Planning and Environmental Consultants

Appendix 6-4 – Botanical study

Botanical Survey, Derrinlough Wind Farm

DOCUMENT DETAILS

Client:	**Derrinlough Wind Farm**
Project Title:	**Botanical Survey, Derrinlough Wind Farm**
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Planning and Environmental Consultants

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1. INTRODUCTION

1.1 Introduction

MKO were commissioned to undertake detailed botanical surveys to verify and ground truth the habitat mapping that had been undertaken by Bord na Móna in their evaluation and assessments of the cutaway peatlands at Derrinlough Bog. The detailed assessments focussed on the development footprint including the turbine bases, the proposed substation, new access route, grid connection and associated infrastructure. The detailed botanical surveys were undertaken on the 21st and 22nd of August and 18th - 19th of September 2019. Additional surveys of some areas of cutover bog were also undertaken on the 05 December 2019.

2. SURVEY METHODS

Representative samples of the habitats identified by Bord na Mona were 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. A minimum of three relevés were recorded of the most commonly occurring habitats within the site which were spatially and botanically representative of the habitat type. A smaller number of relevés were recorded for habitats which occurred less regularly and were relatively homogenous such as bare peat habitat.

A total of 29 relevés were undertaken within the proposed development footprint and are shown on Figure 1.1. Those relevés that were undertaken in woodland followed methods that were set out in the following document:

- *Cross, J. & Lynn, D. (2013) Results of a monitoring survey of bog woodland. Irish Wildlife Manuals, No. 69. National Parks and Wildlife Service*

Those relevés that were undertaken in non-wooded peatland habitats followed guidelines set out in the following document:

- *Perrin, P.M, Martin, J.R., Barron, J.R., Roche & O' Hanrahan, B. (2014) Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland. Version 2.0. Irish Wildlife Manuals, No. 79. National Parks and Wildlife Service.*

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).

2.1 Statement of Authority

Field surveys were undertaken by David McNicholas (B.Sc., M.Sc., MCIEEM) of MKO on 21st and 22nd of August and 18th - 19th of September 2019. Additional surveys of some areas of cutover bog were also undertaken on the 05 December 2019. David is an experienced ecologist with over eight years professional experience. In addition to the below botanical data, the lands within the wider study area were also surveyed in detail while ground truthing the Bord Na Mona habitat map in 2018 and 2019. These surveys also informed the ecological constraints identification process.

3. RESULTS

3.1 Turbine 1

Predominantly located on bare peat, with some marsh arrowgrass *(Triglochin palustris)* and soft rush *(Juncus effusus)*.

Table 3-1 Botanical Survey – Turbine 1

Turbine 1	Grid reference: N07075 15332	Date: 18/09/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Scrub		
Betula pendula	Birch	+
Salix spp	Willow	+
Herb/Dwarf Shrub		
Eriophorum angustifolium	Common cottongrass	40
Triglochin palustris	Marsh arrowgrass	40
Typha latifolia	Bulrush	5-7
Tussilago farfara	Coltsfoot	2
Non-vascular Plants		
% Bare ground		10
Habitat Classification		Poor Fen [PF2] and cutover bog (PB4) mosaic

+ indicates presence, below 1% cover

Plate 3-1 Example of recolonising bare peat within the study area around T1

3.2 Turbine 2

Area dominated by bare peat, with some recolonising bare ground and poor fen occurring in the wider area.

Table 3-2 Botanical Survey - Turbine 2

Turbine 2	Grid reference: N07257 14732	Date: 18/09/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Scrub		
Betula pendula	Birch saplings	2-5
Herb/Dwarf Shrub		
Triglochin palustris	Marsh arrowgrass	20
Eriophorum angustifolium	Common cottongrass	30
Fragaria vesca	Wild strawberry	+
Cerastium fontanum	Mouse ear	+
Leontodon hispidus	Rough hawkbit	+
Non-vascular Plants		None
% Bare ground		45
Habitat Classification		Cutover bog (PB4)

Plate 3-2 Example of bare peat and recolonising bare ground habitats within T2 footprint

3.3 Proposed internal road south of Turbine 2

Area comprising of a mosaic of pioneering heath type vegetation, birch scrub and bog woodland.

Table 3-3 Botanical Survey – Proposed internal road south of Turbine 2

Proposed internal road south of Turbine 2	Grid reference: N07269 14020	Date: 18/09/2019
Species	Common Name	% Cover
Vascular Plants		
Betula pendula	Birch	5
Salix sp.	Willow	5
Scrub		
Betula pendula	Birch saplings	3
Herb/Dwarf Shrub		
Calluna vulgaris	Ling heather	30
Hedera helix	Ivy	5
Non-vascular Plants		
Cladonia sp.	*Cladonia* lichen	5
Cladonia floerkeana	Matchstick lichen	1
% Bare ground		55
Habitat Classification		Cutover bog (PB4) with revegetating heath type vegetation and scrub WS1.

Plate 3-3 Example of pioneering heath type vegetation within the access track south of Turbine 2

3.4 Turbine 3

Area dominated by bare peat, with some poor fen in the wider area surrounding drainage ditches.

Table 3-4 Botanical Survey – Turbine 3

Turbine 3	Grid reference: N06726 13310	Date: 18/09/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Herb/Dwarf Shrub		
Juncus bufonius	Toad rush	5
Triglochin palustris	Marsh arrowgrass	2-3
Equisetum sp.	Horsetail	+
Non-vascular Plants		
Cladonia		5
% Bare ground		90
Habitat Classification		Cutover bog (PB4) dominated by bare peat

Plate 3-4 Representative photo of habitat within T3 study area

3.5 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. Some of the surrounding drainage ditches contain some pioneering marsh arrowgrass (*Triglochin palustris*).

Plate 3-5 - Representative image of Cutover bog (PB4) dominated by bare peat within proposed infrastructure footprint.

3.6 Turbine 5

IG Reference: IN 07154 12314

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. Some of the surrounding drainage ditches contain small amounts of pioneering marsh arrowgrass (*Triglochin palustris*) and individual soft rush (*Juncus effusus*).

Plate 3-6 Representative photo of Cutover bog (PB4) dominated by bare peat habitat southeast of T5

3.7 Turbine 6

Area of Cutover bog (PB4) with pioneering Poor fen (PF2) and Scrub (WS1). Drainage ditches in the surrounding area comprise of bulrush *(Typha latifolia)*, cottongrass (*Eriophorum angustifolium)* and soft rush (*Juncus effusus)*.

Table 3-5 Botanical Survey - Turbine 6

Turbine 6	Grid reference: N06495 14829	Date: 18/09/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Scrub		
Salix sp.	Willow	5
Herb/Dwarf shrub		
Triglochin palustris	Marsh arrowgrass	30
Eriophorum angustifolium	Common cottongrass	5
Leontodon hispidus	Rough hawkbit	3
Juncus effusus	Soft rush	2
Rubus fruticosus	Bramble	+
Juncus bulbosus	Bulbous rush	+
Non-vascular Plants		
Drosera rotundifolia	Round-leaved sundew	+
% Bare ground		50
Habitat Classification		Cutover bog (PB4) with pioneering Poor fen (PF2) and Scrub (WS1)

Plate 3-7 Example of representative Cutover bog (PB4) with pioneering Poor fen (PF2) and Scrub (WS1) habitat within Turbine 6 study area

3.8 Turbine 7

Area of Cutover bog (PB4) with Poor fen (PF2). Ling heather *(Calluna vulgaris)* recorded in the wider area, but sparsely distributed.

Table 3-6 Botanical Survey – Turbine 7

Turbine 7	Grid reference: N05773 14884	Date: 19/08/2019
Species	Common Name	% Cover
Vascular Plants		
Scrub		
Schoenus nigricans	Black bog-rush	70
Eriophorum angustifolium	Common cottongrass	3
Festuca rubra	Red fescue	3
Deschampsia flexuosa	Wavy hairgrass	3
Carex flacca	Blue sedge	1
Betula pendula	Birch	3-5
Potentilla erecta	Tormentil	+
Salix sp	Willow	+
Erica tetralix	Cross-leaved heath	+
Triglochin palustris	Marsh arrowgrass	+
Drosera rotundifolia	Round-leaved sundew	+
Non-vascular Plants		
Cladonia sp.	-	+
Racomitrium sp.	-	+
% Bare ground		15
Habitat Classification		Cutover bog (PB4) with Poor fen (PF2)

Plate 3-8 Cutover bog (PB4) with Poor fen (PF2) within the Turbine 7 footprint

3.9 Proposed internal road northeast of T7

Pioneering poor fen (PF2) with establishing birch scrub (WS1). Proposed site access track/road northeast of T7.

Table 3-7 Botanical Survey – Proposed internal road

Proposed site access track/road	Grid reference: N05745 14950	Date: 21/08/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Betula pubescens	Downy birch	+
Salix sp.	Willow	+
Scrub		
Rubus fruticosus	Bramble	+
Herb/Dwarf Shrub		
Eriophorum angustifolium	Common cottongrass	30-40
Centaurium erythraea	Common centaury	+
Molinia caerulea	Purple moor-grass	2-3
Prunella vulgaris	Selfheal	2
Chamaenerion angustifolium	Rosebay willowherb	+
Dactylorhiza fuchsii	Common spotted-orchid	+
Cirsium vulgare	Common thistle	+
Hypericum perforatum	Perforate St John's-wort	+
Non-vascular Plants		
Drosera rotundifolia	Round-leaved sundew	1-2
% Bare ground		30
Habitat Classification		Pioneering poor fen (PF2) with establishing birch scrub (WS1)

Plate 3-9 –Representative photo of pioneering poor fen (PF2) with establishing birch scrub (WS1) habitats recorded within proposed site access road.

3.10 Turbine 8

Pioneering poor fen (PF2) with establishing birch scrub (WS1). Areas of bare peat recorded to the west of the turbine base. The wider area is characterised by plant species such as soft rush (*Juncus effusus*), toad rush (*Juncus bufonius*), willow (*Salix* sp.) and broad-leaved willowherb (*Epilobium montanum*).

Table 3-8 Botanical Survey – Turbine 8

Turbine 8	Grid reference: N05964 15579	Date: 19/09/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Scrub		
Betula pendula	Birch	5-10
Picea sitchensis	Sitka spruce	+
Herb/Dwarf Shrub		
Eriophorum angustifolium	Common cotton grass	70
Holcus lanatus	Yorkshire fog	+
Betula pendula	Birch	3
Rumex acetosella	Sheep's sorrel	1
Non-vascular Plants		
% Bare ground		10
Habitat Classification		Pioneering poor fen (PF2) with establishing birch scrub (WS1)

Plate 3-10 Pioneering poor fen (PF2) with establishing birch scrub (WS1) at Turbine 8

3.11 Turbine 9

Area dominated by bare peat (PB4). A nearby drainage ditch located within the turbine footprint comprises of common reed *(Phragmites australis),* birch *(Betula pendula),* bulrush *(Typha latifolia),* and willows (*Salix* sp.).

Table 3-9 Botanical Survey – Turbine 9

Turbine 9	Grid reference: N05999 14303	Date: 21/09/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Eriophorum angustifolium	Common cottongrass	+
Equisetum sp.	Horsetail sp.	+
Agrostis stolonifera	Creeping bent	+
Non-vascular Plants		
Cladonia sp.	*Cladonia* sp.	+
% Bare ground		99
Habitat Classification		Cutover bog (PB4)

Plate 3-11 Bare peat/Cutover bog (PB4) at Turbine 9

3.12 Proposed internal road near Turbine 9

Cutover bog (PB4) with establishing birch scrub (WS1) dominate this area with areas of bare peat occurring in the surrounding area.

Table 3-10 Botanical Survey – Turbine 9

Proposed internal road near Turbine 9	Grid reference: N05911 14291	Date: 21/09/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Scrub		
Betula pubescens	Downy birch	30
Salix sp.	Willow	10
Herb/Dwarf Shrub		
Eriophorum angustifolium	Common cottongrass	+
Hypericum perforatum	Perforate St John's-wort	+
Leontodon hispidus	Rough hawkbit	+
Rubus fruticosus	Bramble	+
Equisetum sp.	Horsetail sp.	+
Agrostis stolonifera	Creeping bent	+
Cirsium vulgare	Commo thistle	+
Prunella vulgaris	Selfheal	+
Non-vascular Plants		
Cladonia sp.	*Cladonia* sp.	+
% Bare ground		50-60
Habitat Classification		Cutover bog (PB4) with establishing birch scrub (WS1)

Plate 3-12 – Example of recolonising bare ground habitat, Cutover bog (PB4) with establishing birch scrub (WS1), within proposed internal road near T9

3.13 Turbine 10 - Relevé 1

Area of Cutover bog (PB4) with establishing poor fen (PF2)/birch scrub (WS1) mosaic.

Table 3-11 Botanical Survey – Turbine 10

Turbine 10 Relevé 1	Grid reference: N05146 14552	Date: 21/08/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Betula pendula	Birch	+
Eriophorum angustifolium	Common cottongrass	90
Mentha aquatica	Water Mint	+
Lycopus europaeus	Gypsywort	1
Scrub		
Betula pendula	Birch	20-30
Salix sp.	Willow	5
Herb/Dwarf Shrub		
Epilobium montanum	Broad-leaved willowherb	+
Molinia caerulea	Purple moor grass	2
Non-vascular Plants		
Hydrocotyle vulgaris	Pennywort marsh	3-4
% Bare ground		7
Habitat Classification		Cutover bog (PB4) with establishing Poor Fen (PF2) and birch scrub (WS1)

Plate 3-13 Turbine 10 dominated by Cutover bog (PB4) with establishing poor fen (PF2) and birch scrub (WS1)

3.14 Turbine 10 – Relevé 2

This area of Cutover bog (PB4) has establishing poor fen (PF2) and birch scrub (WS1).

Table 3-12 Botanical Survey – Turbine 10 Relevé 2

Turbine 10 Relevé 2	Grid reference: N05140 14528	Date: 21/08/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Betula pubescens	Downy Birch	+
Herb/Dwarf Shrub		
Pteridium sp.	Bracken	+
% Bare ground		90
Habitat Classification		Cutover bog (PB4) with bare peat and establishing poor fen (PF2) and birch scrub (WS1)
Note: Nearby drainage ditch becoming vegetated with marsh arrowgrass, birch and bracken.		

Plate 3-14 Turbine 10 with Cutover bog (PB4) with establishing poor fen (PF2) and birch scrub (WS1)

3.15 Turbine 10 – Relevé 3

Area comprising of birch dominated bog woodland (WN7) and scrub (WS1) mosaic.

Table 3-13 Botanical Survey – Turbine 10 Relevé 3

Turbine 10 Relevé 3	Grid reference: N05120 14539	Date: 21/08/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Betula pendula	Birch	+ (40% of canopy)
Salix sp.	Willow	+
Pinus contorta	Lodgepole pine	+
Scrub		
Rubus fruticosus	Bramble	+
Pteridium sp.	Bracken	+
Molinia caerulea	Purple moor-grass	+
Calluna vulgaris	Ling heather	+
Herb/Dwarf Shrub		
Juncus effusus	Soft rush	+
Holcus lanatus	Yorkshire fog	+
Potentilla erecta	Tormentil	+
Eriophorum angustifolium	Common cottongrass	3
Non-vascular Plants		
Celdonia sp.	*Cladonia* lichen	+
% Bare ground		50
Habitat Classification		Birch dominated bog woodland (WN7) and scrub (WS1) mosaic

Plate 3-15 – Example of Area comprising of birch dominated bog woodland (WN7) and scrub (WS1) mosaic within T10

3.16 Turbine 11

Cutover bog (PB4) dominated by bare peat and some re-establishing heath type vegetation.

Table 3-14 Botanical Survey - Turbine 11

Turbine 11	Grid reference: N05321 13994	Date: 19/09/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Herb/Dwarf Shrub		
Hydrocotyle vulgaris	Marsh pennywort	5
Eriophorum angustifolium	Common cottongrass	5
Salix sp.	Willow	2
Leontodon hispidus	Rough hawkbit	2
Triglochin palustris	Marsh arrowgrass	3
Calluna vulgaris	Ling heather	10-15
Erica tetralix	Cross-leaved heath	7-10
Juncus effusus	Soft rush	20
Rubus fruticosis	Bramble	5
Holcus lanatus	Yorkshire fog	+
Agrostis stolonifera	Creeping bent	+
Stellaria media	Common chickweed	+
Equisetum sp.	Horsetail sp.	+
Non-vascular Plants		
% Bare ground		
Habitat Classification		Cutover bog (PB4) with re-establishing heath type vegetation and bare peat

Plate 3-16 Turbine 11 location comprising of cutover bog (PB4) with re-establishing heath type vegetation and bare peat

3.17 Cutover bog south of Turbine 11 - Relevé 1

Area of cutover bog (PB4) dominated by bare peat. Some poor fen (PF2) occurs in the wider area together with some small patches of colonising/pioneering heath type vegetation.

Table 3-15 Botanical Survey – Cutover bog south of Turbine 11

Turbine 11	Grid reference: Lat 53.175973 Long -7.9221618	Date: 21/08/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Herb/Dwarf Shrub		
Eriophorum angustifolium	Common cottongrass	+
Triglochin palustris	Marsh arrowgrass	4
Juncus effusus	Soft rush	+
Rubus fruticosis	Bramble	+
Agrostis stolonifera	Creeping bent	+
Non-vascular Plants		
Cladonia sp.	*Cladonia* lichen	+
% Bare ground		99
Habitat Classification		Cutover bog (PB4) dominated by bare peat

Plate 3-17 Example of Cutover bog (PB4) dominated by bare peat.

3.18 Cutover bog south of Turbine 11 - Relevé 2

Area of cutover bog (PB4) comprising of bare peat and areas of pioneering poor fen (PF2). Linear birch dominated scrub with some bramble *(Rubus fructicosus)* and ling heather *(Calluna vulgaris)* recorded adjacent to a drain to the south-east. Bare peat dominates the area to the north-west.

Table 3-16 Botanical Survey - Turbine 11 Relevé 2

Turbine 11 Relevé 2	Grid reference: N05274 13893	Date: 21/08/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Betula pubescens	Downy birch	5-10
Pinus contorta	Lodgepole pine	+
Herb/Dwarf Shrub		
Hydrocotyle vulgaris	Marsh pennywort	+
Anthoxanthum odoratum	Sweet vernal grass	+
Molinia caerulea	Purple moor-grass	+
Eriophorum angustifolium	Common cottongrass	80
Leontodon hispidus	Rough hawkbit	+
Calluna vulgaris	Ling heather	3
Juncus effusus	Soft rush	+
Rubus fruticosis	Bramble	+
Agrostis stolonifera	Creeping bent	+
Non-vascular Plants		
% Bare ground		10
Habitat Classification		Cutover bog (PB4) comprising of bare peat with pioneering poor fen [PF2]

Plate 3-18 Representative photo of cutover bog with recolonising bare ground dominated by cottongrass (Eriophorum angustifolium) (PF2).

3.19 Proposed internal road northwest of T11

Area of birch dominated bog woodland (WN7) with some ling heather *(Calluna vulgaris)* within the field layer.

Table 3-17 Botanical Survey – Relevé 6: Proposed internal road

Proposed internal road northwest of T11	Grid reference: N05069 14345	Date: 21/08/2019
Species	Common Name	% Cover
Vascular Plants		
Betula pubescens	Downy birch	30
Salix sp.	Willow	3-5
Sorbus aucuparia	Rowan	+
Mid-layer		
Betula pendula	Birch	20
Salix sp.	Willow	3
Calluna vulgaris	Ling heather	60
Erica tetralix	Cross-leaved heath	+
Rubus fruticosus	Bramble	2-3
Molinia caerulea	Purple moor-grass	1-3
Herb/Dwarf Shrub		
Hedera helix	Ivy	1
Chamaenerion angustifolium	Rosebay willowherb	+
Non-vascular Plants		
Cladonia sp.	*Cladonia* lichen	+
Polytrichum commune	Common hair cap moss	+
% Leaf Litter		20-30
Habitat Classification		*Bog Woodland (WN7)*

Plate 3-19 - Representative sample of Birch dominated bog woodland (WN7)

3.20 Turbine 12

Area comprises of cutover bog (PB4) comprising of bare peat and establishing poor fen (PF2).

Table 3-18 Botanical Survey – Turbine 12

Turbine 12	Grid reference: N09707 15228	Date: 19/09/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Betula pendula	Birch	5
Salix sp.	Willow	5
Scrub		
Betula pendula	Birch saplings	throughout dry heath
Herb/Dwarf Shrub		
Eriophorum angustifolium	Common cottongrass	10-15
Triglochin palustris	Marsh arrowgrass	10
Epilobium parviflorum	Hoary willowherb	+
Leontodon hispidus	Rough hawkbit	+
Juncus bufonius	Toad rush	+
Lycopus europaeus	Gypsywort	+
Non-vascular Plants		
% Bare ground		70
Habitat Classification		Cutover bog (PB4) comprising of bare peat and establishing poor fen (PF2)

Plate 3-20 Cutover bog (PB4) comprising of bare peat and establishing poor fen (PF2) at Turbine 12 location

3.21 Turbine 13

Cutover bog (PB4), dominated by bare peat, with establishing poor fen (PF2) and artificial drainage ditches. Bare peat with poor fen occurring in the drain, which is located within the infrastructure footprint.

Table 3-19 Botanical Survey – Turbine 13

Turbine 13	Grid reference: N09655 14472	Date: 19/09/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Scrub		
Juncus effusus	Soft rush	10
Eriophorum angustifolium	Common cottongrass	5
Triglochin palustris	Marsh arrowgrass	10-15
Salix sp.	Willow	3
Epilobium sp.	Willowherb sp.	+
Leontodon hispidus	Rough hawkbit	+
Tussilago farfara	Colt's-foot	+
Non-vascular Plants		
% Bare ground		80
Habitat Classification		Cutover bog (PB4) comprising of bare peat and establishing poor fen (PF2) within drains

Plate 3-21 Turbine 13 located within Cutover bog (PB4), dominated by bare peat, with establishing poor fen (PF2) in nearby drains

3.22 Turbine 14

IG Reference: N10020 14044

Cutover Bog (PB4) dominated by bare peat with some marsh arrowgrass *(Triglochin palustris),* common reed *(Phragmites australis),* common cottongrass *(Eriophorum angustifolium)* and birch *(Betula pendula)* within nearby drainage ditches.

Plate 3-22 Location of Turbine 14, Cutover Bog [PB4]

3.23 Turbine 15

Cutover bog (PB4) dominated by bare peat with establishing poor fen (PF2) and birch scrub.

Table 3-20 Botanical Survey – Turbine 15

Turbine 15	Grid reference: N10849 14372	Date: 19/09/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Scrub		
Betula pendula	Birch	5
Salix sp.	Willow	5
Herb/Dwarf Shrub		
Juncus effusus	Soft rush	10
Eriophorum angustifolium	Common cottongrass	30
Holcus lanatus	Yorkshire fog	5-10
Juncus bufonius	Toad rush	3
Leontodon hispidus	Rough hawkbit	3
Epilobium montanum	Broad-leaved willowherb	+
Non-vascular Plants		None
% Bare ground		30-40
Habitat Classification		Cutover bog (PB4) dominated by bare peat with establishing poor fen (PF2)

Plate 3-23 Turbine 15 location within Cutover bog (PB4) dominated by bare peat with establishing poor fen (PF2) and birch scrub.

3.24 Turbine 16

IG Ref: 16372 14699

Cutover bog (PB4) dominated by bare peat with establishing poor fen (PF2). The milled bare peat is becoming revegetated, although currently restricted to wetter areas or drainage ditches. Vegetation comprising predominantly of marsh arrowgrass (*Triglochin palustris*). The vegetation located in wet area constitutes a Poor Fen (PF2). Some cottongrass (*Eriophorum angustifolium*) also occurring in the wider area.

Plate 3-24 Example of milled peat/cutover bog (PB4) with vegetated drainage ditches (dominated by marsh arrowgrass and some common cottongrass) at T16

3.25 Turbine 17

Primarily birch dominated bog woodland (WN7) which has established on cutover bog (PB4), with part of the turbine infrastructure located on bare peat to the south of the relevé. No *Sphagnum* mossed recorded.

Table 3-21 Botanical Survey – Turbine 17

Turbine 17	Grid reference: N10119 15926	Date: 22/08/2019
Species	Common Name	% Cover
Vascular Plants		
Betula pendula	Birch	80
Salix sp.	Willow	10
Pinus contorta	Lodgepole pine	1-3
Mid-layer		
Betula pendula	Birch	20
Salix sp.	Willow	20
Field Layer		
Rubus fruticosus	Bramble	7
Hedera helix	Ivy	+
Fragaria vesca	Wild strawberry	+
Non-vascular Plants		
Polytrichum commune		1
		+
Dryopteris sp.		+
% Bare ground		60
Habitat Classification		Bog woodland (WN7) which has established on cutover bog (PB4)

Plate 3-25 Photo of representative Birch dominated woodland (WN7) and scrub mosaic within the T17 study area

3.26 Turbine 18

Cutover bog (PB4) with pioneering poor fen (PF2) and some establishing bare birch scrub.

Table 3-22 Botanical Survey – Turbine 18

Turbine 18	Grid reference: N09990 16608	Date: 22/08/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Betula pubescens	Downy birch	20
Salix sp.	Willow	2
Pinus contorta	Lodgepole pine	10
Salix sp.	Willow	5
Herb/Dwarf Shrub		
Centaurium erythraea	Common centaury	+
Rubus fruticosus	Bramble	5-10
Cirsium vulgare	Thistle	+
Fragaria vesca	Wild strawberry	+
Molinia caerulea	Purple moor-grass	10
Centaurea nigra	Common knapweed	+
Juncus effusus	Soft rush	5-10
Hypericum perforatum	Perforate St. John's wort	+
Potentilla erecta	Tormentil	1-2
Pteridium sp.	Fern sp.	+
Eriophorum angustifolium	Common cottongrass	+
Polygala vulgaris	Common milkwort	+
Non-vascular Plants		
Cladonia sp.		+
Cladonia sp.		+
Habitat Classification		Cutover bog (PB4) with pioneering poor fen (PF2)

Plate 3-26 Cutover bog (PB4) with pioneering poor fen (PF2) at Turbine 18

3.27 Turbine 19

IG Ref: N09232 15516

Area of cutover bog (PB4) dominated by bare peat, where a regularly used access track occurs, as well as birch dominated woodland (WN7) and scrub (WS1). Railway tracks and Bare Peat are found to the south of the base.

Plate 3-27 Example of cutover bog (PB4) dominated by bare peat, where a regularly used access track occurs, as well as birch dominated woodland (WN7) and scrub (WS1) within the infrastructure footprint of T19.

3.28 Turbine 20

This area of Cutover bog (PB4) is dominated by bare peat with a mosaic of recolonising bare ground. The wider area also comprises soft rush (*Juncus effusus*), birch (*Betula pendula*), bramble (*Rubus fruticosus*), horsetail (*Equisetum* sp.) and some patches of common cottongrass (*Eriophorum angustifolium*).

Table 3-23 Botanical Survey – Turbine 16

Turbine 20	Grid reference: N09433 16128	Date: 22/08/2019
Species	Common Name	% Cover
Vascular Plants		
Herb/Dwarf Shrub		
Eriophorum angustifolium	Common cottongrass	5-10
Betula pendula	Birch	2
Pinus contorta	Lodgepole pine	+
Non-vascular Plants		
Cladonia floerkeana	Matchstick lichen	
Cladonia sp.	Cladonia lichen	
% Bare ground		95
Habitat Classification		Cutover bog (PB4)

Plate 3-28 Example of cutover bog (PB4) dominated by bare peat habitat and birch dominated woodland (background) recorded within the development footprint at T20

3.29 Turbine 21

Area of Cutover bog (PB4) dominated by recolonising bare peat (PF1) and linear sections of birch dominated bog woodland (WN7)/Scrub (WS1) mosaic along existing drainage infrastructure. Nearby drainage ditches are dominated by bulrush (*Typha latifolia*), willow (*Salix* sp.) and water mint (*Mentha aquatica*). Other species recorded within nearby drainage ditches include marsh pennywort (*Hydrocotyle vulgaris*), cross-leaved heath (*Erica tetralix*), marsh arrowgrass (*Triglochin palustris*), cuckoo flower(*Cardamine pratensis var. palustris*), mouse-ear hawkweed (*Pilosella officinarum*), sweet vernal grass (*Anthoxanthum odoratum*), mouse-ear (*Cerastium fontanum*), Cut leaved cranesbill (*Geranium dissectum*) and gypsywort (*Lycopus europaeus*).

Table 3-24 Botanical Survey – Turbine 21

Turbine 21	Grid reference: N09769 17069	Date: 22/08/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Betula pendula	Birch	10
Picea sitchensis	Sitka spruce sapling	+
Herb/Dwarf Shrub		
Equicetum sp.	Horsetail sp.	+
Juncus effusus	Soft rush	+
Agrostis sp.	Bentgrass sp.	+
Non-vascular Plants		
Cladonia sp. (2 Species)		+
% Bare ground		80-90
Habitat Classification		Cutover bog (PB4) with establishing Poor fen (PF1) and birch dominated bog woodland (WN7)/Scrub (WS1) mosaic.

Plate 3-29 Representative photo of the mosaic of bare peat, pore fen and birch scrub habitats within T21 study area

3.30 Turbine 21 Relevé 2

Example of birch scrub/woodland occurring within the infrastructure footprint.

Table 3-25 Botanical Survey – Turbine 21 relevé 2

Turbine 21 Relevé 2	Grid reference: N09767 17107	Date: 22/08/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Betula pubescens	Downy birch	60
Pinus contorta	Lodgepole pine	3
Scrub		
Betula pendula	Birch	10
Salix sp.	Willow	1
Herb/Dwarf Shrub		
Equicetum sp.	Horsetail sp.	+
Rubus fruticosus	Bramble	10
Hedera helix	Ivy	30
Fragaria vesca	Wild strawberry	+
Quercus robur	Oak sapling	+
Pteridium sp.	Fern sp.	1
Juncus effusus	Soft rush	+
Agrostis sp.	Bentgrass sp.	+
Potentialla erecta	Tormentil	+
Cirsium vulgare	Thistle	+
Eriophorum angustifolium	Common cottongrass	3
Juncus effusus	Soft rush	2
Calluna vulgaris	Ling heather	+
Non-vascular Plants		
Hypnum cupressiforme		+
Cladonia sp. (2 Species)		+
% Bare ground		0

Habitat Classification	Bare peat, pore fen and birch scrub mosaic

Plate 3-30 Example of birch dominated scrub (SW1) and woodland (WN7) mosaic establishing on cutover bog (PB4) within the infrastructure footprint.

3.31 Construction compound

The vegetation recorded on the cutover bog (PB4) within the compound comprised of establishing birch dominated scrub (WS1) and pioneering heath type vegetation.

Table 3-26 Botanical Survey – Proposed Site Compound

Construction compound	Grid reference: N009113 15529	Date: 19/09/2019
Species	Common Name	% Cover
Vascular Plants		
Betula pendula	Birch	20
Salix sp.	Willow	5
Herb/Dwarf Shrub		
Calluna vulgaris	Ling heather	20
Lotus corniculatus	Bird's-foot-trefoil	10-15
Rubus fruticosus	Bramble	7
Fragaria vesca	Wild strawberry	7
Chamaenerion angustifolium	Rosebay willowherb	5
Epilobium montanum	Broad-leaved willowherb	5
Tussilago farfara	Coltsfoot	5
Betula pendula	Birch	5
Daucus carota	Wild carrot	3
Potentilla erecta	Tormentil	3
Carlina vulgaris	Carline thistle	2
Potentilla reptans	Cinquefoil	+
Taraxacum officinale	Dandelion	+
Polygala serpyllifolia	Common milkwort	+
Leontodon hispidus	Rough hawkbit	+
Non-vascular Plants		
Polytrichum sp.		+
% Bare ground		10

Habitat Classification	Cutover bog (PB4) with establishing birch dominated scrub (WS1) and pioneering heath type vegetation.

Plate 3-31 Construction compound southwest to Turbine 19 comprising of cutover bog (PB4) and establishing scrub (WS1)

3.32 Representative survey of bare peat/birch scrub mosaic

The surrounding area also contains pioneering heath type vegetation on bare peat with scattered birch scrub.

Table 3-27 Botanical Survey – Representative survey of bare peat/birch scrub mosaic

Bare peat/Birch scrub mosaic	Grid reference: N10160 15260	Date: 22/08/2019
Species	Common Name	% Cover
Vascular Plants		
Betula pendula	Birch	70
Salix sp.	Willow	5
Mid-layer		
Betula pendula	Birch	15
Rubus fruticosus	Bramble	5
Field Layer		
Rubus fruticosus	Bramble	50-60
Hedera helix	Ivy	15
Pteridium sp.	Fern sp.	+
Chamaenerion angustifolium	Rosebay willowherb	+
Ulex europaeus	Gorse	+
Crataegus monogyna	Hawthorn	+
Fragaria vesca	Wild strawberry	+
Non-vascular Plants		
% Bare ground		40
Habitat Classification		

Plate 3-32 – Example of cutover bog (PB4) with establishing birch dominated bog woodland (WN7) on bae peat recorded within the Drinagh study area

3.33 Proposed Internal Road

Area of cutover bog (PB4) with establishing birch scrub (WS1) and recolonising bare peat.

Table 3-28 Botanical Survey – Proposed Internal Road

Proposed Internal Road	Grid reference: N09480 14952	Date: 19/09/2019
Species	Common Name	% Cover
Vascular Plants		
Betula pendula	Birch	10-15
Salix sp.	Willow	5
Herb/Dwarf Shrub		
Salix sp.	Willow	7-10
Equisetum sp.	Horsetail	3
Eriophorum angustifolium	Common cottongrass	2
Molinia caerulea	Purple grass	3
Pilosella officinarum	Mouse-ear hawkweed	+
Mouse-ear Hawkweed	Toad rush	+
Agrostis stolonifera	Creeping bent	+
Cerastium fontanum	Common mouse-ear	+
Fragaria vesca	Wild strawberry	3
Succisa pratensis	Devil's-bit scabious	+
Non-vascular Plants		
% Bare ground		60-70
Habitat Classification		Scrub

Plate 3-33 Cutover bog (PB4) with establishing birch scrub (WS1) and recolonising bare peat located near proposed internal road within the Drinagh study area

3.34 Proposed Internal Road

Cutover bog (PB4) with establishing birch dominated bog woodland (WN7) habitat within the study area between T7 and T8. Quadrat area 20x20m. A lot of leaf litter present with very few mosses recorded. No *Sphagnum* species recorded, and the ground was very dry.

Table 3-29 Botanical Survey – Relevé

Relevé	Grid reference: N05839 15212	Date: 19/09/2019
Species	Common Name	% Cover
Vascular Plants		
Canopy		
Betula pendula	Birch	80
Salix sp.	Willow	+
Picea sitchensis	Sitka spruce	+
Salix cinerea	Grey willow	+
Mid-layer		
Rubus fruticosus	Bramble	15
Calluna vulgaris	Ling heather	1
Rumex acetosella	Sheep's sorrel	1
Holcus lanatus	Yorkshire fog	+
Leontodon hispidus	Rough hawkbit	+
Galium palustre	Common marsh-bedstraw	+
Hypericum perforatum	Perforate St John's-wort	+
Agrostis stolonifera	Creeping bent	+
Fragaria vesca	Wild strawberry	+
Pteridium sp.	Bracken	+
Juncus effusus	Soft rush	+
Crataegus monogyna	Hawthorn	+
Non-vascular Plants		
Cladonia sp.	*Cladonia* lichen	+
Polytrichum commune	Common hair cap moss	+

% Leaf Litter	20
Habitat Classification	Cutover bog (PB4) with establishing birch dominated bog woodland (WN7)

Plate 3-34 Cutover bog (PB4) with establishing birch dominated bog woodland (WN7)

3.35 Proposed Internal Road

Establishing birch dominated woodland (WN7) on cutover bog (PB4). No *Sphagnum* mosses recorded with dry conditions under foot.

Table 3-30 Botanical Survey - Proposed Internal Road

Relevé 6 – Proposed Internal Road	Grid reference: N05873 15051	Date: 21/08/2019
Species	Common Name	% Cover
Vascular Plants		
Betula pendula	Birch	5-10
Salix sp.	Willow	3
Scrub		
Rubus fruticosus	Bramble	+
Calluna vulgaris	Ling heather	50
Molinia caerulea	Purple moor-grass	20-30
Potentilla erecta	Tormentil	+
Hypericum perforatum	Perforate St John's-wort	3
Herb/Dwarf Shrub		
Hieracium pilosella	Mouse-ear hawkweed	+
Galium palustre	Common marsh-bedstraw	+
Non-vascular Plants		
Cladonia sp.		+
% Bare ground		10
Habitat Classification		*Establishing birch dominated woodland (WN7) on cutover bog (PB4)*

Plate 3-35 Representative photo of relevé area within establishing birch dominated woodland (WN7) on cutover bog (PB4)

3.36 Proposed Internal Road

Cutover bog (PB4) with establishing birch dominated bog woodland (WN7). No *Sphagnum* moss species recorded with dry conditions under foot.

Table 3-31 Botanical Survey – Proposed Internal Road

Turbine 4	Grid reference: N05429 14758	Date: 21/08/2019
Species	Common Name	% Cover
Vascular Plants		
Betula pubescens	Downy birch	70
Salix sp.	Willow	10
Scrub		
Betula pendula	Birch	20-30
Salix sp.	Willow	5
Herb/Dwarf Shrub		
Betula pendula	Birch	10
Rosa sp.	Rose sp.	+
Holcus lanatus	Yorkshire fog	+
Juncus articulatus	Jointed rush	2
Agrostis stolonifera	Creeping bentgrass	+
Cirsium dissectum	Meadow thistle	+
Epilobium montanum	Broad-leaved willowherb	3
Chamaenerion angustifolium	Rosebay willowherb	1-2
Rubus fruticosus	Bramble	10
Juncus effusus	Soft rush	2-3
% Bare ground		60 - 80 %
Canopy height		6m
Habitat Classification		Cutover bog (PB4) with establishing birch dominated bog woodland (WN7)

Plate 3-36 – Example of bog woodland (background), poor fen (right of foreground) and areas of bare peat habitats within the proposed internal road.

3.37 Compound Area

Table 3-32 Botanical Survey – Compound Area

Compound Area	Grid reference: N 07698 15073	Date: 21/08/2019
Species	**Common Name**	**% Cover**
Vascular Plants		
Scrub		
Betula pendula.	Birch	5
Herb/Dwarf Shrub		
Triglochin palustris	Marsh arrowgrass	30
Juncus effusus	Soft rush	5
Rumex acetosa	Common sorrel	+
Epilobium montanum	Broad-leaved willowherb	+
Fragaria vesca	Wild strawberry	+
Juncus bufonius	Toad rush	+
Non-vascular Plants		
% Bare ground		50
Habitat Classification		Cutover bog (PB4) with recolonising bare peat/Poor fen (PF2) mosaic

Plate 3-37 Example of Cutover bog (PB4) with recolonising bare peat/Poor fen (PF2) mosaic within the Compound Area

3.38 Proposed 110KW Substation

The area is characterised predominantly by revegetated cutover peat with typical peatland species occurring throughout. However, imported store for the nearby railway construction has resulted in some calcareous species occurring within the sward.

Table 3-33 Botanical Survey – Proposed 110KW Substation Location

110KW Substation	Grid reference: N10904 18843	Date: 05/12/2019
Species	Common Name	% Cover Abundance
Vascular Plants		
Molinia caerulea	Purple moor-grass	35
Carex sp.	Sedge species	30
Centaurea nigra	Common knapweed	10
Eriophorum angustifolium	Common cottongrass	10
Potentilla anserina	Silverweed	5
Cirsium arvense	Creeping thistle	3
Anthriscus sylvestris	Cow parsley	3
Juncus acutiflorus	Sharp-flowered rush	2
Juncus effusus	Soft rush	2
Triglochin palustris	Marsh arrowgrass	+
Betula pendula	Birch	+
Cirsium palustre	Marsh thistle	+
Prunella vulgaris	Self-heal	+
Hieracium pilosella	Mouse-ear hawkweed	+
Carex flacca	Blue sedge	+
Leontodon hispidus	Rough hawkbit	+
Daucus carota	Wild carrot	+
% Bare ground		-
% Exposed Rock		2-3
% Bryophyte/lichen Cover		-
Mean Vegetation Height		25cm

Habitat Classification	Cutover bog (PB4) with establishing grassy vegetation assessed as 2 Dry meadows and grassy verges (GS2).

Plate 3-38 Example of Cutover bog (PB4) within recolonising bare ground within the proposed substation location

3.39 Junction modification at Kennedy's Cross

Relevé taken within Agricultural grassland (GA1) to the east of Kennedy's Cross. Hedgerows along the northwest of the site were dominated by hawthorn (*Crataegus* monogyna) and willow (*Salix* sp.) scrub, with nettle (*Urtica dioica*) and bramble (*Rubus fruticosus*) in the understorey. The hedgerows recorded to the South East were dominated by planted hawthorn *(Crataegus monogyna)* (managed). Some snowberry (*Symphoricarpos albus*) was recorded along the reeds.

Table 3-34 Botanical Survey – Kennedy's Cross Q2

Kennedy's Cross (Q1: Grassland)	Grid reference: N07368 07521	Date: 05/12/2019
Species	**Common Name**	**% Cover Abundance**
Vascular Plants		
Urtica dioica	Nettle	7
Cirsium arvense	Creeping thistle	3
Ranunculus repens	Creeping buttercup	10
Rumex obtusifolius	Broad-leaved dock	3
Lolium perenne	Perennial ryegrass	80
Juncus effusus	Soft rush	+
Veronica persica	Common field-speedwell	+
Habitat Classification		Improved Agricultural Grassland [GA1]

Plate 3-39 – Example of improved agricultural grassland through which the proposed junction modification will be located.

3.40 Junction modification at Kennedy's Cross - Adjacent woodland

A small area of wet woodland (WN6) occurs outside of the proposed road realignment at Kennedy's cross and will not be impacted by the proposed infrastructure. The below information provides an assessment of the vegetation community occurring within this habitat for context only.

Table 3-35 Botanical Survey – Kennedy's Cross Q1

Kennedy's Cross (Q1: Woodland)	Grid reference: N07394 07486	Date: 05/12/2019
Species	**Common Name**	**% Cover Abundance**
Vascular Plants		
Hedera helix	Ivy	85
Salix sp.	Willow species	7 (70% of Canopy)
Rubus fruticosus	Bramble	5
Fraxinus excelsior	Ash	3
Betula pendula	Birch	3
Asplenium scolopendrium	Hart's tongue fern	1
Geranium robertianum	Herb-Robert	+
Rosa sp.	Rose species	+
Polystichum sp.	Shield-fern	+
Urtica dioica	Nettle	+
Prunus spinosa	Blackthorn	+
Heracleum sphondylium	Common hogweed	+
Ranunculus repens	Creeping buttercup	+
Phalaris arundinacea	Reed canary-grass	+
Non-vascular Plants		
Hypnum jutlandicum	Hypnum moss	5
Habitat Classification		Wet willow-alder-ash woodland (WN6)

Plate 3-40 Example of wet woodland recorded outside of the proposed road realignment footprint at Kennedy's cross.

3.41 Representative Sample of Uncut Bog

Area of remnant uncut bog (PB1) located north of T10. Birch beginning to establish from seedlings near the periphery. Cross-leaved heath *(Erica tetralix)* occurring more frequently at the margins. The bog was dry underfoot, with no *Sphagnum* recorded.

Table 3-36 Botanical Survey – Uncut bog vegetation

Representative Sample of Uncut Bog	Grid reference: Lat 53.184565 Long -7.9269268	Date: 05/12/2019
Species	Common Name	% Cover Abundance
Vascular Plants		
Calluna vulgaris	Ling heather	90
Non-vascular Plants		
Cladonia chlorophaea	*Cladonia* lichen	+
Campylopus introflexus	Heath star moss	+
Pleurozium schreberi	Red-stemmed Feather-moss	+
Habitat Classification		Degraded Raised bog (PB1)

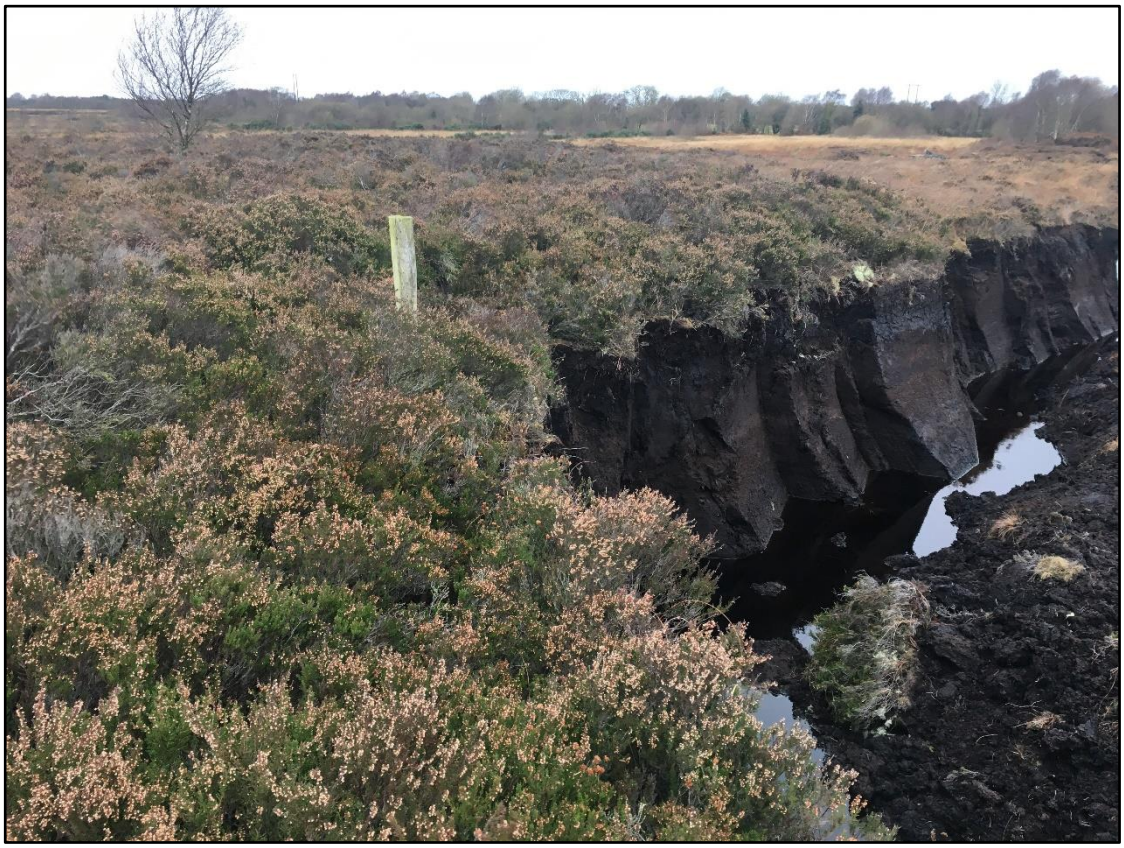

Plate 3-41 – Example of remnant uncut bog (PB1)

Plate 3-42– Example of remnant uncut bog (PB1) vegetation

3.42 Proposed Car Park

Area of revegetated cutover bog (PB4). The vegetation is dominated by purple moor-grass *(Molinia caerulea)*. No mosses present beneath carpet of dead *Molinia* leaflitter. Ling heather *(Calluna vulgaris)* is starting to colonise in places as well as some encroaching gorse, willow and birch scrub.

Table 3-37 Botanical Survey – Car Park

Car Park	Grid reference: N11107 19342	Date: 05/12/2019
Species	Common Name	% Cover Abundance
Vascular Plants		
Juncus articulatus	Jointed rush	3
Juncus acutiflorus	Sharp-flowered rush	2
Molinia caerulea	Purple moor-grass	90
Juncus effusus	Soft rush	2
Ulex europaeus	Gorse	2
Calluna vulgaris	Ling heather	3
Erica tetralix	Cross-leaved heath	+
Cirsium vulgare	Common thistle	2

Hypericum perforatum	Perforate St John's-wort	+
Habitat Classification		Cutover bog (PB4) revegetated with purple moor-grass

Plate 3-43 - Example of Cutover bog (PB4) revegetated with purple moor-grass

4. HABITAT EVALUATION

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 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 (91DO) 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 Derrinlough

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 fruiticosus* 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 was occasionally dominated by ling heather and in places purple moor grass *(Molinia caerulea*). However, no areas identified *Sphagnum* mosses, with the species only recorded in association with uncut raised bog. In addition, in most cases, other moss species were not a significant component of the ground flora.

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 20m x 20m following the methodology set out in '*Results of monitoring survey of bog woodland'* (Cross and Lynn, 2013). The results of these surveys are provided in Section 3 above and confirm the findings of the walkover surveys as well as demonstrating 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 fruiticosus* agg.), Bracken (*Pteridium aquilinum*) and Purple Moor-grass *(Molinia caerulea*), with some areas having significant areas of bare peat in the understory. 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 vulgarisis)* typically the main species but bell heather *(Erica cinereal),* 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 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 Derrinlough

The secondary dry heath communities were often dominated by ling heather *(Calluna vulgarisis)* with some purple moor grass *(Molinia caerulea*) and cottongrasses *(Eriophorum angustifolium)* on dry peats and little or no *Sphagnum* present. Where this habitat occurs in close proximity to existing areas of uncut bog, or in wetter areas close to drainage ditches, some of this vegetation is analogous to Raised Bog – Facebank Ecotope. These habitats contained varying amounts of bare peat and formed intimate mosaics with wetter poor fen communities and woodlands/scrub in places. However, the habitat often occurs as sparsely distributed on bare peat across the site. It is likely that the dry heath type areas would, if left undisturbed, colonize to form bog woodland (BnM – Dry Birch Woodland – Non Annex I). 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, or much wetter areas that grade into poor fen. Detailed botanical surveys were undertaken in accordance with the methodology set out in '*The National Survey of Upland Habitats'* (Perrin *et.al.* 2014) at representative locations across the study are where dry heath type was either the dominant habitat type or formed part of a mosaic woodland, scrub or poor fen. 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 are 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 North Atlantic Wet Heath 4010

The Irish Wildlife Manual '*Guidelines for a National Survey and Conservation Assessment of Upland Habitats in Ireland*' defines the Annex I habitat North Atlantic Wet Heaths (4010) as follows:

> *Wet heath is a highly variable habitat that is intermediate between dry heath and blanket bog, generally occurring on gently sloping, poorly-draining ground on shallow or intermediate peat depths (typically less than 50 cm deep). It is dominated by a mixture of Molinia caerulea, Erica tetralix, Trichophorum germanicum and Calluna vulgaris, although not all of these species need to be present. Unlike dry heaths, there is no minimum threshold for dwarf shrub cover (cf. Fossitt, 2000) as dwarf shrubs may be scarce or absent in degraded examples of wet heath characterised by Trichophorum germanicum or Molinia caerulea.*

This definition is referenced and repeated in the NPWS Article 17 Reporting '*The Status of EU Protected Habitats and species in Ireland*' (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 to Annex I Wet Heath habitat occurring as a secondary habitat on cutover raised bog habitats. In addition, a review of Irish SACs that are designated for the protection of Raised Bogs. The majority of these (all that were reviewed) include areas of cutover bog surrounding the uncut high bog. In none of the Conservation Objective documents that were reviewed was there any reference to Wet Heath habitats being present as a secondary habitat arising on cutover raised bog. Raised Bog SACs reviewed included:

- Bellanagare Bog SAC (000592)
- Callow Bog SAC (000595)
- Clooneen Bog SAC (002438)
- Lough Ree SAC (000440)
- Mouds Bog SAC (002331)
- Redwood Bog SAC (002353)
- River Moy SAC (002998)
- Barroughter Bog SAC (000231)
- Coolrain Bog SAC (002332)
- Monivea Bog SAC (002352)
- Moanveanlagh Bog SAC (002351)

In addition, in a review of the National Raised Bog Special Areas of Conservation Management Plan 2017 – 2022, there is no reference to Wet Heath, though the ecological value of the cutover habitats is considered in the context of their potential to support the raised bog habitats and to be rewetted so that they develop secondary peat forming habitats.

4.3.1 Description of Wet Heath type habitats recorded at Derrinlough

The secondary heath type communities recorded on site are primarily dominated by ling heather *(Calluna vulgaris)* with some purple moor grass *(Molinia caerulea*) and cottongrasses *(Eriophorum angustifolium)* on dry peats and little or no *Sphagnum* present. The heath type habitats occurring on site contain varying amounts of bare peat and formed intimate mosaics with wetter areas comprising of poor fen communities and woodlands/scrub in places. However, the habitat often occurs as sparsely distributed on bare peat across 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, or much wetter areas that grade into poor fen. Detailed botanical surveys were undertaken in accordance with the methodology set out in '*The National Survey of Upland Habitats'* (Perrin *et.al.* 2014) at representative locations across the study. Details of these relevés taken within the proposed infrastructure footprint are provided in Section 3 of this report.

The secondary heath type communities on the site do not conform to the Annex I Wet 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.

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

4.4.1 Annex I Habitat Description

Although poor fen habitat was recorded on site, the species recorded within this habitat were not found to conform to the Annex I habitat 7150 as it lacked the species assemblages and association with intact raised bogs. The definition of the Annex I habitat, *Rhynchosporion* depressions by NPWS (NPWS, 2019) describes it as amicro-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).

The National Raised Bog Special Areas of Conservation Management Plan (NPWS (2017)) states that The Annex I habitat *Rhynchosporion* depressions has a close ecological relationship on raised bogs with both Active raised bog and degraded raised bog, and that on raised bog SACs it is not necessary to set conservation objectives for all three habitats individually. It further states that should favourable conservation status for Active Raised Bog be achieved, then favourable conservation status for Depressions of the *Rynchosporion* (7150) would also be achieved.

4.4.2 Description of Depressions on peat substrates of the *Rhynchosporion* at Derrinlough

Rynchospora species were not recorded on the site during the walkover surveys undertaken, see Section 3 above. The detailed botanical surveys were undertaken in accordance with the methodology set out in '*The National Survey of Upland Habitats'* (Perrin *et.al.* 2014) at representative areas of poor fen throughout the site of the proposed project. These were the wettest habitats on the site and those most likely to support *Rynchospora* species. No habitat that had a species composition that corresponded to the description of Annex I *Depressions of the Rynchosporion* was recorded within the development footprint or in the surrounding cutover bog and it is noted that this habitat is typically associated with uncut active raised bog and or degraded raised bog which has been completely avoided in the design of the proposed project.

Whilst there is high bog which supports degraded raised bog, these habitats have been completely avoided by the proposed project with no effects predicted. There is therefore **no effect** on any Annex I *Depressions of the Rynchosporion* (7150) associated with the proposed project.

4.5 Alkaline Fens 7230

4.5.1 Annex I Habitat Description

'The Status of EU Protected Habitats in Ireland Document' (Article 17 reporting (NPWS 2013)) has the following description of the Annex I habitat Alkaline Fen (7230)

Alkaline fens are typically base-rich basin or flush fen systems with extensive areas of species-rich small sedge communities of the alliance *Caricion davallianae*. These fen systems are often a complex mosaic of habitats, with tall sedge beds, reedbeds, wet grasslands, springs and open-water often co-occurring at a given fen site. Alkaline fen habitat can occur beyond peat-forming fen systems, such as in dune slacks and wet grasslands. Based on a phytosociological description of small-sedge vegetation in Ireland, the associations *Campylio-Caricetum dioicae*, *Schoenetum nigicantis* and *Juncetum subnodulosi* correspond with 7230 Alkaline fens. The most extensive areas of alkaline fens in Ireland are thought to occur in lowland basins associated with limestone groundwater bodies with a karstic or poorly productive flow regime. Alkaline fens within flushes in upland and lowland regions, along the fringes of calcareous lakes and within turloughs, dune slacks and machair are thought to be more limited in extent but more widespread.

The Interpretation Manual of European Union Habitats defines Annex I Alkaline Fen habitat (7230) as follows:

> Wetlands mostly or largely occupied by peat- or tufa-producing small sedge and brown moss communities developed on soils permanently waterlogged, with a soligenous or topogenous baserich, often calcareous water supply, and with the water table at, or slightly above or below, the substratum. Peat formation, when it occurs, is infra-aquatic. Calciphile small sedges and other Cyperaceae usually dominate the mire communities, which belong to the *Caricion davallianae*, characterised by a usually prominent "brown moss" carpet formed by Campylium stellatum, Interpretation Manual - EUR28 Page 89 *Drepanocladus intermedius*, *D. revolvens, Cratoneuron commutatum, Acrocladium cuspidatum, Ctenidium molluscum, Fissidens adianthoides, Bryum pseudotriquetrum* and others, a grasslike growth of *Schoenus nigricans, S. ferrugineus, Eriophorum latifolium, Carex davalliana, C. flava, C. lepidocarpa, C. hostiana, C. panicea, Juncus subnodulosus, Scirpus cespitosus, Eleocharis quinqueflora*, and a very rich herbaceous flora including *Tofieldia calyculata, Dactylorhiza incarnata, D. traunsteineri, D. traunsteinerioides, D. russowii, D. majalis ssp.brevifolia, D. cruenta*, *Liparis loeselii, Herminium monorchis, Epipactis palustris, Pinguicula vulgaris, Pedicularis sceptrum-carolinum, Primula farinose* and *Swertia perennis*. Wet grasslands (*Molinietalia caerulaea*, e.g. *Juncetum subnodulosi* & *Cirsietum rivularis*, 37), tall sedge beds (Magnocaricion, 53.2), reed formations (*Phragmition*, 53.1), fen sedge beds (*Cladietum mariscae*, 53.3), may form part of the fen system, with communities related to transition mires (54.5, 54.6) and amphibious or aquatic vegetation (22.3, 22.4) or spring communities (54.1) developing in depressions. The subunits below, which can, alone or in combination, and together with codes selected from the categories just mentioned, describe the composition of the fen, are understood to include the mire communities sensu stricto (*Caricion davallianae*), their transition to the *Molinion*, and assemblages that, although they may be phytosociologically referable to alkaline *Molinion* associations, contain a large representation of the *Caricion davallianae* species listed, in addition to being integrated in the fen system; this somewhat parallels the definition of an integrated class *Molinio-Caricetalia davallianae* in Rameau et al., 1989. Outside of rich fen systems, fen communities can occur as small areas in dune slack systems (16.3), in transition mires (54.5), in wet grasslands (37), on tufa cones (54.121) and in a few other situations. The codes below can be used, in conjunction with the relevant principal code, to

signal their presence. Rich fens are exceptionally endowed with spectacular, specialised, strictly restricted species. They are among the habitats that have undergone the most serious decline. They are essentially extinct in several regions and gravely endangered in most.

Alkaline Fen is associated with Rich Fen habitats as described as the habitat PF1 in '*A Guide to Habitats in Ireland*' (Fossitt, 2000).

4.5.2 Alkaline Fen at Derrinlough

A number of small areas of rich fen habitats was recorded at Derrinlough during the walkover surveys, the detailed botanical assessment or the previously assessments undertaken of the bog. These areas occur primarily on shallower peat where peat extraction has resulted in more subsoil being exposed and thus more calcareous conditions occurring locally. The habitat occurred in close association with willow scrub and revegetating bare peat which has resulted in a mix of species recorded. This habitat was not recorded within or immediately adjacent to the proposed development footprint. At its closest location, this habitat occurs in excess of 260 metres from the T9 and associated road infrastructure, separated by an existing railway and areas of bare milled peat. There is also no potential for impacts on this habitat associated with the proposed project drainage infrastructure. The rich fen habitat identified within the study area did not support the vegetation composition of the habitat as described in the NPWS Article 17 report or the Interpretation Manual of European Union Habitats due to its establishment on intensively cutover bog. None of the areas within the development footprint support vegetation that is associated with the Annex I, Alkaline Fen habitat.

4.6 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, 2013) provides definitions for both Active Raised Bog (7110) and Degraded Raised Bog still capable of Natural Regeneration (7120).

It is clear from this document that both the Annex I habitats are found only on uncut raised bog habitats and not on cutover raised bog habitats. This is evident from the below quote from that document.

> *The actual definition of the habitat (still capable of regeneration), indicates that the habitat can be restored to Active Raised Bog habitat (7110). In the Irish context, the habitat does not include secondary degraded raised bog which relates to highly drained high bog devoid of vegetation, cutover, and cutover bog.*

The most recent Article 17 report (NPWS, 2019) states that;

> *In an Irish context, ARB (which is currently defined as occurring only on the high bog) encompasses active peat-forming ecotopes (central and sub-central) as defined by Kelly (1993) and Kelly & Schouten (2002), and actively peat-forming flushes.*

There are some remnant uncut raised bog habitats at the peripheries of the site at Derrinlough, however, these areas of peat have been entirely avoided by the proposed infrastructure. These have been identified and are shown in the Habitat Map (see Figure 6.3, Chapter 6 of the EIAR). At its closest, this habitat is located in excess of 250 metres from T10, separated by a mosaic of cutover bog habitats. As such, no potential for any impacts on these areas exist.

5. BIBLIOGRAPHY

Cross, J. & Lynn, D. (2013) *Results of a monitoring survey of bog woodland*. Irish Wildlife Manuals, No. 69. National Parks and Wildlife Service

Perrin, P.M, Martin, J.R., Barron, J.R., Roche & O' Hanrahan, B. (2014) Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland. Version 2.0. Irish Wildlife Manuals, No. 79. National Parks and Wildlife Service

Commission of the European Communities, 2003, Interpretation manual of European Union habitats - EUR 25. DG Environment *Nature and Biodiversity. Brussels. Commission of the European Communities.

NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill