</i>	Purple moor grass	<5%
Non-vascular Plants		
% Bare ground		0
Habitat Classification	Cutover bog (PB4) characterised by Dry heath (HH1) and Scrub (WS1)	



Plate 3-33 Cutover bog dominated by ling heather and birch scrub at the location of T24

3.26.1.2 Relevé 2 – Bog woodland

This is a narrow strip of downy birch dominated dry Bog woodland (WN7) bordering a drain. No Sphagnum cover was recorded within the woodland area. The ground was dry and firm underfoot.

Table 3-25 Botanical Survey at the location of T24

Turbine 24	ITM: X665508 Y759802	Date: 27/05/2021
Relevé No. 27		
Species	Common Name	% Cover
Canopy		
<i>Betula pubescens</i>	Downy birch	70%
<i>Salix sp.</i>	Willow	3%
Understorey/Ground flora		
<i>Rubus fruticosus agg.</i>	Bramble	50
<i>Hedera hibernica</i>	Ivy	10%
<i>Pteridium aquilinum</i>	Bracken	10%

<i>Kinbergia praelonga</i>		5%
<i>Hypnum jutlandicum</i>		10
% Leaf litter		80
Habitat Classification	Non-Annex dry Bog woodland (WN7).	



Plate 3-34 Drain through Bog woodland at the location of T24



Plate 3-35 Bog woodland at the location of T24

3.26.1.3 Relevé 3

The northern extent of the T24 infrastructure extends into an area classified as uncut Raised bog (PB1). While uncut, this area of bog is highly degraded and disturbed characterised by abundant common cottongrass and areas of bare peat. Ling heather and cross leaved heath (*Erica tetralix*) were also recorded. Further north of this a mix of ling heather and hare’s tail cottongrass dominated (refer to Plate 3-38 below). The vegetation best conformed to Raised Bog ‘Marginal’ ecotope vegetation, i.e. no Sphagnum cover and ling heather cover <50% cover and no Sphagnum (Fernandez et al. 2014).

Table 3-26 Botanical Survey at the location of Turbine 24

Turbine 24		Grid reference: X 665475 Y 759893	Date: 27/05/2021
Relevé No. 28			
Species	Common Name	% Cover	
Vascular Plants			
<i>Eriophorum angustifolium</i>	Common cottongrass	60	
<i>Calluna vulgaris</i>	Ling heather	25	
<i>Erica tetralix</i>	Cross-leaved heath	15	
<i>Eriophorum vaginatum</i>	Hare’s tail cottongrass	2	

Non-vascular Plants	
<i>Cladonia portentosa</i>	7
% Bare ground	10
Habitat Classification	Raised Bog (PB1)



Plate 3-36 Degraded uncut Raised bog at the location of T24 (releve)



Plate 3-37 Degraded uncut raised bog at the location of T24

3.27 Access Track between T24 and T25

Small sections of the proposed access track between T24 and T25 traverse narrow strips of highly degraded uncut Raised bog (PB1) dominated by ling heather, with areas of bare ground. No Sphagnum species were recorded in this area of bog and the ground was dry and firm underfoot. The raised bog remnant best conformed to Raised bog 'Facebank' ecotype, i.e. tall robust ling heather with >50% cover and no Sphagnum (Fernandez et al. 2014).

Table 3-27 Botanical Survey along access track between Turbine 24 and Turbine 25

Access Track T24 – T25	ITM Co-ordinates X665550 Y 759745	Date: 27/05/2021
Relevé No. 29		
Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	85
<i>Eriophorum angustifolium</i>	Common cottongrass	1
Non-vascular Plants		
<i>Campylopus introflexus</i>		5
<i>Cladonia portentosa</i>		5
% Bare ground		5
Habitat Classification	Degraded dry uncut Raised bog (PB1).	



Plate 3-38 Highly degraded uncut Raised bog along access track between T24 and T25

3.28 Turbine 25

T25 is located in an area of Cutover bog (PB4) with bare peat being colonised by ling heather (*Calluna vulgaris*) and common cottongrass (*Eriophorum angustifolium*). The ground was very dry and firm underfoot. No Sphagnum species were recorded in this area. The turbine is located adjacent to a drain, approximately 3m wide, with emergent vegetation dominated by bulrush (*Typha latifolia*).

Table 3-28 Botanical Survey at the location of Turbine 25

Turbine 25	ITM: X665728 Y759323	Date: 27/05/2021
Relevé No. 30		
Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	30
<i>Eriophorum angustifolium</i>	Common cottongrass	40
<i>Eriophorum vaginatum</i>	Hare's tail cottongrass	+
Non-vascular Plants		
-		-

% Bare ground	30
Habitat Classification	Cutover bog (PB4) with establishing Pioneer poor fen (PF1) and Dry heath (HH1).



Plate 3-39 Cutover bog at the location of T25



Plate 3-40 Drain to the north of T25 with emergent bulrush

3.29 Turbine 26

T26 is located in an area of Cutover bog (PB4) dominated by a mosaic of common cottongrass and bare peat with smaller amounts of ling heather and hare's tail cottongrass also present. The ground was very dry and firm. No *Sphagnum* species were recorded and birch saplings were beginning to establish in places.

Table 3-29 Botanical Survey – Turbine 26

Turbine 26	ITM: X665017 Y759163	Date: 27/05/2021
Relevé No. 31		
Species	Common Name	% Cover
Vascular Plants		
<i>Betula pubescens</i>	Birch	1
Herb/Dwarf Shrub		
<i>Calluna vulgaris</i>	Ling heather	5
<i>Eriophorum angustifolium</i>	Common cottongrass	55
<i>Eriophorum vaginatum</i>	Hare's tail cottongrass	10

Non-vascular Plants	
<i>Campylopus introflexus</i>	+
% Bare ground	30
Habitat Classification	Cutover bog (PB4) with establishing Pioneer poor fen (PF1), Dry heath (HH1) and Scrub (WS1) mosaic.



Plate 3-41 Cutover bog at the location of T26

3.29.1 Substation & Construction Compound Carranstown Bog

The proposed substation and construction compound at Carranstown Bog are located in an area of Cutover bog (PB4) characterised by a mosaic of ling heather dominated Dry heath (HH1) and downy birch dominated Scrub (WS1). Sphagnum cover was absent. The ground was firm and dry underfoot.

A badger sett was also recorded at this location.

Table 3-30 Botanical Survey at the location of the substation at Carranstown Bog

Substation - Carranstown Bog	ITM: X663631 Y 755352	Date: 27/05/2021
Relevé No. 32		
Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	50
<i>Betula pubescens</i>	Downy birch	30
<i>Pinus contorta</i>	Lodgepole pine	5
Non-vascular Plants		
<i>Campylopus introflexus</i>		10
<i>Isoetecium myosuroides</i>		10
% Bare ground		5
Habitat Classification	Cutover bog (PB4) with <i>Calluna</i> dominated Dry heath (HH1) and Scrub (WS1)	



Plate 3-42 Cutover bog characterised by Dry heath at the proposed substation at Carranstown

3.29.2 Amenity Carpark Carranstown Bog

The proposed carpark is located in an area of bare peat. No table of vegetative composition is provided here due to the bare peat dominated nature of the habitat within the proposed turbine footprint.

3.29.3 Borrowpit 1a - Carranstown Bog

Borrowpit 1a is located to the south of the proposed substation at Carranstown Bog. It is dominated by an expansive area of bare peat Cutover bog (PB1). No table of vegetative composition is provided here due to the bare peat dominated nature of the habitat within the proposed turbine footprint. The ground was dry and firm underfoot and peat depth was >1m.

3.29.4 Borrowpit 1b - Carranstown Bog

The proposed borrowpit at Carranstown Bog is located on a raised “mound” which rises above the surrounding bog. The woodland is dry in nature, dominated by ash (*Fraxinus excelsior*) and hazel (*Corylus avellana*) with smaller quantities of pedunculate oak (*Quercus robur*).

Table 3-31 Botanical survey at location of Borrowpit 1b

Borrowpit 1b	ITM Co-ordinates: X 664238 Y 755308	Date: 27/09/2022
Relevé No. 33		
Species	Common Name	% Cover
Vascular Plants		
Trees		
<i>Fraxinus excelsior</i>	Ash	40%
<i>Corylus avellana</i>	Hazel	60%
Understorey		
<i>Quercus robur</i>	Young Pedunculate Oak	25%
<i>Fraxinus excelsior</i>	Ash	50%
<i>Corylus avellana</i>	Hazel	25%
Shrub		
<i>Pteridium aquilinum</i>	Bracken	30%
<i>Rubus fruticosus</i>	Bramble	40%
<i>Quercus robur</i>	Oak saplings	15%
<i>Fraxinus excelsior</i>	Ash saplings	15%
Ground flora		
<i>Arum maculatum</i>	Lords and ladies	2%
<i>Dryopteris carthusiana</i>	Narrow buckler fern	3%
<i>Pteridium aquilinum</i>	Young Bracken	3%
<i>Luzula sylvatica</i>	Great Woodrush	8%
<i>Rubus fruticosus</i>	Young Bramble	20%
<i>Hedera hibernica</i>	Ivy	80%

% Bare ground	NA	
Habitat Classification	Oak-ash-hazel (WN2)	Woodland



Plate 3-43 Oak-ash-hazel woodland at Carranstown Bog

3.29.5 Borrowpit 2 – South of Bracklin Bog

Borrowpit 2 is located in species poor Improved agricultural grassland (GA1) to the south of Ballivor Bog. The grassland is dominated by perennial rye grass (*Lolium perenne*) with other species, typical of agricultural grassland also present including white clover (*Trifolium repens*) and dandelion (*Taraxacum officinale* agg.). The field boundaries comprise Hedgerows (WL1), with mature ash (*Fraxinus excelsior*) trees present throughout.

Table 3-32 Botanical Survey at the Location of Borrowpit 2

Borrowpit 2	ITM: X661604 Y756139	Date: 08/07/2021
Relevé No. 34		
Species	Common Name	% Cover
Vascular Plants		
<i>Lolium perenne</i>	Perennial rye grass	80
<i>Holcus lanatus</i>	Yorkshire fog	10
<i>Dactylis glomerata</i>	Cocksfoot	5
<i>Trifolium repens</i>	White clover	5
<i>Taraxacum officinale agg.</i>	Dandelion	2
<i>Ranunculus repens</i>	Creeping buttercup	2
<i>Rumex acetosa</i>	Common sorrel	+
Non-vascular Plants		
% Bare ground		0
Habitat Classification		Improved agricultural grassland (GA1)



Plate 3-44 Agricultural grassland at the location of Borrowpit 2



Plate 3-45 Improved agricultural grassland and hedgerow at the location of Borrowpit 2

3.29.6 Access Road to Borrowpit 2 from the North

The proposed access road to Borrowpit 2 will be floated over an existing drain in an area of uncut Raised bog (PB1). A relevé was taken in the Raised bog habitat. The habitat best conformed to 'Sub-marginal' Raised bog ecotope, i.e. Sphagnum cover exceeded 10%. However, the remnant is very small in size, dry in nature and no pools were present. It is surrounded by agricultural land and bog access road.

Table 3-33 Botanical Survey in Raised bog along the access track to Borrowpit 2

Access Road to Borrowpit 2	ITM: X661523 Y756325	Date: 26/05/2021
Relevé No. 35		
Species	Common Name	% Cover
Vascular Plants		
<i>Narthecium ossifragum</i>	Bog asphodel	50
<i>Eriophorum angustifolium</i>	Common cottongrass	20
<i>Calluna vulgaris</i>	Ling heather	70
<i>Erica tetralix</i>	Cross-leaved heath	8
<i>Eriophorum vaginatum</i>	Hare's tail cottongrass	5
<i>Trichophorum germanicum</i>	Deergrass	5
<i>Andromeda polifolia</i>	Bog rosemary	+
Non-vascular Plants		
<i>Cladonia portentosa</i>		40
<i>Sphagnum capillifolium</i>		15
<i>Sphagnum denticulatum</i>		1
<i>Sphagnum papillosum</i>		10
<i>Pleurozium schreberi</i>		5
<i>Hypnum jutlandicum</i>		1
% Bare ground		10

Habitat Classification	Raised Bog (PB1)
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Plate 3-46 Uncut raised bog along the access track to Borrowpit 2

3.29.7 Construction Compound - Bracklin Bog (East)

The proposed construction compound at Bracklin Bog is located in an area of Cutover bog (PB4) characterised by abundant common cottongrass as well as ling heather. The moss species, *Campylopus introflexus* was also present. The surrounding area was characterised by large areas of bare peat with birch and pine saplings also present. No Sphagnum species were recorded and the ground was dry and firm underfoot.

Table 3-34 Botanical Survey at the location of the Construction Compound at Bracklin Bog

Construction Compound Bracklin	ITM: X663932 Y757350	Date: 27/09/2021
Relevé No. 36		
Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	25
Herb/Dwarf shrub		
<i>Eriophorum angustifolium</i>	Common cottongrass	60
<i>Erica tetralix</i>	Cross-leaved heath	5
Non-vascular Plants		
<i>Campylopus introflexus</i>		20
<i>Cladonia portentosa</i>		5
% Bare ground		5
Habitat Classification	Cutover bog (PB4) with establishing pioneer Poor fen (PF2), Dry Heath (HH1) and Scrub (WS1)	



Plate 3-47 Cutover bog characterised by Dry heath at the Construction Compound at Bracklin Bog



Plate 3-48 Cutover bog at the Construction Compound at Bracklin Bog

3.30 Access track between Lisclogher East and Bracklin Bogs

The proposed access track between Lisclogher East and Bracklin Bogs traverses an area of heavily drained but uncut raised bog dominated by a mix of ling heather and bell heather. Numerous parallel drainage ditches were present throughout the bog and an existing railway track lies to the west. Bog asphodel (*Narthecium ossifragum*) and deergrass (*Trichophorum germanicum*) were also present as well as beds of white-beak sedge (*Rhynchospora alba*), however, the ground was relatively dry and firm underfoot. Sphagnum cover in the relevé was low at approximately 3% cover. The habitat best conformed to Raised bog 'Marginal' ecotope, i.e. Sphagnum cover <10% and ling heather cover <50%.

Table 3-35 Botanical survey along the access track between Lisclogher Bog and Bracklin Bog

Species	Common Name	% Cover
Vascular Plants		
<i>Eriophorum angustifolium</i>	Common cottongrass	5
<i>Calluna vulgaris</i>	Ling heather	35
<i>Erica tetralix</i>	Cross-leaved heath	25
<i>Trichophorum germanicum</i>	Deergrass	15
<i>Narthecium ossifragum</i>	Bog asphodel	5
<i>Rhynchospora alba</i>	White beak sedge	15
Non-vascular Plants		
<i>Campylopus introflexus</i>		50
<i>Cladonia portentosa</i>		5
<i>Sphagnum denticulatum</i>		3
<i>Hypnum jutlandicum</i>		4
% Bare ground		
% Bare ground		5
Water (Drain)		
Water (Drain)		
Habitat Classification		Raised bog (PB1)



Plate 3-49 Uncut raised bog along access track between Lislogher East and Bracklin Bogs

3.31 Amenity Tracks

The proposed Amenity track south of Bracklin Bog and at Lislogher Bog, either overlap the Proposed Development infrastructure or follow existing roads/tracks classified as Spoil and bare ground (ED2) or areas of Cutover bog (PB4) dominated by bare peat.

3.31.1 Ballivor Bog amenity track (north)

The proposed amenity track on the south-middle bog is predominantly proposed along the existing railway track (Plate 3-50) the verges of which consists of **Dry calcareous and neutral grassland (GS1)** (Plate 3-51). Species found along the railway include Yorkshire fog (*Holcus lanatus*), cock's-foot (*Dactylis glomerata*), purple-moor grass (*Molinia caerulea*), sweet vernal grass (*Anthoxanthum odoratum*), knapweed (*Centaurea nigra*), cat's ear (*Hypochaeris radicata*), self-heal (*Prunella vulgaris*), ribwort plantain (*Plantago lanceolata*), star sedge (*Carex echinata*), bracken (*Pteridium aquilinum*), colt's foot (*Tussilago farfara*), tormentil (*Potentilla erecta*), mouse-ear chickweed (*Cerastium fontanum*), yarrow (*Achillea millefolium*), ox-eye daisy (*Leucanthemum vulgare*), birds-foot trefoil (*Lotus corniculatus*), common hogweed (*Heracleum sphondylium*), red clover (*Trifolium pratense*). On occasion were bog asphodel (*Narthecium ossifragum*), and four species of orchid which included marsh helleborine (*Epilates palustris*), lesser butterfly orchid (*Platanthera bifolia*), fragrant orchid (*Gymnadenia conopsea*) and common spotted orchid (*Dactylorhiza fuchsii*), as well as it's white sub-species (*Dactylorhiza fuchsii* subsp. *okellyi*).

The track becomes overgrown with **scrub (WS1)** to the south consisting of birch (*Betula spp.*), hawthorn (*Crataegus monogyna*), scot's-pine (*Pinus sylvestris*), bracken (*Pteridium aquilinum*), willows (*Salix sp.*), and ling heather (*Calluna vulgaris*). **Dense bracken (HD1)** (Plate 3-52) and recolonising cutover bog (**PB4**) is found in this area consisting of purple-moor grass, sweet vernal grass, cat's ear, devil's-bit scabious (*Succisa pratensis*), knapweed, ox-eye daisy, self-heal, tormentil, willow herb (*Epilobium sp.*), soft rush (*Juncus effusus*) and sedges (*Carex spp.*).

The track then crosses recolonising bare peat classified as **cutover big (PB4)** (Plate 3-53) which consists of ling heather (*Calluna vulgaris*), soft rush (*Juncus effusus*), Yorkshire fog (*Holcus lanatus*), willow herb (*Epilobium sp.*), thistle (*Cirsium sp.*), heath- star moss (*Campylopus introflexus*) and liverworts. This section of track ends within dry **bog woodland (WN7)** dominated by downy birch (*Betula pubescens*) (Plate 3-54).

3.31.2 Ballivor bog amenity track (south)

This proposed amenity track to the south of the bog follows an existing woodland grassy track categorised as **dry meadows and grassy verges (GS2)** (Plate 3-55) which passes through **bog woodland (WN7)**, dominated by downy birch (*Betula pubescens*) with ivy (*Hedera helix*), willow (*Salix sp.*) and bracken (*Pteridium aquilinum*) (Plate 3-56). Species along the track include nettles (*Urtica dioica*), bramble (*Rubus fruticosus*) soft rush (*Juncus effusus*), ling heather (*Calluna vulgaris*), purple-moor grass (*Molinia caerulea*), cross-leaved heath (*Erica tetralix*), and bracken (*Pteridium aquilinum*). This track eventually turns to recolonising **cutover bog (PB4)** (Plate 3-57) and crosses over bare peat and drains as it travels northwards (Plate 3-58).



Plate 3-50 The amenity track within the south-middle bog follows an existing railway track.



Plate 3-51 Orchid-rich grassland (GSI) along the track.



Plate 3-52 Dense bracken and scrub towards the southern end of the track.



Plate 3-53 Recolonising bare peat.



Plate 3-54 This track ends in dry birch woodland (WN7).



Plate 3-55 The southern-most amenity track which is located along a grassy track through bog woodland.



Plate 3-56 Birch-dominated bog woodland (WN7), dry underfoot with dense bracken.



Plate 3-57 The track exits the woodland onto recolonising peat dominated by ling heather.



Plate 3-58 The track ends northwards on bare cutover peat.

3.32 Uncut Raised Bog Relevés from outside the Construction Footprint

A number of relevés were taken from uncut Raised Bog remnants that are located entirely outside of the construction footprint but within the boundaries of the Proposed Development Site. These areas comprised the largest areas of remnant, undrained and uncut raised bog within the boundaries of the Proposed Development Site.

3.32.1 North-East of Ballivor Bog between Ballivor & Carranstown Bogs

Table 3-36 Botanical Survey of Raised bog remnant at the northern extent of Ballivor Bog

Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	65%
<i>Narthecium ossifragum</i>	Bog Asphodel	5%
<i>Erica tetralix</i>	Cross-Leaved Heath	4%
<i>Eriophorum angustifolium</i>	Bog Cotton	1%
<i>Juncus (effusus)</i>	Rush (soft)	2%
<i>Trichophorum germanicum</i>	Deergrass	15%
<i>Luzula sylvatica</i>	Great Woodrush	3%
Non-vascular Plants		
<i>Sphagnum capillifolium</i>		25%
<i>Cladonia portentosa</i>		2%
% Bare ground		
		NA
Habitat Classification		Raised Bog (PB1)



Plate 3-59 Uncut Raised Bog Ballivor Bog

3.32.2 Ballivor Bog north of Famine House

This area of remnant Raised bog (PB1) is located to the south of the Famine House in Bracklin Bog. It lies outside the construction footprint, between two existing machine passes. Sphagnum cover was relatively low and the bog was dry and firm underfoot, however with localised wetter areas where white-beak sedge was present. A relevé was undertaken in the habitat. The habitat best conform to raised bog 'Facebank' and 'Marginal' ecotopes (Fernandez et al. 2014) as Sphagnum cover was <10%. Ling heather growth varied between tall and robust with >50% cover to less robust with just under 50% cover.

Table 3-37 Botanical Survey of Raised Bog habitat outside the Construction Footprint of the Proposed Development

RB2	ITM: X663779 Y 756417	Date: 27/09/2021
Relevé No. 39		
Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	55
<i>Erica tetralix</i>	Cross-leaved heath	7
<i>Eriophorum angustifolium</i>	Common cottongrass	5
<i>Trichophorum germanicum</i>	Deergrass	5
<i>Rhynchospora alba</i>	White beak sedge	40
Non-vascular Plants		
<i>Cladonia portentosa</i>		5
<i>Sphagnum capillifolium</i>		2
<i>Sphagnum papillosum</i>		7
<i>Campylopus introflexus</i>		5
% Bare ground		
		0
Habitat Classification		Raised Bog (PB1)



Plate 3-60 Uncut raised bog at Bracklin Bog to the north of the Famine House



Plate 3-61 Uncut raised bog at Bracklin Bog, north of the Famine House

3.32.3 Bracklin Bog West of T13

This area of remnant Raised bog (PB1) is located to the east of T13 in Bracklin Bog. It lies outside the construction footprint, adjacent to an existing machine passes. The bog was very dry (previously burnt), dominated by ling heath and Sphagnum cover was absent. A relevé was undertaken in the habitat. The habitat best conformed to Raised bog 'Facebank' ecotope, i.e. tall, robust ling heather with >50% cover and no Sphagnum cover.

Table 3-38 Botanical Survey of Raised Bog habitat outside the Construction Footprint of the Proposed Development

RB3	ITM: X663655 Y756891	Date: 27/09/2021
Relevé No. 40		
Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	99
Non-vascular Plants		
<i>Cladonia portentosa</i>		5
<i>Campylopus introflexus</i>		5
% Bare ground		3
Habitat Classification		Raised Bog (PB1)



Plate 3-62 Uncut raised bog at Bracklin Bog

3.32.4 **Raised Bog Remnant at Southern Extent of Lisclogher East**

An area of uncut remnant raised bog at the southern section of Lisclogher East, dominated by ling heather but with other typical raised bog species present including cross-leaved heath and bog asphodel (*Narthecium ossifragum*). Large areas to the south were cutover and the northern section of the bog is heavily drained with numerous parallel drainage ditches. The ground was dry and firm underfoot, with wetter patches in places. The habitat best conformed to sub-marginal Raised bog ecotope (Fernandez et al. 2014) as *Sphagnum* cover exceeded 10% but was <30% in cover and pools were absent. It is located entirely outside the construction footprint.

Table 3-39 Botanical survey of raised bog at Lisclogher East

RB4	ITM Co-ordinates: X 665647 Y 758051	Date: 26/09/2022
Relevé No. 41		
Species	Common Name	% Cover
Vascular Plants		
<i>Calluna vulgaris</i>	Ling heather	65%
<i>Narthecium ossifragum</i>	Bog Asphodel	20%
<i>Erica tetralix</i>	Cross-Leaved Heath	40%
<i>Juncus (effusus)</i>	Rush (soft)	2%
<i>Trichophorum germanicum</i>	Deergrass	10%
<i>Luzula sylvatica</i>	Great Woodrush	20%
Non-vascular Plants		
<i>Sphagnum capillifolium</i>		25%
<i>Cladonia portentosa</i>		2%
% Bare ground		NA
Habitat Classification		Raised Bog (PB1)



Plate 3-63 Raised bog at south of Lisclogher East

3.32.5 Raised Bog Remnant – Southern Extent of Bracklin Bog

An area of raised bog dominated by ling heather and *Cladonia* sp. A good representation of Sphagnum species was present. The habitat best conformed to sub-marginal Raised bog ecotope (Fernandez et al. 2014) as Sphagnum cover exceeded 10% but was <30% in cover and pools were absent. It is located entirely outside the construction footprint.

Table 3-40 Botanical survey of raised bog at the southern extent of Bracklin Bog

RB5	ITM Co-ordinates: X 663151 Y 756687	Date: 26/09/2022
Relevé No. 42		
Species	Common Name	% Cover
Vascular Plants		
<i>Betula pubescens</i>	Downy Birch	2
<i>Calluna vulgaris</i>	Ling heather	40
<i>Erica tetralix</i>	Cross-leaved Heath	10
<i>Eriophorum vaginatum</i>	Hare's tail cottongrass	10
<i>Rhynchospora alba</i>	White-beaked sedge	5
<i>Narthecium ossifragum</i>	Bog Asphodel	10
<i>Trichophorum spp.</i>	Deergrass	15
<i>Andromeda polifolia</i>	Bog Rosemary	1
Non-vascular Plants		
<i>Cladonia portentosa</i>		40
<i>Sphagnum austinii</i>		5
<i>Sphagnum rubellum</i>		5
<i>Sphagnum papillosum</i>		5
% Bare ground		
% Bare ground		3
Habitat Classification		Raised Bog (PB1)



Plate 3-64 Example of uncut raised bog at southern extent of Bracklin Bog

4. EVALUATION OF HABITATS WITHIN THE CONSTRUCTION FOOTPRINT

Following the results of the detailed botanical study's undertaken across the site as outlined in the preceding sections, the below subsections provide an assessment as to whether the habitats recorded on site, in the footprint of the Proposed Development, correspond to those listed in Annex I of the EU Habitats Directive.

4.1 Bog Woodland Habitat *91D0

4.1.1 Annex I Habitat Description

The Irish Wildlife Manual '*Results of a monitoring survey of bog woodland*' (Cross and Lynn (2013)) references the description of this habitat in the Interpretation '*Manual of European Union Habitats*' and defines Annex I bog woodland (91D0) as a very distinctive and characteristic habitat dominated by downy Birch (*Betula pubescens*) and *Sphagnum* spp. Three distinct sub types can be recognised including sub types on raised bogs and on cutover bog. Typical dwarf shrub species include ling heather (*Calluna vulgaris*), and typical herbs include purple moor-grass (*Molinia caerulea*), soft rush (*Juncus effusus*) and broad buckler-fern (*Dryopteris dilatata*). In contrast, the moss layer is well developed and is dominated by *Sphagnum* species, often also with an abundance of *Polytrichum commune*. On raised bogs it is associated with weakly flushed sites. On cutover sites it is also associated with sites with a weak ground-water influence and characterised by presence of fen carr species such as ash (*Fraxinus excelsior*) and marsh horsetail (*Equisetum palustris*). Cross and Lynn (2013) suggest that it is possible that these

woodlands are transient communities which arise at a certain stage in the recolonisation of cutover bog and that will be gradually replaced by open bog vegetation.

The Irish Wildlife Manual defines the Annex I bog woodland habitat as:

Woodland dominated by birch in the canopy with a Sphagnum cover of >25% is classified as bog woodland. This includes some areas that are transitional to carr but species indicative of groundwater influence should be only minor constituents.

4.1.2 Description of woodland habitats recorded at Ballivor

The extensive surveys undertaken at the site (both in the Bord na Mona habitat mapping and in the surveys undertaken by MKO to inform the EIAR for the proposed project) have identified the woodland as being typically dominated by birch (*Betula pubescens*) with willows (*Salix* spp.). The ground flora was commonly dominated by brambles (*Rubus fruticosus* agg.) with bracken (*Pteridium aquilinum*) and other fern species. Full descriptions of the woodland habitat are provided in Section 6 of the EIAR. In areas where the woodlands and scrub had established or begun to colonise the cutover bog, the ground flora occasionally comprised ling heather and purple moor grass (*Molinia caerulea*). However *Sphagnum* mosses were not recorded within any of the woodland relevés undertaken, with the species only recorded in association with uncut or wet cutover raised bog habitats.

A representative sample of these woodlands (which were relatively homogenous across the site with no Annex I bog woodland recorded) were subject to detailed botanical assessment. Woodland relevés were 10m x 10m (Smith and Crowley, 2020). The results of these surveys are provided in Section 3 above and demonstrate that none of the woodland on the site conforms to Annex I Bog Woodland *91D0, as none has developed on *Sphagnum* rich substrates. These surveys found that bog woodland on site is dry, the ground flora is dominated by brambles (*Rubus fruticosus* agg.), ivy (*Hedera Hibernica*) and bracken (*Pteridium aquilinum*), with some areas having significant areas of bare peat and leaf litter on the ground. *Sphagnum* within the woodland was entirely absent. In summary, while Birch stands on site can be classified as Bog Woodland – WN7 according to the Fossitt (2000) ‘*A Guide to Habitats in Ireland*’ classification, they do not conform to the Annex I habitat classification as defined by the EU Habitat Manual (European Commission 2013) or Cross and Lynn (2013).

4.2 European Dry Heaths 4030

4.2.1 Annex I Habitat Description

The Irish Wildlife Manual ‘*Guidelines for a National Survey and Conservation Assessment of Upland Habitats in Ireland*’ defines the Annex I habitat European Dry Heaths (4030) as follows:

Dry heaths comprise vegetation dominated by ericaceous dwarf shrubs and usually occur on well-drained mineral soils or shallow peats on sloping ground (typically less than 50 cm deep). Ling heather (*Calluna vulgaris*) typically the main species but bell heather (*Erica cinerea*), gorse (*Ulex gallii*) and bilberry (*Vaccinium myrtillus*) may also be important components. Dwarf shrub cover should be over 25%.

This definition is referenced and repeated in the NPWS Article 17 Reporting ‘*The Status of EU Protected Habitats and Species in Ireland, 2019*’ (NPWS, 2019).

The Irish Wildlife Manual provides a description of all the variations of this habitat and the situations where it may occur. There is no reference within the manual to Annex I Dry Heath habitat occurring as a secondary habitat on cutover raised bog habitats.

4.2.2 Description of Dry Heath type habitats recorded at Ballivor

The secondary dry heath communities which have developed on areas of cutover bog were mostly dominated by ling heather (*Calluna vulgaris*) with common cottongrass (*Eriophorum angustifolium*) and occasional purple moor grass (*Molinia caerulea*).

The ground was generally dry with little or no *Sphagnum* present. This habitat varied from sparse to very dense cover with varying amounts of bare peat. It commonly formed intimate mosaics with wetter poor fen communities and scrub throughout the site. It is likely that the dry heath type dominated areas would, if left undisturbed, colonize to form dry bog woodland (WN7), which is present at various locations throughout the site.

The wetter communities supported higher abundance of *Sphagnum*, purple moor grasses (*Molinia caerulea*) and bog cottons (*Eriophorum angustifolium*) with some cross-leaved heath (*Erica tetralix*). This habitat type covers a broad range of conditions from bare peat, dry but vegetated, to wetter areas that grade into poor fen. Detailed botanical surveys were undertaken in accordance with the methodology set out in 'The Habitats of Cutover Raised Bog' (Smith and Crowley 2020) at representative locations within the construction footprint. Details of these relevés are provided in Section 3 of this report.

The dry heath type communities are located on cutover raised bog habitat. These are Non-Annex I cutover bog habitats that have a species assemblage that is analogous to highly degraded Dry Heath in that they are dominated by heather species with few other components. In addition, the majority of the areas were transitional either to woodland, scrub or poor fen habitats.

The secondary Dry Heath type Communities on the site do not conform to the Annex I Dry Heath Habitat as defined by the Irish Wildlife Manual as they are a secondary, cutover raised bog habitat that is located on relatively level peat.

4.3 Depressions on peat substrates of the *Rhynchosporion* (7150)

4.3.1 Annex I Habitat Description

The definition of the Annex I habitat, *Rhynchosporion* depressions by NPWS (NPWS, 2019) describes it as a micro-habitat of Active raised bog (7110) and Blanket bog (7130).

The habitat is considered an Annex I type where it occurs in their most developed form in the wettest sections of the Active raised bog (7110), which correspond with pools, *Sphagnum* lawns and hollows. Only when the *Rhynchospora* species are associated with plant communities of the most sensitive and less disturbed parts of blanket bog and associated wetland habitats are they considered to correspond with the EU Annex I habitat type. Characteristic species of this habitat where it occurs on the margins of pools and hollows include white beak-sedge (*Rhynchospora alba*), brown beak sedge (*R. fusca*) sundews (*Drosera* spp.), bogbean (*Menyanthes trifoliata*), common cottongrass (*Eriophorum angustifolium*) and *Sphagnum* mosses. *Rhynchospora* vegetation communities can be found extensively in other more man-modified situations such as degraded raised bog (e.g. tracks and cutover areas). This vegetation is not considered to correspond with the EU habitat in the Irish context as it lacks the characteristic assemblages required (NPWS, 2019).

4.3.2 Description of Depressions on peat substrates of the *Rhynchosporion* at Ballivor

Small beds of white-beak sedge species were recorded within areas of highly degraded Raised bog (PB1) remnants throughout the site. However, these areas generally had low Sphagnum cover (<30% and in most cases < 10%), were relatively dry, i.e. no pools of or standing water, and did not occur in association with Sphagnum lawns. The detailed botanical surveys were undertaken in accordance with the methodology set out in the 'Raised Bog Monitoring and Assessment Survey 2013' (Fernandez *et.al.* 2014) at representative areas of Raised bog (PB1) throughout the site, both within and outside the construction footprint. No *Rhynchospora* species were recorded in any other habitat within the site, including wetter areas of Poor fen (PB2).

No habitat that had a species composition that corresponded to the description of Annex I *Depressions of the Rhynchosporion* was recorded within the development footprint or in the surrounding cutover bog.

4.4 Annex I Raised Bog Habitats

Information is contained here regarding Annex I Raised Bog Habitats. 'The Status of EU Protected Habitats in Ireland' (Article 17 report (NPWS, 2019) provides definitions for both Active Raised Bog (7110) and Degraded Raised Bog still capable of Natural Regeneration (7120).

Active Raised Bog (7110)

According to the above Article 17 report Active Raised Bog (ARB) 'is characterised by the presence of an acrotelm, which is defined as the living, actively growing upper layer of a raised bog, the surface of which is composed mainly of living bog mosses (*Sphagnum* species)'.

In addition, as outlined in Smith and Crowley (2020), previous raised bog research in Ireland indicated that ARB, at least in the midlands, generally supports cover of Sphagnum greater than 40% (Fernandez Valverde *et al.* 2005, 2012). The raised bog remnants sampled at Ballivor Bog Group, particularly those within the construction footprint, lacked a diverse or abundant Sphagnum component. Sphagnum cover was generally <20% and in most cases <10% on any of the raised bog remnants sampled. Typical Raised bog microtopography, including hummocks, bog pools and Sphagnum lawns were absent from these habitats. Whilst slightly wetter areas did occur in localised patches, supporting *Rhynchospora* species, these were still not characterised by standing water and were not associated with lawns of Sphagnum.

While the Article 17 report acknowledges that surveys in recent years have indicated the occurrence of peat-forming vegetation on cutover areas at some sites, it states that while these areas occasionally correspond to regenerating ombrotrophic vegetation characterised by Sphagnum cover greater than 40-50%, they generally lack the diversity and abundance of Sphagnum species, microtopographical features and good quality indicators associated with ARB.

Degraded Raised Bog still capable of Natural Regeneration (7120)

According to the Article 17 report, Degraded Raised Bog (DRB) is characterised by the complete absence, or at best the presence of only a patchy thin cover of an 'acrotelm' layer. According to the report, while previously all the vegetated areas of high bog which were not delineated as Active Raised Bog (ARB) were classified as DRB, on the assumption that most of it could be restored to active peat-forming condition after implementation of comprehensive restoration works, the results of recent research show that only those areas with the right combination of physical conditions (including surface shape, slope and drainage patterns) ultimately capable of supporting ARB are now considered DRB. To qualify as DRB, these areas must still be capable of natural regeneration to active bog within 30 years if their

hydrology is repaired (usually after restoration works, particularly blocking of drains). The remainder of the high bog that is neither ARB nor DRB is now referred to as 'Supporting Raised bog habitat'.

The conditions outlined in the Article 17 report as being suitable for supporting DRB include:

'a) sites over 30ha of high bog with typical bog vegetation which were part of a larger bog and contain drains which could be blocked and b) smaller sites (< 30 ha) which are part of small basins with drains present which could be blocked....The occurrence of DRB is ruled out from those sites where the high bog area is below 30ha, which were once part of a much larger site and are now surrounded by facebanks and without drains to be blocked.'

4.4.1 Description of Raised Bog Habitats at Ballivor

The proposed development has been specifically designed to avoid areas of uncut raised bog wherever possible. However, it will result in the loss of approximately 1.03ha of highly degraded but uncut raised bog in the construction footprint. The 1.03ha of uncut raised bog within the Proposed Development footprint is made up of small marginal sections of the habitat, located within six separate fragments of highly degraded bog.

The raised bog remnants within the construction footprint, lacked a diverse or abundant *Sphagnum* component. *Sphagnum* cover was generally <10% or absent within these areas, with the exception of the raised bog remnant along the proposed temporary access track to the Borrowpit 2 to the south of Bracklin Bog where *Sphagnum* cover was 26%. Typical Raised bog microtopography, including hummocks, bog pools and *Sphagnum* lawns were absent from these habitats. The areas of remnant raised bog within the construction footprint, given their highly degraded and fragmented nature, and absence of typical raised bog micro-topography, do not conform to the Annex I habitat Active Raised Bog [7110].

The raised bog fragments within the construction footprint are in general of a very small size (well below 30ha), are highly degraded and are drained on all sides. One section of remnant raised bog located at the northern extent of Lislogher Bog, while it is of a larger size, is also highly degraded and heavily drained through the insertion of parallel drainage ditches. The section of this area of remnant raised bog within the construction footprint was dry, dominated almost exclusively by ling heather and cottongrass, and was characterised by an absence of *Sphagnum* cover and the presence of areas of bare disturbed ground. Only a small marginal section of this area will be lost to facilitate the development.

The majority of raised bog remnants within the construction footprint best conform to Marginal and Facebank ecotopes as per Fernandez et al. (2014), i.e. *Sphagnum* cover is <10% (or often absent), and/or are very small in size and dry in nature, surrounded by agricultural land/cutover habitats and with low restoration potential. While other larger areas of undrained raised bog within the Application Site boundary were found to best fit the description of Sub-marginal ecotype, i.e. *Sphagnum* cover >10% but less than 30% and pool cover <15% (Fernandez et al. 2014), these have been avoided by the construction footprint.

While the Proposed Development will result in the loss of 1.03ha of highly degraded raised bog, it is proposed to enhance approx. 12ha of raised bog habitat within the Proposed Development Site by blocking drains (refer to Habitat Management and Enhancement Plan in Appendix 6-5 of the EIAR).

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APPENDIX 1

**Bord na Móna Habitat
Classification Scheme**

Appendix II

An Overview of the Bord na Móna Habitat Classification

General Pioneer Community	Pioneer Community	BnM Habitat Code	Nearest Phytosociological Syntaxa	Fossitt 2000 Classification	
	Bare peat (0-50% cover)	BP		Spoil and bare ground	ED2
Embryonic bog	Pioneer <i>Eriophorum angustifolium</i> community (acidic) *	PBa	Oxycocco-Sphagnetea	Bog	PB
	<i>Sphagnum cuspidatum</i> - <i>Eriophorum angustifolium</i> community*	PBb	Oxycocco-Sphagnetea	Bog	PB
	Embryonic bog community (somewhat more diverse and developed) *	PBc	Calluno-Sphagnion	Bog	PB
Poor fen	Pioneer <i>Campylopus</i> dominated community	pCamp	Caricion curto-nigrae	Poor fen	PF2
	Pioneer <i>Juncus effusus</i> community	pJeff	Caricion curto-nigrae	Poor fen	PF2
	Pioneer <i>Eriophorum angustifolium</i> community (poor fen)	pEang	Caricion curto-nigrae	Poor fen	PF2
	Pioneer <i>Juncus bulbosus</i> community	pJbulb	Caricion curto-nigrae	Poor fen	PF2
	Pioneer <i>Triglochin palustris</i> community	pTrig	Caricion curto-nigrae	Poor fen	PF2
	Pioneer <i>Juncus</i> with <i>Sphagnum</i> *	pJunc	Sphagneto-Juncetum	Poor fen	PF2
Rich fen	Pioneer rich fen community with <i>Schoenus nigricans</i> (rudimentary rich fen)	Pschon	Caricetalia davallianae	Rich fen	PF1
	Pioneer <i>Carex viridula</i> /brown moss community (rich fen)	pVir	Caricetalia davallianae	Rich fen	PF1
	Pioneer <i>Cladium</i> community	pCladium	Caricion davallianae	Rich fen	PF1
Emergent wetland communities	<i>Carex rostrata</i> community (poor fen)	pRos	Cariculion rostratae	Poor fen	PF1
	<i>Carex paniculata</i> community	pPan	Caricetum paniculatae	Reed and large sedge swamps	FS1
	<i>Phragmites australis</i> community*	pPhrag	Scirpo-Phragmitetum	Reed and large sedge swamps	FS1
	<i>Typha</i> community*	pTyp	Typhetum latifoliae	Reed and large sedge swamps	FS1
	<i>Schoenoplectus</i> community	pSch	Scirpo-Phragmitetum	Reed and large sedge swamps	FS1
Open water/aquatic	Permanent pools and lakes	OW	Isoeto-Litorelletea	Dystrophic lakes	FL1
	Permanent pools and lakes	OW	Isoeto-Litorelletea	Acid-oligotrophic lakes	FL2
	Charaphytes	pChar	Charetea	Limestone/Marl lakes	FL3
	Temporary open water	tOW			
Woodland and scrub	Emergent <i>Betula</i> -dominated community (A)	eBir	Salici-Betuletum pubescentis	Scrub	WS1
	Open <i>Betula</i> -dominated community (B)	oBir	Salici-Betuletum pubescentis	Scrub	WS1
	Closed <i>Betula</i> scrub community (C)	cBir	Salici-Betuletum pubescentis	Scrub	WS1
	<i>Ulex</i> -dominated community	eGor		Scrub	WS1
	<i>Betula</i> - <i>Salix</i> woodland	BirWD	Salici-Betuletum pubescentis	Bog woodland	WN7

General Pioneer Community	Pioneer Community	BnM Habitat Code	Nearest Phytosociological Syntaxa	Fossitt 2000 Classification	
Heathland	Dry <i>Calluna</i> community	dHeath	Calluno-Ulicetalia	Dry heath	HH1
	Wet Heath community	wHeath	Nartheccio-Ericetum	Wet Heath	HH3
	Dense <i>Pteridium</i>	dPter	Rhamno-Prunetea	Dense Bracken	HD1
Grassland	Dry calcareous grassland	gCal	Centaureo-Cynosuretum	Dry calcareous and neutral grassland	GS1
	<i>Antoxanthum-Holcus-Equisetum</i> community	gAn-H-Eq	No close affinities to Irish syntaxa	Dry calcareous and neutral grassland	GS
	<i>Dactylis-Arrhenatherum</i> community	gDact-Arr	Arrhenatheritum elatioris	Dry meadows and grassy verges	GS2
	<i>Molinia caerulea</i> -dominated community	gMol	Junco conglomerati-Molinion	Wet grassland	GS4
	Marsh - <i>Filipendula</i> and other tall herbs	Mar	Filipendulion ulmariae	Marsh	GM1
Disturbed	<i>Tussilago</i> -dominated community (vegetation > 50%)	DisCF	Tussilaginetum	Recolonising bare ground	ED3
	<i>Epilobium</i> -dominated community (vegetation > 50%)	DisWil	Tussilaginetum	Recolonising bare ground	ED3
General	Riparian areas (streams or drains with associated edge habitats)	Rip			FW2/4
	Access (tracks or railways with associated edge habitats)	Acc			BL3

*indicates potentially peat forming habitat

Appendix III

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