Rehabilitation Plan

2017

Knockahaw Bog

This rehabilitation plan is developed under Condition 10 of IPC Licence Ref. PO-499-01 (September 2017). It outlines measures that will provide for stabilisation of the bog area upon cessation of peat production and decommissioning of the site. ***Rehabilitation*** *generally comprises natural colonisation and site stabilisation with or without targeted management.* ***After-use*** *involves the development of cutaway peatland into other land-uses. Rehabilitation can be incorporated into after-use development (e.g. Mountlucas Windfarm). Bord na Móna has focused after-use development of cutaway bogs into forestry, agriculture, grassland, amenity and biodiversity, (Lough Boora Discovery Park) and commercial industrial development (Drehid Resource Recovery, renewable energy – Mountlucas Windfarm). The general after-use strategy of Bord na Móna is outlined in the Bord na Móna Strategic Framework for Future-Use of Cutaway Bogs 2011. Any consideration of future after-uses for Knockahaw Bog such as amenity, developments or mixed uses will be conducted following the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.*

Rehabilitation of industrial peatlands is a key objective of the Bord na Móna Biodiversity Action Plan 2016-2021. This action plan outlines the main objectives and actions around biodiversity on Bord na Móna lands.

Rehabilitation Plan			
Bog Name:	**Knockahaw**	**Area (ha):**	371 Hectares
Works Name:	Littleton	**County:**	Located on the Laois and Tipperary border
Author(s):	BnM Ecology Team	**Survey/ Monitoring Date(s):**	26th March 2010 15/07/2013 08/2017
Maps:	Habitats Map, Landuse Map		
Review status: Finalised Dec 2017.			

Background

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Littleton bog group (Ref. P0-499-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the bog lands within the licensed area. Knockahaw Bog is part of the Littleton bog group.

This plan is a specific rehabilitation plan for Knockahaw bog and outlines:

- criteria which define the successful rehabilitation,
- consultation to date with interested parties,
- main issues for rehabilitation,
- proposed rehabilitation programme,
- proposed timeframe to implement this programme,
- associated aftercare, maintenance and monitoring.

The basis for the proposed approaches and implementation is the experience gained in 40 years of research on the after-use development and rehabilitation of the Bord na Móna cutaway bogs (see reference documents).

Scope

The scope of the rehabilitation plan seeks to address issues of concern as identified by Bord na Móna and the consultees. The key issues identified are:

- Categorisation of the habitats developing on Knockahaw Bog (outlined in Appendix II)
- Environmental stabilisation of the former peat production areas
- Maintenance of drainage and silt control through the site
- Remediation of water courses where necessary *(decommissioning)*
- The timeframe for bog rehabilitation/restoration
- The impact of any other proposed development on the site and rehabilitation plan

List of consultees to date

- Open consultation with range of stakeholders at annual BAP review days 2010-2017.
- General consultation with NPWS re Knockahaw Bog 2012-2017.
- General consultation at a local community event in Littleton in Dec 2016.
- The draft plan was circulated to a range of stakeholders prior to finalising the rehabilitation plan (Environmental Protection Agency, National Parks and Wildlife Service, Irish Peatland Conservation Council, Inland Fisheries Ireland, Coillte, Laois County Council Heritage Officer, Tipperary County Council Heritage Officer, An Taisce. Birdwatch Ireland, Irish Wildlife Trust, NARGC, Woodlands of Ireland).

Site description

Knockahaw Bog is a relatively large (371 ha), triangular shaped bog situated approximately 11 kilometres north east of Templemore on the R433 Templemore to Rathdowney Road. The Limerick-Dublin rail line runs close (1km) to the south of the site. The bog is contained within one block and is bounded by agricultural farmland, other peatland habitats and plantation forestry. The Erikina River forms a boundary with much of its northern end while the Clonmore River flows along the western edge of the bog. A secondary road forms a boundary to the southern-most section of the site.

The bog itself is largely comprised of raised bog (PB1) that has been ditched during the late 1980s by Bord na Mona. Although the bog was ditched no industrial peat harvesting took place on the site. However, domestic turf cutting has been carried out along the margins of the site. Locations along the eastern and western edges of the bog are currently used for this purpose with old sections of cutover bog (PB4) located at various places along the boundary of the bog. Other marginal habitats include scrub (WS1), Birch/Pine woodland (WN7) and conifer plantation (WD4).

Overall this bog is in relatively poor condition and quite dry compared to other comparable sites (such as Clonbuagh, which was not ditched or burned). The bog, for the most part, is quite dry with the drainage system functioning well. There was almost no infilling of drains with the exception of a couple of drains that had begun to become infilled around and within the flushes and in the NW section. A large part of the bog was also burnt in the recent past (burn-line visible on 2010 AP). Both these factors have had a significant impact on the bog with the vegetation dominated by regenerating Heather, Bog Asphodel, Carnation Sedge and Bog Cotton spp. A significant portion of the ground cover was also bare peat with a carpet of *Campylopus introflexus* and the regeneration since the burn (> 6 years) has been relatively poor (or the fire was quite bad). Trees within the flushes were also burned and as a result there are many multi-stemmed Birch re-developing. The southern part of the bog was not burned and the Heather cover is more dominant and quite high in places.

Two watercourses are located on the site; the Erkina River flows east where it eventually joins the River Nore while the Clonmore River flows in a south westerly direction before joining the River Suir. The Nore and Suir Rivers contain Annex II species including Freshwater Pearl Mussel and Atlantic Salmon. See Appendix I for more detail on site, habitats and local features.

Peat production programme and proposed developments

- **Cessation of peat production.** Bord na Móna announced in 2015 that peat production for the generation of electricity was to cease by 2030 (http://www.bordnamona.ie/wp-content/uploads/2016/01/Sustainability_Statement_2015.pdf). Industrial peat production (with regard to all appropriate regulations) to supply other customers or sectors (e.g. horticulture) may continue after this date.
- **Peat extraction regulations.** New regulations for the extraction of peat are currently being drafted by government. It is proposed that peat extraction on sites greater than 30 ha will be regulated through IPC licencing administered by the EPA. This draft rehabilitation plan has been prepared under the conditions of the original IPC licence.
- Milled peat production has never been carried out in this site despite having been drained for this purpose.
- Knockahaw is now part of the Bord na Móna Raised Bog Restoration programme. Bord na Móna have now decided to conserve and restore this bog.
- Knockahaw was included in a NPWS assessment of raised bogs for potential SAC/NHA designation (NPWS 2014 - Review of the raised bog National Heritage Area Network). It was called Dromond-Cullihill Bog in this report.

Other considerations

- Domestic sod peat cutting (private turbary) is carried out on a section of the site inside and outside the BnM property boundary.

Key biodiversity features of interest (2017)

- This site contains a large extent of high bog that has been ditched but still retains typical raised bog characteristics (parts of which are likely to qualify as the Annex I EU Habitats Directive habitat – 'degraded raised bogs still capable of regeneration' – 7120). (Number codes refer to EU habitat classification system – European Commission, 2013). The majority of the bog is currently in poor-moderate condition and the ditching/drainage has had a significant impact by drying out the majority of the bog. This bog (known as Cullahill Dromard Bog) was also assessed by consultants for NPWS as part of the review of the raised bog Natural Heritage Area network (NPWS 2014).
- Large Heath butterfly was recorded on the high bog. This butterfly species has the status 'vulnerable' on the Irish Red List for butterflies (Regan *et al.* 2010). Marsh Fritillary has also recently been recorded around the margins of this site on cutover bog. This butterfly species is listed in Annex II of the EU Habitats Directive.
- The site is used occasionally by Hen Harrier and small flocks of Golden Plover in the winter (Biosphere Environmental Services 2014). Breeding Snipe also use the bog.
- There are some other semi-natural habitats associated with this bog such as poor fen and flush (PF2) that have also been affected by the ditching of the bog.
- The high bog is surrounded by some cutover bog that is relatively old, inactive and beginning to develop diverse secondary habitats such as Birch/Pine woodland (WN7) and wet grassland (GS4).
- A section of Birch/Pine (bog) woodland (WN7) has developed on the raised bog in the southern section of the site.
- The Clonmore River and the Erkina River, both of which are located along the boundaries of the site are components of two different catchments, the Suir and Nore respectively. These catchments are important ecologically and contain Annex II species such as Atlantic Salmon and Freshwater Pearl Mussel. Any activities carried out on this bog have the potential to impact on the aforementioned species within the catchments.

Current ecological rating (*NRA (2009) Guidelines*)

Current ecological rating of the habitats on site ranges from **National** to **Local Importance (lower value)** (NRA (2009). The large unit of raised bog is rated as being of national importance as this habitat corresponds to the EU Annex I habitat – 'degraded raised bogs still capable of regeneration (7120)' and is currently being considered for designation as a Natural Heritage Area (NHA).

Criteria defining successful rehabilitation

Given the relatively high ecological value of larger raised bog sites with restoration potential and the fact that this site still retains raised bog features, the main success criteria in the degraded raised bog areas capable of restoration is rewetting and restoration where possible of raised bog habitats.

- Approximately 85% of Knockahaw is comprised of degraded raised bog (raised bog that has been drained). The remaining 15% comprises areas of scrub, Birch/Pine woodland, conifer plantation, old cutover bog (PB4) and wet grassland.
- The restoration work will involve blocking drains on high bog within Bord na Móna-owned areas according to guidelines set out by the National Parks and Wildlife Service (McDonagh 1997). The work will be completed by excavator and follows a levelling survey to determine best location of dams relative to surface contours. This restoration method has been used extensively by the NPWS and Bord na Móna on a number of sites including Clara Bog and Abbeyleix Bog.
- Rehabilitation of silt ponds and watercourses where required.

Proposed Rehabilitation programme

Short-term (0-2 years)

- Consult with local stakeholders as to bog restoration plans for the site.
- Determine ownership status and potential to carry out restoration work (drain blocking).
- Level survey of bog to determine the appropriate location for dams to be built/drain blocked. This is generally at any point where there is a fall in a drain level of 10 cm as outlined in NPWS guidelines (McDonagh 1997). This will be carried out by Bord na Móna.
- Block drains/construction of peat dams on selected sub-sites using Hitachi Ex75 excavator. This will be carried out by Bord na Móna.
- Monitor the success of rehabilitation measures. The success of the rehabilitation work will be monitored using the methods developed by NPWS for nationwide monitoring of raised bogs. The potential role of NPWS in such monitoring is currently being explored.
- Resolve issues relating to private turf-cutting within Bord na Móna-owned property around the sites selected for restoration.

Long-term

- This phase will follow on from cessation of peat production in adjacent bogs.
- Monitoring of the site to ensure stabilisation and complete re-vegetation/rehabilitation.
- Decommissioning of silt-ponds will be assessed if required.
- Evaluate success of rehabilitation measures (if employed) and enhance where necessary (to be determined by selected short-term management above).
- Reporting to the EPA will continue until the IPC License is surrendered.

Timeframe for rehabilitation

Short-term (2018-2020)

- Assess and carry out restoration works. This is subject in the short-term to the availability of resources such as suitable machinery. Initially there will be a level survey, then drain blocking using peat dams will be used to rehabilitate this bog. The sequence of work will depend on availability of machinery and resolution of any potential ownership/title issues. It is expected that resources will be available to carry out the restoration works in 2018.
- Ecotope mapping and permanent quadrats will be used to monitor the success of the restoration works. Baseline ecotype mapping will be carried out soon after restoration work is complete.
- Ongoing consultation with NPWS and other stakeholders.

Long-term

- This phase will follow on from cessation of peat production in adjacent bogs.
- Continued monitoring and planning will take place to assess further rehabilitation requirements at this site taking account of ongoing activities on the site.
- Reporting to the EPA will continue until the IPC License is surrendered.

After-care and maintenance

- There will be annual assessments of the site to determine the progress of the rehabilitation work and requirements for further enhancement measures.

- It is not expected that there will be any requirement for after-care and maintenance other than ecological monitoring.
- Where other uses are proposed for the site, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the appropriate assessment and planning procedures.

Potential future natural habitats on the site

This section attempts to predict how the habitats on the site will develop and also takes into account future land-use, such as restoration/rehabilitation works. This prediction is based on research and methods used to predict the natural vegetation of Ireland (Cross 2006).

- Raised bog (PB1)
- Birch/Pine (bog) woodland (WN7)
- Conifer plantation (WD4)
- Wet grassland (GS4)
- Scrub (WS1)
- Poor fen and flush (PF2)
- Depositing rivers (FW2) (both the Clonmore and Erkina rivers)

Budget and costing

At this time a basic rehabilitation provision will be allocated to the site based on the development of deep peat habitats and regenerating bog communities across the area of high bog.

Appendix I

Ecological Survey Report

Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value.

Bog Name:	**Knockahaw**	**Area (ha):**	371 Hectares
Works Name:	Littleton	**County:**	Located on the Laois and Tipperary border
Recorder(s):	MMC & DF	**Survey Date(s):**	26th March 2010

Habitats present (in order of dominance)

The most common habitats present at this site include:

- Raised Bog (PB1) (Codes refer to Heritage Council habitat classification, Fossitt 2000), See Appendix II.)
- Cutover Bog (PB4)
- Scrub (WS1) (on cutover bog along the margins of the site)
- Birch/Pine woodland (WN7) (on high bog)
- Poor fen and flush (PF2) (part of high bog)
- Wet grassland (GS4) (around margins)
- Conifer plantation (WD4) (north eastern boundary – Coillte managed)
- Buildings and artificial surfaces (BL3) (road)
- Depositing rivers (FW2) (both the Clonmore and Erkina rivers)

Description of site

Knockahaw Bog is a relatively large (371 ha), triangular shaped bog situated approximately 11 kilometres north east of Templemore on the R433 Templemore to Rathdowney Road. The Limerick-Dublin rail line runs close (1km) to the south of the site. The bog is contained within one block and is bounded by agricultural farmland, other peatland habitats and plantation forestry. The Erikina River forms a boundary with much of its northern end while the Clonmore River flows along the western edge of the bog. A secondary road forms a boundary to the southern-most section of the site.

The bog itself is largely comprised of raised bog (PB1) that has been ditched during the late 1980s by Bord na Mona. Although the bog was ditched no industrial peat harvesting took place on the site to date. However, domestic turf cutting has been carried out along the margins of the site. Locations along the eastern and western edges of the bog are currently used for this purpose with old sections of cutover bog (PB4) located at various places along the boundary of the bog. Other marginal habitats include scrub (WS1), bog woodland (WN7) and conifer plantation (WD4).

Overall this bog is in relatively poor condition and quite dry compared to other comparable sites (such as Clonbuagh, which was not ditched or burned). The bog, for the most part, is quite dry with the drainage system functioning well. There was almost no infilling of drains with the exception of a couple of drains that had begun to become infilled around and within the flushes. A large part of the bog was also burnt in the recent past (burn-line visible on 2010 AP). Both these factors have had a significant impact on the bog with the vegetation dominated by regenerating Heather, Bog Asphodel, Carnation Sedge and Bog Cotton spp. A significant portion of the ground cover was also bare peat with a carpet of *Campylopus introflexus* and the regeneration since the burn (> 6 years) has been relatively poor (or the fire was quite bad). Trees within the flushes were also burned and as a result there are many multi-stemmed Birch re-developing. The southern part of the bog was not burned and the Heather cover is more dominant and quite high in places.

Some sections of the bog, particularly in the north west corner of the site were somewhat wetter with species such as *Sphagnum cuspidatum, S. fuscum, S. subnitens* and *S. magellanicum* present. However, it should be noted

that no active pool systems or other features indicative of bog regeneration were present. A former pool system had been located to the west of the Birch/Pine woodland in the south of the bog, but this area is now degraded and the former tear pools were infilling or contained algae. Some of the pools had small patches of *S. magellanicum* lawns but extensive *S. cuspidatum* was rare. Some relatively large hummocks of *S. austinii* were present. None of the bog could be considered 'active' raised bog'.

Several flushes (poor fen and flush - PF2) are present on the site. These areas are mostly dominated with Purple Moorgrass while trees such as Willow, Birch and to a lesser extent Pine were also present. Older more mature trees had existed on the site but a fire approximately seven years ago killed many of them off, while the remainder are partially damaged. Many trees are regenerating from their base and will develop into multi-stem shrubs/trees. Bog Myrtle is prominent in some parts of the flushes. Other species present include Hard Fern, Bramble, Bog Milkwort and Devil's Bit. The majority of the flushes are quite dry. *Sphagnum* palustre is present and there are also some hummocks of *S. austinii*. Other bryophytes include frequent *Campylopus introflexus* and degraded hummocks of *Polytrichum* spp. and *Leucobryum glaucum*. Drains within the flush are partially infilling and there is more frequent growth of Bog Cotton and other *Carex* spp. Some parts of the eastern flush are somewhat more enriched, as indicated by the appearance of Black Bog Rush. There is a central drainage channel through this flush that is partially exposed in places with sink-hole type features and running water could be heard. Greater Tussock-sedge also appears along another part of this flush.

One of the main topographical features of this bog is a relatively large Birch/Pine woodland (WN7) that has developed in the southern part of the bog. This woodland is dominated by Scots Pine and has developed on a flushed area. Some sections are dominated by Birch while Holly, Willow and Sitka Spruce were all recorded. Parts of the woodland have a relatively dense canopy. However, this woodland has only developed in the past 20 years and all the trees were cleared off the bog with the bog was ditched by BnM in the late 1980s. The BnM drains pass through the woodland. Parts of the woodland have a regular structure with trees lining the drains and are even-aged, similar to conifer plantation. Some of the ground cover under the densest Pine is similar to conifer plantation and is dominated by leaf litter. (This is somewhat unusual for naturally developed Scots Pine, perhaps some of the woodland is dominated by Lodgepole Pine). Other sections are more diverse with younger Pine and Birch growing amongst the older trees. Heather is the most prominent ground cover plant and Bilberry is beginning to dominate in some of the woodland. Bracken, Soft Rush and Bog Rosemary are all occasionally frequent and Hypnum spp. moss cover dominates the bryophyte layer. Some of the woodland is quite open around the margins and more typically natural with flushed Heather and Crowberry prominent in the ground layer and scattered Birch and Pine present. .

Another section of bog woodland dominated by Birch was located close to the western side of the site. However this section of woodland had been completely destroyed by fire approximately seven years ago but younger trees had become established again.

Two watercourses are located on the site; the Erkina River flows east where it eventually joins the River Nore while the Clonmore River flows in a south westerly direction before joining the River Suir. The Nore and Suir Rivers contain Annex II species including Freshwater Pearl Mussel and Atlantic Salmon.

Designated areas on site (cSAC, NHA, pNHA, SPA other)

None

Adjacent habitats and land-use

The majority of the site is bounded by agricultural farmland (GA1, GS4) (mostly grazing). Areas of cutover bog (PB4) and raised bog (PB1) are also to be found adjacent to the site, particularly in the north west and north east corners. A small conifer plantation (PB4) is located along the north eastern boundary, part of which is situated on the site.

Watercourses (major water features on/off site)

- The Erkina River flows in an easterly direction along the northern boundary of the site. This river is part of the Nore catchment. This part of the river is only a stream, being part of its upper section and has poor riparian development

- The Clonmore River flows along the western boundary of the site in a southerly direction. This stream flows into the River Suir six kilometres to the south west of the site.
- One feature of interest is that the bog is drained by streams flowing into two different catchments.

Peat type and sub-soils

- As this bog has only been ditched and not significantly developed the main peat present is horticultural peat.

Fauna biodiversity

Birds

Several bird species were noted on the site during the survey.

- Long-eared Owl flushed from the high bog and cutover bog.
- Eight individual Snipe were flushed from the high bog at various different locations.
- Grey Crow, Rook, Robin, Dunnock, Blackbird and Redpoll were all noted on the site. Meadow Pipit and Skylark were displaying over the bog. Coal Tit and Wren were using the Birch/Pine woodland. Several old possible Corvid species nests were noted in some of the trees within the flushes.

Mammals

- Evidence that Badgers were using the site in the form of latrines and tracks.
- Signs of Hare and Fox were noted on the high bog.

Other animals

Frogspawn was noted occasionally in some of the drains with live frogs.

Fungal biodiversity

Turkeytail (*Trametes versicolor*) on dead wood in flushed area.

References

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Appendix II. Codes used for habitat classification.

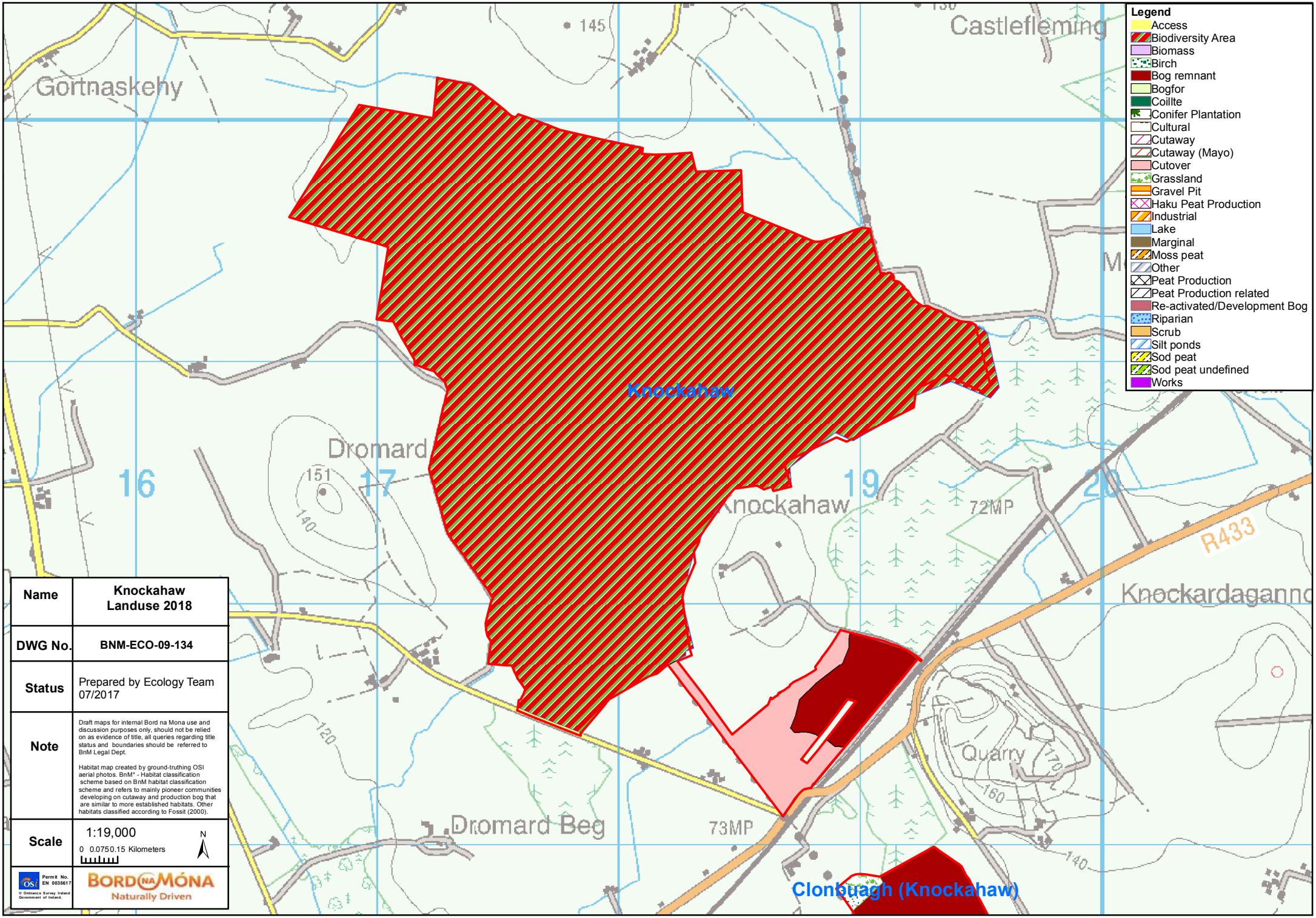
Bord na Mońa habitat classification scheme

	General	Habitat [1]	BnM habitat code	Equivalent Heritage Council codes [2]
Pioneer habitats of industrial cutaway	Peatland	Bare peat (0-50% cover)	BP	ED2
		Embryonic bog community (containing *Sphagnum* and Bog Cotton)	PBa	PB
		Embryonic bog community (Calluno-Sphagnion)	PBb	PB
	Flush and Fen	Pioneer *Campylopus*-dominated community	pCamp	PF2
		Pioneer *Juncus effusus*-dominated community (Soft Rush)	pJeff	PF2
		Pioneer *Eriophorum angustifolium*-dominated community (Bog Cotton)	pEang	PF2
		Pioneer *Juncus bulbosus*-dominated community (Bulbous Rush)	pJbulb	PF2
		Pioneer *Triglochin palustris*-dominated community (Marsh Arrowgrass)	pTrig	PF2
		Pioneer Caricion davallianae-Community with *Cladium* (rich fen)	pCladium	PF1
	Emergent communities	Pioneer *Carex rostrata*-dominated community (Bottle Sedge)	pRos	FS1
		Pioneer *Phragmites australis*-dominated community (Common Reed)	pPhrag	FS1
		Pioneer *Typha latifolia*-dominated community (Reedmace)	pTyp	FS1
		Pioneer *Schoenoplectus lacustris*-dominated community (Bulrush)	pSch	FS1
	Open water	Charaphyte-dominated community	pChar	FL2
		Permanent pools and lakes	OW	FL2
		Temporary open water	tOW	
	Woodland and scrub	Emergent *Betula*/*Salix*-dominated community (A) (Birch/Willow)	eBir	WS1
		Open *Betula*/*Salix*-dominated community (B) (Birch/Willow)	oBir	WS1
		Closed *Betula*/*Salix*-scrub community (C) (Birch/Willow)	cBir	WS1
		Ulex europaeus-dominated community (Gorse)	eGor	WS1
		Betula/*Salix*-dominated woodland (Birch/Willow)	BirWD	WN7
	Heathland	Pioneer dry *Calluna vulgaris*-dominated community (Heather)	dHeath	HH1
		Dense *Pteridium aquilinum* (Bracken)	dPter	HD1
	Grassland	Pioneer dry calcareous and neutral grasssland (Centaureo-Cynosuretum)	gCal	GS1
		Dactylis-Anthoxanthum-dominated community (Cocksfoot-Sweet Vernalgrass)	gCo-An	GS2
		Anthoxanthum-Holcus-Equisetum community (Sweet Vernalgrass-Yorkshire Fog-Horsetail)	gAn-H-Eq	GS
		Molinia caerulea-dominated community (dry) (Purple Moorgrass)	gMol	GS4
		Marsh (Meadowsweet and other tall herbs) (Filipendulion ulmariae)	Mar	GM1
	Disturbed	*Tussilago farfara*-dominated community (vegetation > 50%) (Colt's Foot)	DisCF	ED3
		Epilobium-dominated community (vegetation > 50%) (Willowherb spp.)	DisWil	ED3
	General	Riparian areas (streams or drain with associated edge habitats (e.g. FW2/4 + WS1, GS2 etc)	Rip	FW2 +
		Silt Ponds (artificial ponds with associated bank habitats (e.g. FL8 + WS1, GS2, ED2, ED3)	Silt	FL8 +
		Access (tracks or railways with associated edge habitats (e.g. BL3 + gCal, gMol, eGor etc)	Acc	BL3 +
		Works areas (predominately built land but can include landscaped and brownfield habitats (e.g. GA2, WS3, WD4, ED2, ED3)	Works	BL3 +

[1] These are generally pioneer habitats of bare peat and the communities can contain a significant proportion of bare peat. Some habitats are more developed than others. They frequently occur in mosaic with each other.
[2] Not all these communities are equivalent to habitat classes used by The Heritage Council habitat classification scheme (Fossitt 2000) as some are quite rudimentary and undeveloped.

Heritage Council habitat classification scheme (Fossitt 2000)

	General	Habitat	Heritage Council code
Semi-natural and modified habitats	Peatlands	Raised Bog	PB1
		Lowland Blanket bog	PB3
		Cutover Bog	PB4
		Rich fen and flush	PF1
		Poor fen and flush	PF2
		Transition mire and quaking bog	PF3
	Woodland and scrub	Oak-Birch-Holly woodland	WN1
		Oak-Ash-Hazel woodland	WN2
		Wet Pendunulate Oak-Ash woodland	WN4
		Riparian Woodland	WN5
		Wet Willow-Alder-Ash woodland	WN6
		Bog woodland	WN7
		Mixed broad-leaved woodland	WD1
		Mixed broad-leaved/conifer woodland	WD2
		Conifer plantation	WD4
		Scrub (Gorse)	WS1
		Emergent Betula-dominated community	WS1
		Closed Betula scrub community	WS1
		Recently-planted woodland	WS2
		Ornamental scrub	WS3
		Short-rotation coppice	WS4
		Recently-felled woodland	WS5
	Linear woodland	Hedgerow	WL1
		Treeline	WL2
	Grasslands and Marsh	Improved grassland	GA1
		Amenity grassland	GA2
		Dry calcareous and neutral grassland	GS1
		Dry meadows and grassy verges	GS2
		Dry-humid acid grassland	GS3
		Wet grassland	GS4
		Freshwater Marsh	GM1
	Heath and Bracken	Dry Heath	HH1
		Dry calcareous Heath	HH2
		Wet Heath	HH3
		Dense Bracken	HD1
	Disturbed ground	Exposed sand, gravel or till	ED1
		Spoil and bare ground	ED2
		Recolonising bare ground	ED3
		Active quarry	ED4
	Freshwater	Acid Oligotrophic lakes	FL2
		Mesotrophic lakes	FW4
		Artificial ponds (slit ponds)	FL8
		Depositing rivers	FW2
		Canals	FW3
		Drains	FW4
	Cultivated and Built land	Stonewalls and other stonework	BL1
		Earth Banks	BL2
		Buildings and artificial surfaces	BL3
		Arable crops	BC1
		Horticulture	BC2
		Tilled land	BC3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Gortnaskehy
Castlefleming
145
Knockahaw
Dromard
16
17
19
20
151
140
Knockahaw
72MP
R433
Knockardaganno
120
Quarry
170
160
Dromard Beg
73MP
140
Clonbuagh (Knockahaw)
Name
Knockahaw Landuse 2018
DWG No.
BNM-ECO-09-134
Status
Prepared by Ecology Team 07/2017
Note
Draft maps for internal Bord na Mona use and discussion purposes only, should not be relied on as evidence of title, all queries regarding title status and boundaries should be referred to BnM Legal Dept.
Habitat map created by ground-truthing OSI aerial photos. BnM* - Habitat classification scheme based on BnM habitat classification scheme and refers to mainly pioneer communities developing on cutaway and production bog that are similar to more established habitats. Other habitats classified according to Fossit (2000).
Scale
1:19,000
0 0.0750.15 Kilometers
N
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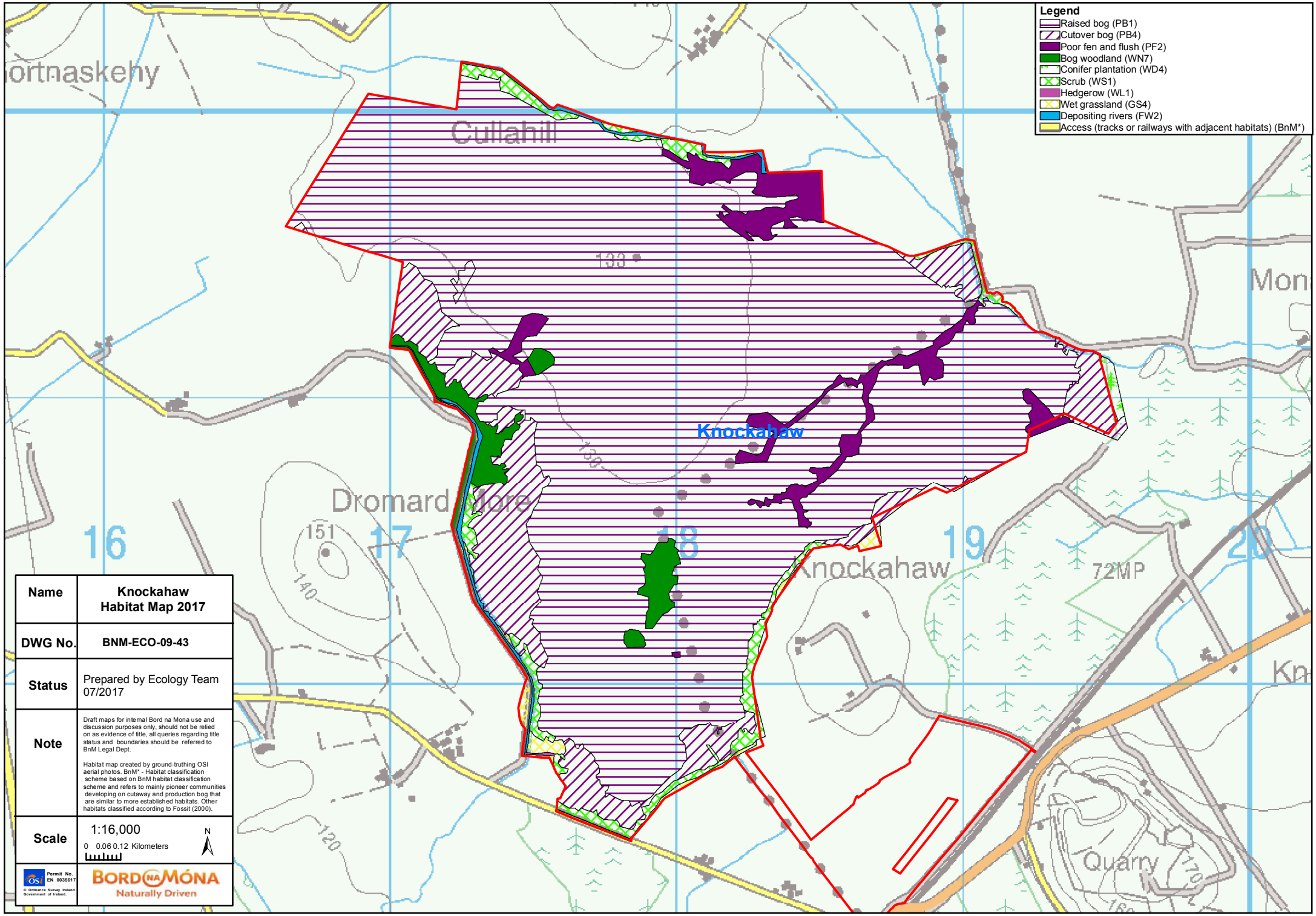
BORD NA MÓNA
Naturally Driven


Legend
Raised bog (PB1)
Cutover bog (PB4)
Poor fen and flush (PF2)
Bog woodland (WN7)
Conifer plantation (WD4)
Scrub (WS1)
Hedgerow (WL1)
Wet grassland (GS4)
Depositing rivers (FW2)
Access (tracks or railways with adjacent habitats) (BnM*)
Cullahill
Knockahaw
Dromard More
Knockahaw
72MP
Quarry
16
17
18
19
20
151
140
130
120
Name
Knockahaw Habitat Map 2017
DWG No.
BNM-ECO-09-43
Status
Prepared by Ecology Team 07/2017
Note
Draft maps for internal Bord na Mona use and discussion purposes only, should not be relied on as evidence of title, all queries regarding title status and boundaries should be referred to BnM Legal Dept.
Habitat map created by ground-truthing OSI aerial photos. BnM* - Habitat classification scheme based on BnM habitat classification scheme and refers to mainly pioneer communities developing on cutaway and production bog that are similar to more established habitats. Other habitats classified according to Fossit (2000).
Scale
1:16,000
0 0.06 0.12 Kilometers
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Rehabilitation Plan

2018

Ballybeg-Lanespark-Derryvilla Bog

This rehabilitation plan is developed under Condition 10 of IPC Licence Ref. PO-409-01 (June 2018). It outlines measures that will provide for stabilisation of the bog area upon cessation of industrial peat production and decommissioning of the site. ***Rehabilitation*** *generally comprises natural colonisation with or without targeted management.* ***After-use*** *involves the development of cutaway peatland into other land-uses. Rehabilitation can be incorporated into after-use development (e.g. Mountlucas Windfarm). Bord na Móna has focused after-use development of cutaway bogs into forestry, agriculture, grassland, amenity and biodiversity, (Lough Boora Discovery Park) and commercial industrial development (Drehid Resource Recovery, renewable energy – Mountlucas Windfarm). This rehabilitation plan* ***does not*** *outline future after-use development for Ballybeg-Lanespark-Derryvilla Bog. The general after-use strategy of Bord na Móna is outlined in the Bord na Móna Strategic Framework for Future-Use of Cutaway Bogs 2011 (currently being reviewed by Bord na Móna). Any consideration of future after-uses for Ballybeg-Lanespark-Derryvilla Bog such as amenity, developments or mixed uses will be conducted following the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.*

Rehabilitation of industrial peatlands is a key objective of the Bord na Móna Biodiversity Action Plan 2016-2021. This action plan outlines the main objectives and actions around biodiversity on Bord na Móna lands.

Rehabilitation Plan			
Bog Name:	**Ballybeg-Lanespark-Derryvilla**	**Area (ha):**	485.9 ha
Works Name:	Littleton	**County:**	Tipperary
Author(s):	BnM Ecology Team	**Survey/ Monitoring Date(s):**	15/07/2010, 28/08/2012, 20/09/2012 22/02/2013, 11/2017, 04/2018
Maps:	Habitats Map, Landuse Map		
Review status: Reviewed June 2018.			

Background

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Littleton bog group (Ref. PO-409-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Ballybeg-Lanespark-Derryvilla bog is part of the Littleton bog group.

This plan is a specific rehabilitation plan for Ballybeg-Lanespark-Derryvilla bog and outlines:

- criteria which define the successful rehabilitation,
- consultation to date with interested parties,
- main issues for rehabilitation,
- proposed rehabilitation programme,
- proposed timeframe to implement this programme, and,
- associated aftercare, maintenance and monitoring.

The basis for the proposed approaches and implementation is the experience gained in 40 years of research on the after-use development and rehabilitation of the Bord na Móna cutaway bogs (see reference documents).

Scope

The scope of the rehabilitation plan seeks to address issues of concern as identified by Bord na Móna and the consultees. The key issues identified are:

- Categorisation of the habitats developing on Ballybeg-Lanespark-Derryvilla bog (outlined in Appendix I & II)
- Environmental stabilisation of the former industrial peat production areas
- Maintenance of drainage and silt control through the site
- Remediation of water courses where necessary *(decommissioning)*
- The timeframe for bog rehabilitation/restoration
- The impact of any other proposed development on the site and rehabilitation plan

List of consultees to date

- Ongoing consultation with Slieve Ardagh Rural Development group. Meeting with group in June 2018.
- Open consultation with range of stakeholders at annual BAP review days 2010-2018.
- Consultation with the North Tipperary Heritage Forum.
- General consultation at a local community event in Littleton in Dec 2016 and site meeting in June 2018.

Site description

Ballybeg-Lanespark-Derryvilla Bog is located in Co. Tipperary, 1km south-east of Littleton Village. This site is actually a series of three bogs that are linked. The site is part of the Littleton Bog group and Lanespark (the central bog) is the location of the Lanespark Briquette factory. The factory was developed in 1981 at a site along the south bog margin. There are branches of the railway connecting Lanespark to Ballybeg (to the west), Derryvilla (to the north-east), Killeens to the south, and the wider Littleton Bog group through Littleton bog to the north. A local road runs along the eastern margin of Lanespark and separates the Loch Doire Bhile amenity area and Derryvilla bog from the former Lanespark industrial peat production area. (This road is now closed where it crosses the BnM railway). Up until 2017/2018, the majority of Ballybeg-Lanespark-Derryvilla was managed for industrial milled peat production and is dominated by bare peat and recolonising vegetation. A railway running through the site links the latter sites to the rest of the Littleton group and the former Littleton Briquette Factory.

Lanespark has a partially pumped drainage system, although the majority of the bog drains by gravity. The majority of this bog still has bare peat cover. There are several ridges underlying the bog (orientated north-south) and mixed till glacial material from these ridges has been exposed in places, leading in parts of the bog coming out of industrial peat production in the past. These cutaway areas are now developing a range of pioneer cutaway habitats.

The majority of Derryvilla and Ballybeg bogs were up until recently managed for milled peat production and are dominated by bare peat. A glacial gravel/sub-soil mound has been exposed at the southern end of Derryvilla and this area has been now out of industrial peat production for some time and developing as cutaway. Some small parts around the margins of Ballybeg bog have also been out of milled peat production for some time and more mature cutaway habitats have established in this areas (Birch scrub and Heather-dominated dry heath).

The northern part of Lanespark bog (north of road) has been out of industrial peat production for some time and developed as cutaway. Part of this cutaway was then developed as a fishing lake in 1999. Glacial substrates were dug out to create a lake basin and the surrounding area was re-profiled. The cutaway to the east of the lake was managed as a wetland and some drains were blocked. The Lough Doire Bhile amenity area is now leased to the Slieve Ardagh Rural Development community group and has been developed as a fishing lake and for walking. This area also has a high biodiversity value with its wetland and calcareous grassland development. Potential rich fen indicators are also present in this area as well as some embryonic peat-forming *Sphagnum*/bog community development in small localised pockets. Cutaway and marginal bog to the west of the amenity area (and road) also has high biodiversity value.

Industrial peat production programme, land-use and proposed developments

- In 2017, Bord na Móna announced the closure of the Littleton Briquette factory (in April 2018) and the cessation of industrial peat production in a number of cutaway bogs within the Littleton Bog Group, including Ballybeg-Lanespark-Derryvilla. Under Condition 10 of IPC Licensing, rehabilitation measures outlined in this document will be carried out to ensure environmental stabilisation of the former production bog.
- Bord na Móna are currently assessing options for renewable energy and other commercial development across these lands.

Other considerations

- **Cessation of industrial peat production.** Bord na Móna announced in 2015 that industrial peat production for the generation of electricity was to cease by 2030 (http://www.bordnamona.ie/wp-content/uploads/2016/01/Sustainability_Statement_2015.pdf). Industrial peat production (with regard to all appropriate regulations) by Bord na Móna to supply other customers or sectors (e.g. horticulture) may continue after this date.
- **Peat extraction regulations.** New regulations for the extraction of peat are currently being drafted by government. Peat extraction on sites greater than 30 ha will be regulated through IPC licencing administered by the EPA. This rehabilitation plan has been prepared under the conditions of the current IPC licence.

- **Decommissioning.** Requirements for Decommissioning are outlined in Condition 10.1 of the IPC Licence. Decommissioning generally occurs prior to the rehabilitation phase. However, in some circumstances, both phases can be carried out together. Decommissioning of Ballybeg-Lanespark-Derryvilla Bog will be carried out in full, as per requirements of Condition 10.1.
- **Bord na Móna infrastructure**. There is a railway link to the former Littleton Briquette factory. Decommissioning of this infrastructure will be required in line with the cessation of industrial peat production at Ballybeg-Lanespark-Derryvilla with the onset closure of Littleton Briquette factory.
- **Re-wetting potential.** Ballybeg-Lanespark-Derryvilla bog has a partially pumped drainage system, with a pump being used to drain a small area in Lanespark Bog. This pump is now not operational, although gravity drainage now drains the area that was previously pumped.
- **Sod peat production**. There is some active private sod-peat cutting along some of the bog margins.
- **Local Roads**. The site is dissected by two local roads dividing the site into several sections.
- **Lough Doire Bhile amenity area.** Leased by Slieve Ardagh Rural Development community group.
- **Coillte forestry.** A small part of Lanespark has been developed for conifer forestry (northern margin) and is associated with forestry development adjacent to the site.
- **Unauthorised grazing**. There are numerous ponies and horses scattered around the site, grazing marginal areas.

Key biodiversity features of interest (2018)

- Marsh Fritillary butterfly has been recorded at the Lough Doire Bhile. Marsh Fritillary is listed on Annex II of the EU Habitats Directive and is considered to be one of the most endangered butterflies in Europe, with Irish populations of the species deemed to be of international importance. The site also attracts a diverse Butterfly fauna.
- White-clawed Crayfish present in lake (recorded by John Fogerty, 2010). White-clawed Crayfish is also listed on Annex II of the EU Habitats Directive.
- The lake and wetlands of Lough Doire Bhile have attracted wintering waders and wildfowl in the past such as Whooper Swans, Teal, Mallard, Pintail, Golden Plover and Lapwing. The site is also likely to provide breeding habitat for wetland species such as Mallard and Snipe and possibly other species deemed to be of conservation interest such as Lapwing and Redshank.
- The Lough Doire Bhile cutaway is relatively mature and the developing plant communities are relatively diverse. These include the development of some ‘potential rich fen’ vegetation. There are frequent signs of significant calcareous influence on the remaining peat, possibly by groundwater seepage, in places. There are also small pockets of an embryonic bog community that is developing in association with dry heath and other pioneer cutaway habitats. Overall, the habitat diversity is high with a complex mosaic of several wetland habitats and transitions to drier plant communities present.
- The adjacent area of cutaway (north-west) also has some development of ‘potential rich fen’ vegetation.
- The majority of the industrial production bog area has few other features of particular ecological interest at present as the majority of the bog was in industrial peat production until recently.

Current ecological rating ranges from County to Local Importance (lower value) to National Importance; following NRA (2009) Evaluation Criteria.

The former peat production area is rated as **Local Importance (Lower Value)** due to the dominance of bare peat. Some sections of cutaway and marginal habitats have higher biodiversity value and are deemed to be of **local importance (higher value).**

It is expected that the overall ecological value of the new cutaway areas will increase somewhat in the future as the site re-vegetates and forms semi-natural habitats.

Lough Doire Bhile is deemed to be of **County Importance** while other habitats are deemed to be of N**ational Importance** due to the presence of Marsh Fritillary.

Criteria defining successful rehabilitation

- The main criteria are stabilisation of the industrial peat production area and mitigation of potential silt run-off.

Industrial peat production has now ceased at Ballybeg-Lanespark-Derryvilla Bog and the decommissioning and rehabilitation phases will start immediately. Natural colonisation will form the basis for the environmental stabilisation of the former milled peat production area. Small areas of pioneer cutaway vegetation are already developing where milled peat production has ceased in the past. The Lough Doire Bhile area is a good example of how the milled peat production areas are likely to develop in the future. The majority of the Lough Doire Bhile amenity area and cutaway is now re-vegetated, is environmentally stabilised and is developing habitats with a high biodiversity value. The bare peat cutaway has varying environmental characteristics including a variable topography. Re-wetting of the cutaway, where possible, is a general rehabilitation strategy. However, some of the site will remain relatively dry due to natural environmental and topographical conditions.

Blocking of former peat production field drains will be carried out across the site to rewet the dry peat surface and facilitate vegetation establishment. This will mitigate against drying out of the peat soil surface and facilitate stabilisation of the peat with naturally colonising plants. It is likely that some smaller areas with deeper open water (> 0.5 m) will develop naturally as a result of the varying topography and the presence of natural basins but the creation of extensive deeper water areas will be minimised, where possible. The extent of wet peatland habitat could be increased by targeted management (drain-blocking), which would enhance ecosystem services of the whole site. These wetter areas will aid the trapping of silt within the site, by slowing down water movement and acting as natural silt control areas. There is high potential for the development of rich diverse wet peatlands due to the influence of the underlying shell marl (alkaline influence) in parts of the site. As a result, there may be some potential for the development of rich fen habitat. Hydrological management will be key in relation to managing optimum water levels across the site and avoiding any negative impacts, for example to neighbouring land. This is likely to require adjustment of outfall levels on a phased basis.

No drain-blocking will be carried out drains around the margin of the site. Rehabilitation will be carried out in a manner that does not impact on neighbouring land. It is expected that water will still flow out of the site at the various emission points, through existing silt ponds, which will be maintained until it is deemed that rehabilitation and site stabilisation has been successful.

There is high potential for the development of rich diverse wet peatlands in the north Lanespark cutaway (and Lough Doire Bhile area) due to the influence of the underlying shell marl. There may be some potential for the development of rich fen in other parts of this site.

There are relatively deeper remnant peat deposits in Derryvilla and in part of Ballybeg. The main criteria for successful rehabilitation in these areas are re-wetting this deeper peat and encouraging the development of wet surface vegetation (poor fen/embryonic peat-forming vegetation), where possible. This will require managing water-levels close to the surface of the peat.

No active rehabilitation is anticipated for any of the remnant raised bog around the margins of the site as these areas are still being used for private sod peat cutting or are too small in area for any active raised bog restoration and will be allowed to develop naturally.

- Remediation of silt ponds and watercourses where required.
- At this point in time, a large proportion of (~73%) the site would be expected to develop as woodland and scrub (assuming no other significant land use) and about 14% would be likely to develop as a wetland habitat mosaic, with the remainder being other habitats.

Proposed Rehabilitation programme

Short-term (0-3 years)

- There will be ongoing monitoring of the site and appropriate rehabilitation planning related to any changes in land-use or proposed developments in the future at Ballybeg-Lanespark-Derryvilla bog.
- Assessment of re-wetting scenarios (field drain blocking) and site drainage to be carried out to assess the potential to enhance re-wetting in Ballybeg-Lanespark-Derryvilla bog and potential impacts on adjacent lands, including potential impacts of turning pump off.

- Assessment of potential ecological impacts on designated European sites associated with active rehabilitation management measures at Ballybeg-Lanespark-Derryvilla.
- Carry out a trial programme of rehabilitation works.
- Assessment of potential ecological impacts associated with active rehabilitation management measures in Ballybeg-Lanespark-Derryvilla bog.
- Significant bare peat areas within the site and the progress of natural re-colonisation of the cutaway areas will be monitored.
- All stock-piles will be removed from the site as part of the decommissioning phase of industrial peat production operations.
- Implementation of re-wetting measures such as drain blocking and, outfall modification. Natural colonisation is expected to proceed almost immediately once industrial peat production ceases. The most sustainable initial management option for un-vegetated areas within the site is to allow continued natural re-colonisation, in association with re-wetting, where possible.
- Significant bare peat areas through the site and the progress of natural re-colonisation of the cutaway areas will be monitored.
- Silt-ponds will be monitored during this period and there will be continued maintenance and cleaning (if required) to prevent silt run-off from the site during the rehabilitation phase.

Medium-term (5 years)

- Targeted active management such as seeding of a nursery crop or use of fertiliser to help promote natural re-colonisation (see Drumman Rehabilitation Trials) will be considered, if natural re-colonisation of significant bare peat areas has not progressed satisfactorily at this stage.
- The effect of any targeted active management will be monitored and further work determined.
- Silt-ponds will be monitored during this period and there will be continued maintenance and cleaning (if required) to prevent silt run-off from the site during the rehabilitation phase.

Long-term (>5 years)

- Monitoring of the site to ensure stabilisation and complete re-vegetation.
- Evaluate success of short-term rehabilitation measures outlined above and enhance where necessary (to be determined by selected short-term management above).
- Decommissioning of silt-ponds will be assessed.
- Reporting to the EPA will continue until the site is deemed environmentally stable.
- IPC License surrender process begins.

Timeframe for rehabilitation

Completed

- 1999-2001. Development of Lough Doire Bhile amenity area and wetland in former Lanespark cutaway. Area now leased for amenity use to Slieve Ardagh Rural Development.

Ongoing

- Part of the site has been naturally colonising for > 10 years and is developing a mosaic of cutaway habitats. Natural re-colonisation of the cutaway so far has been quite effective. Bare peat areas within the cutaway parts of the site are shrinking as vegetation develops and consolidates.

Short-term (2018-2021)

- Assessment of re-wetting scenarios and site drainage to be carried out to assess the potential to enhance re-wetting and assess potential impacts on adjacent lands.
- Assessment of potential ecological impacts and appropriate assessment impacts associated with active rehabilitation management measures at Ballybeg-Lanespark-Derryvilla.
- All stock-piles should be removed from the site as part of the decommissioning phase of industrial peat production operations.
- Implementation of re-wetting measures including drain blocking and outfall modification. Significant bare peat areas through the site and the progress of natural re-colonisation of the cutaway areas will be monitored.
- On-going monitoring of the overall site.

Medium-term (2023)

- Targeted active management such as seeding of a nursery crop or use of fertiliser to help promote natural re-colonisation (see Drumman Rehabilitation Trials) will be considered, if natural re-colonisation of significant bare peat areas has not progressed satisfactorily at this stage.
- The effect of any targeted active management will be monitored and further work determined.

Long-term (2023-)

- This phase will follow on from cessation of industrial peat production in adjacent bogs.
- Continued monitoring and planning will take place to assess further rehabilitation requirements at this site.
- Evaluate success of short-term rehabilitation measures outlined above and enhance where necessary (to be determined by selected short-term management above).
- Reporting to the EPA will continue until the site is deemed environmentally stable.
- IPC License surrender process begins.

After-care and maintenance

- There will be annual assessments of the site to determine the progress of the rehabilitation work and requirements for further enhancement measures.
- It is not expected that there will be any requirement for after-care and maintenance other than ecological monitoring.
- Where other uses are proposed for the site, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the appropriate assessment and planning procedures.

Potential future natural habitats on the site

This section attempts to predict the development of natural habitats on the site, assuming known after-use plans for the cutaway (no specific BnM development planned yet for Derryvilla, Lanespark and Ballybeg). This prediction is based on research and methods used to predict the natural vegetation of Ireland (Cross 2006). Cross (2006) predicted that cutaway bog is likely to develop a mosaic of Birch forest, alder and ash-alder carr, fen and heath in the future. There is no time-line given for the development of these habitats, although it could be expected that the development of natural climax habitats could take hundreds of years. The complexity is the result of small scale variations in the substrate and other environmental factors such as drainage and ground-water influence.

- The majority of the drier former industrial peat production area and cutaway is expected to develop dry species-poor Birch woodland (WN7) in mosaic with dry heath (HH1) (open Heather-dominated areas)

depending on how much peat is removed from the site in the future. There is likely to be a succession from a mosaic of Birch scrub and Heather-dominated dry heath over most of the site. Other parts of the site will develop more typical mosaics of Birch woodland and poor fen/grassland. However, the time required for development of closed woodland from cutaway is likely to vary significantly.

- Parts of Ballybeg and Derryvila have deeper remnant peat. There is some potential for the development of embryonic peat-forming habitats in the SE part of the site, where there is deeper remnant peat (2-3 m). *Sphagnum*-rich poor fen communities are likely to develop in the long-term, where there are suitable hydrological conditions.
- Wetland mosaics (FL3/FS1/PF2/WN6) could be expected to develop across parts of the site within localised basins due to the influence of the local topography and hydrology/drainage (pumped). Some of these sections are already re-wetting. The extent of wetland habitats could be increased with suitable management.
- Some of the emerging low mounds where sub-soil is exposed may have the potential to develop elements of Ash-Oak woodland in the long-term (WN2), similar to the development of the woodland copse at Derrynabroune (Kileen).
- The Loch Doire Bhile wetland area is likely to diversify into the future but is still likely to retain its core habitats of open water surrounded by emergent wetland vegetation including poor fen (PF2) and Reedbeds (FS1). Some wet Willow-dominated woodland (WN6) and scrub will also develop in this area. Over time the open water area could develop into a transitional mire/quaking bog (PF3) as a thick mat of vegetation develops at the water surface.
- There are indicators of potential rich fen vegetation and of significant calcareous influence on the remaining peat in Loch Doire Bhile and in the northern Lanespark cutaway. Some calcareous/tufa like deposits were observed in several places in Loch Doire Bhile. There may also be some springs or at least groundwater seepage in parts of the site that will help develop rich fen habitat (PF1). Some or all of this ground is influenced by underlying shell-marl. Some sections may just develop calcareous-rich wet grassland if there is drainage. However there may be scope for further development of rich fen in some sections, in a mosaic with other poor fen communities.
- The dry calcareous grassland (GS1) around Loch Doire Bhile would be expected to eventually develop rank grassland (GS2), then Blackthorn scrub (WS1) and then Oak-Ash-Hazel woodland (WN2) if it is left unmanaged. However, light grazing will maintain this species-rich grassland and will help its development and diversification.
- The future of the small areas (embryonic bog community) within Loch Doire Bhile where there are extensive *Sphagnum* hummocks is uncertain. These small areas may develop as patches of acidic bog vegetation within the rich fen. They could also be covered in scrub and develop into Birch woodland. This development will depend on how the hydrology of the site develops over time.
- Most of the small high bog remnants and cutover bog around the margins are likely to be slowly invaded by scrub and develop into Birch woodland (WN7) and mixed heathland (PB1/HH1/PF2/HH3) as they dry out, if they are not cut for sod-peat.

Budget and costing

- It is anticipated that the majority of the rehabilitation at this site will be through natural re-colonisation. Some preliminary budgeting can be carried out assuming that approximately 14% of the site will be developed as wetlands with some active management required to block outfalls to enhance re-wetting. The allocated rehabilitation provision will be based on this estimate.

APPENDIX I

Ecological Survey Report

Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value. The report outlines potential options for biodiversity management after industrial peat production has ceased.

Bog Name:	**Ballybeg (Lanespark)**	**Area (ha):**	123.3 ha
Works Name:	Littleton	**County:**	Tipperary
Recorder(s):	MMC	**Survey Date(s):**	20/09/2012 11/2017

Habitats present (in order of dominance)

The most common habitats present at this site include:

- Bare peat (Codes refer BnM classification of pioneer habitats of production bog. See Appendix II).
- Birch scrub (oBir, cBir) (generally in mosaic with other cutaway habitats)
- Pioneer dry heath (generally in mosaic with Birch scrub and Purple Moorgrass-dominated grassland)
- Pioneer poor fen dominated by Soft Rush (pJeff)
- Pioneer Purple Moorgrass-dominated communities (gMol) (around margins and in mosaic)
- Open water (OW)
- Bog timber
- Scrub (WS1) (Codes refer to Heritage Council habitat classification, Fossitt 2000), See Appendix II)
- Birch woodland (WN7)
- Improved grassland (GA1)
- Raised bog (PB1)
- Treeline (WS2)

Description of site

Ballybeg Bog is located in Co. Tipperary, 1 km south-east of Littleton Village. Ballybeg is part of the Littleton Bog group and is located adjacent to Lanespark and the former briquette factory. There is a branch of the railway connecting Ballybeg and Lanespark.

Ballybeg is a small bog and has a dog-leg shape with a narrower eastern portion. Peat fields are orientated south-east to north-west. The bog property extends south to a local road that accesses the former Lanespark Briquette Factory. Another local road crosses the travel path to the east the bog that links Ballybeg and Lanespark. The BnM railway extends along this travel path and along the southern margins of the east half of the bog, with a branch along the eastern margin.

The majority of the bog was managed for milled peat production and is dominated by bare peat. There are only several tiny sections beginning to develop pioneer cutaway habitats. A low mound is beginning to be exposed at the east end of the site with gravel appeared with some vegetation along the edges of the drains. A small part of the north-west corner was wet at the time of the survey and colonised by species associated with pioneer poor fen habitats (i.e. Soft Rush (*Juncus effusus*) and Bulbous Rush (*Juncus bulbosus*). The majority of this former production area is considered to comprise relatively deep peat with some exposed lighter peat present also. In contrast, the eastern half of the bog has a relatively thin layer of peat remaining. The southern part of the site

appears to have more potential for wet peatland habitat development with a basin developed around the main outfall.

A small section at the southern end has been out of production for some time (cutaway) (prior to the 2017 decision to close Littleton Briquette Factory). Silt-ponds have been developed adjacent to the road and grassland (likely grazed) has developed between the silt-ponds. Several fields to the north have been out of industrial peat production for some time or had limited production. They are developing dense Birch scrub/woodland with a mosaic of lighter Birch scrub and pioneer dry heath in sections. Purple Moor-grass (*Molinia caerulea*) and Common Cotton-grass and Hare's-tail Cotton-grass (*Eriophorum angustifolium* and *Eriophorum vaginatum*) are also prominent around the margin of this section and in some parts of the fields where the drainage is impeded. The majority of this section is vegetated.

Several fields along the western part of the northern margin have also developed dry heath and Birch/Gorse scrub mosaics. There has been limited industrial peat production along these fields (fields are relatively high). There are also some sections of bare peat with occasional stands of Ling Heather (*Calluna vulgaris*) re-colonising this area. An area within this section has been developed for the creation of silt-ponds.

Similar vegetation is found in the eastern part of the northern margin. This area is in a localised basin. A dense mosaic of dry Heath, Purple Moorgrass-dominated grassland and Birch scrub form the main part of the mosaic. The marginal areas tend to be Heather dominated. Some sections are wetter and contain more frequent Soft Rush-dominated poor fen with the Birch scrub. The majority of this area is completely vegetated. Several portions of fields adjacent to the milled peat production area have been out of production for a shorter amount of time and are developing Soft Rush-dominated poor fen vegetation with some emergent Birch scrub.

Part of the western production bog margin seems to have been planted with broad-leaved saplings, including Alder), to help form a screen between the bog and an adjacent farmyard. A tall Grey Popular-dominated tree-line is present along the travel path entrance into the bog.

Designated areas on site (cSAC, NHA, pNHA, SPA other)

None

Adjacent habitats and land-use

The surrounding area is largely dominated by farmland, with improved agricultural grassland (GA1) and some wet grassland (GS4) that extends to the majority of the margins around the bog.

Watercourses (major water features on/off site)

- Ballybeg is located within the River Suir catchment.
- Ballybeg is separated into three separate catchments. The northern half of the bog is divided into two separate catchments that both drain north to silt-ponds on the margins of the site. Both ponds drain north towards the Black River via drains.
- The southern catchment drains south through silt-ponds to the Ballyley River. Both rivers drain west towards the River Suir.

Peat type and sub-soils

Dark fen peat is exposed over most of this site. Lighter *Sphagnum*-type peat is also exposed in places where there is deeper peat.

The bog is underlain by mixed glacial till.

Fauna biodiversity

Birds

Several bird species were noted on the site during the survey.

- Blackbird, Mistle Thrush (4), Wren, Robin and Rook (2).

Mammals

Signs of several mammal species were noted on the site during the survey.

- Rabbit were sighted along the railway.
- Fox droppings and Hare droppings were noted around the site.

Other species

N/A

References

Cross, J.R. 2006. The Potential Natural Vegetation of Ireland. Biology and Environment: Proceeding of the Royal Irish Academy, Vol. 106B, No. 2, 65-116 (2006).
European Commission (2013). Interpretation manual of European Union Habitats. European Commission DG Environment Nature ENV B.3.
Fossitt, J. (2000). A guide to habitats in Ireland. Kilkenny. The Heritage Council.
NRA (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes (Revision 2). National Roads Authority.

Ecological Survey Report

Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value. The report outlines potential options for biodiversity management after industrial peat production has ceased.

Bog Name:	**Lanespark** **(includes Lough Doire Bhile)** **(Ballybeg-Lanespark-Derryvilla))**	**Area (ha):**	311.7 ha
Works Name:	Littleton	**County:**	Tipperary
Recorder(s):	MMC	**Survey Date(s):**	15/07/2010 20/09/2012 11/2017

Habitats present (in order of dominance)

The most common habitats present at this site include:

- Bare peat (Codes refer BnM classification of pioneer habitats of milled peat production bog. See Appendix II).
- Pioneer poor fen dominated by Soft Rush (pJeff) and Bog Cotton (pEang) (cutaway)
- Birch scrub (oBir, cBir) (generally in mosaic with other cutaway habitats)
- Pioneer dry heath (generally in mosaic with Birch scrub and Purple Moorgrass-dominated grassland)
- Pioneer Purple Moorgrass-dominated communities (gMol) (around margins and in mosaic)
- Open water (OW)
- Bog timber
- Limestone/Marl lakes (FL2) (Loch Doire Bhile)
- Dry grassland communities (gCal, gMol)
- Pioneer Poor fen communities (pRos, pEang). (cutaway areas)
- Reedbeds (pPhrag) (in wetlands)
- Gorse scrub (eGor)
- Potential rich fen (pVir) (cutaway areas)
- Bracken (dPter)
- Access (travel paths and tracks)
- Car park (BL3)

Habitats present around the margins of the bog and in un-developed parts of the property include

- Scrub (WS1) (Codes refer to Heritage Council habitat classification, Fossitt 2000), See Appendix II.)
- Secondary heathland developed from degraded remnant raised bog (HH1/PF2/WS1)
- Birch woodland (WN7)

- Improved grassland (GA1)
- Raised bog (PB1)
- Conifer plantation (WD4)

Description of site

Lanespark Bog is located in Co. Tipperary, 1 km south-east of Littleton Village. Lanespark is part of the Littleton Bog group and is the location of the former Lanespark (Littleton) Briquette factory. The factory was developed in 1981 at a site along the south bog margin. There are branches of the railway connecting Lanespark to Ballybeg, Derryvella, Killeen and the wider Littleton Bog group through Littleton bog to the north. The Lough Doire Bhile amenity area is located to the north-east of Lanespark and is now leased to the Slieve Ardagh Rural Development community group.

The main BnM railway runs along the western boundary from the former briquette factory and extends north through a travel path towards Littleton. A branch of the railway extends south-east and links Lanespark with the former production bog at Derryvilla. A local road runs along the eastern margin of the site to the north and separates the Loch Doire Bhile amenity area from the former production area at Lanespark (this road is now closed where it crosses the BnM railway). A track connected to this road runs north-west along the northern side of the former production area, separating an older cutaway area from the rest of the bog, and linked in the past to a minor road to the west of the site. This track is now split by the BnM railway.

Lanespark Milled Peat Production Area

This is the largest sub-section of the site and used to take in the former milled peat production areas and the small sections of pioneer cutaway habitats that came out of production in the past. The Lanespark production area fields are orientated north-west to south-east. There are several ridges underlying the bog (orientated north-south) and mixed till glacial material from these ridges has been exposed in places, leading in parts of the bog coming out of milled peat production in the past.

The largest area of pioneer cutaway habitats was located to the north of the factory on (relatively) high ground. Some of this area was used to stockpile bog timber. There are several large piles of bog timber adjacent to the factory. Some of the more established vegetation is dominated by a combination of pioneer Soft Rush-dominated poor fen and Heather-dominated dry heath. This section is also being colonised by frequent Pine spreading as a result of adjacent forestry planted around the factory. Other parts have more frequent bare peat cover and less-established vegetation. The scattered vegetation is generally dominated by Soft Rush with some heather. Some sections also have emerging Birch and some Pine. Gravel is exposed in places (an indicator of shallow peat depths).

There are smaller amounts of former areas pioneer cutaway habitat located around the north-west, northern and eastern margins of the former production area. These areas tend to be dominated by scattered tussocks of Soft Rush-dominated pioneer poor fen. The best-established vegetation is located along the northern margin where there are several sections of fields with dense Soft Rush-dominated poor fen containing some emergent Birch and Willow. These areas also contain patches of bare gravel sub-soil. The eastern half of the bog contains ridge where a band of glacial sub-soil is slowly being exposed. This is generally occurring along the edges of the peat fields. Vegetation also tends to be limited to the edges of the peat fields. Similar pioneer vegetation is appearing along the eastern margin and is mostly scattered open patches of pioneer poor fen. There are several small areas where there was some water between this ridge and the eastern margin, with some temporary open water.

The pioneer poor fen development changes somewhat towards the south-east corner. The vegetation at this location is dominated by Bog Cotton (pEang) and occurs in association with Bottle Sedge, Soft Rush and Bulbous Rush. Again, the majority of the vegetation is developing along the edges of the peat fields. This part of the bog has a pumped drainage system and the pump is located along the southern margin of the bog.

The margins around the former industrial peat production area tends to have typical marginal peatland habitats. Scrub with Gorse is dominant along the eastern and southern margins of the site. Patches of Purple Moor-grass dominated vegetation along with Heather are still present on some of the remnant high peat along the margins. There are several tall piles of spoil to the south and north of the factory. These are generally vegetated with rank grassland (GS2) and some developing scrub (WS1), although the area to the north-west of the factory is being grazed by ponies. There are several small sections of conifer forestry planted around the factory.

Lanespark cutaway (north-west section)

This sub-section is located in the north-west part of Lanespark and to the west of the Loch Doire Bhile amenity area. The minor road to the Loch Doire Bhile car-park forms the eastern boundary and the railway to Derryvilla production bog is situated along the northern boundary. Part of this sub-section has been zoned as a biodiversity area in the land-use survey. A track zig-zags west and cuts off the northern part from a silt-pond complex and the production bog to the south. The majority of this area is now re-vegetated with only minor amounts of bare peat exposed. There is only a minor amount of degraded secondary high bog to the south of the track, now with scrub and secondary high bog communities. The track was created with the calcareous sub-soil and offers an ecological contrast to the surrounding bog. It is still used and has been grazed in places. There is some development of patches of calcareous grassland (GS1) along the margins, as well as dense patches of Gorse and Birch scrub.

The majority of the area to the north of the track was developed for milled peat production in past, although some of the fields to the west still seem to have deep peat, or were used for sod-peat cutting. A small shallow lake was partially developed to the east within the glacial sub-soil. The margins of this area are still poorly developed and unvegetated. No in-flow or out-flow was constructed. The cutaway area has typical pioneer habitats similar to Loch Doire Bhile. Some of the deeper peat has a mosaic of Purple Moor-grass dominated vegetation, Dry Heather-dominated vegetation and open Birch scrub. Further west and adjacent to the track there is a small wetland with standing water and Bog cotton-dominated vegetation. The north-west section is quite diverse with a range of vegetation communities including a significant amount of Bog Cotton, Bottle Sedge, Yellow Sedge and Purple Moorgrass. Some of this vegetation is typical of 'potential rich fen areas', although there were no indications of rich fen mosses apart from *Calliergonella cuspidata* and *Campylium stellatum*. Stoneworts were present in some of the pools. Grazing and trampling is limiting the bryophyte layer development. There is also some Birch and Willow scrub scattered though this area. Shell-marl was exposed along the outfall from the silt ponds. A small wetland has developed at the north-west corner of this sub-section, although it was dry at the time of the survey and was being colonised by Yellow Sedge (*Carex viridula*).

The south-west part of this sub-section has a small area of un-developed remnant bog that is now developing typical secondary raised bog communities. This area was being grazed by horses at present and there was a high sward height, although there seemed to be intensive grazing in the past as much of the Heather was trampled in places. The vegetation was dominated by Purple Moor-grass and the bog surface was relatively dry. Other typical bog species such as *Cladonia portentosa*, Devil's-Bit, Tormentil and Carnation Sedge were present. The Bryophyte layer was poorly developed as it was so dry and due to the heavy trampling. There was some Bog Cotton and some *Sphagnum* development in the drains though this area. Pine was also colonising this area with Birch and Gorse. This section seems to be fenced in strips for grazing.

Loch Doire Bhile Amenity Area (surveyed 07/2010)

This amenity area was a joint development between Slieve Ardagh Rural Development (a local group) and Bord na Móna and was developed on cutaway that had been out of industrial peat production for some time. A lake and two wetland areas were constructed during the Summer of 1999. The lake has been stocked with brown trout and coarse fish over the years. There has been subsequent further development of walking trails including a national looped walk (Loch Dhoire Bhile Loop No. 70), and over 2000 trees have been planted.

The amenity area can be split into two main sections, the area around the lake and the area east of the lake around the wetlands.

Area around lake

The section around the lake has been significantly modified when the lake was dug out and the surrounding area landscaped and sown in part with grass-seed. However, several pioneer communities are developing quickly in these disturbed areas. The majority of the land surrounding the lake, particularly in the south-east section and on the higher drier ground, is being vegetated by dry calcareous grassland. This pioneer community type is species-rich and contains Knapweed, Hogweed, Bird's-foot Trefoil, Wild Carrot, Purple Moorgrass, Cocksfoot, Timothy, Catsear, Sweet Vernal-grass, Bramble, Coltsfoot, Red Clover, Creeping Bent, Heath Wood-rush, Glaucous Sedge, Catsear, Hawkbit sp., Mouse-ear Hawkweed, Mouse-ear Chickweed, Slender St John's-wort, Marsh Thistle, Yellow Rattle, White Clover, Broad-leaved Plantain, Long-leaved Plantain, Creeping Thistle, Hairy Sedge, Milkwort Lesser Centaury, Lesser Trefoil, Red Fescue and Quaking Grass. Large areas are dominated by Glaucous Sedge. The lower slopes around the lake have increasing wet grassland species such as Soft Rush and Jointed Rush. More Purple Moorgrass also occurs in these areas and this species becomes dominant in places.

Some sections around the lake such as adjacent to the north of the car-park are quite rich in plant species and are actually a mosaic of several different community types, ranging from wet to dry. The most prominent communities are poor fen dominated by Bottle Sedge and a potential rich fen community dominated by Yellow Sedge with brown moss species. There is also some Reedbeds developing in this area and a band of Purple Moor-grass dominated grassland appears along the site boundary and along a low bank separating this area from adjacent wetland. The poor fen community is dominated by Bottle Sedge and contains species such as Bog Cotton, Jointed Rush, Creeping Bent, Yellow Sedge, Marsh Thistle, Purple Moorgrass, Lesser Spearwort, Spotted Orchid, Anglica, Silverweed, Self-Heal, Marsh Arrowgrass, Gypsywort, Mint, Rough Meadowgrass and Carnation Sedge. *Calliergonella cuspidata* is frequently found in this vegetation type with *Campylopus introflexus* found in drier areas. Drier sections also include species such as Glaucous Sedge, Devil's Bit, Creeping Thistle, Yarrow, and Quaking Grass.

The potential rich fen community tends to be dominated by Yellow Sedge and Glaucous Sedge and also contains patches of brown mosses such as *Scorpidium* sp*., Campylium stellatum* and other moss species (pVir). This habitat tends to develop on sub-soil or where sub-soil is mixed with peat. Other species present include Common Butterwort, Butterfly Orchid and Common Horsetail. Some tufa or calcareous deposition can also be seen precipitating out of the standing water onto the mosses in some of these areas. This is likely to be as result of seepage through calcareous sub-soils and glacial material dug out from the basin of the lake, although the development of springs cannot be ruled out.

Towards the northern boundary around the lake there is a low ridge. This ridge is vegetated with Purple Moorgrass-dominated grassland and scrub with Birch and Gorse. The grassland contains species such as Heather, Cross-leaved Heath, Willow, Spotted Orchid, Devil's-Bit, Star Sedge, Flea Sedge, Tormentil, Lesser Butterfly Orchid and Fragrant Orchid.

Lake

There is a minor fringe of emergent wetland vegetation around the margins of the lake. Some Bottle Sedge, Bur-weed and Bulrush are present along the margins. Aquatic plant species such as Stoneworts, Water Milfoil and Pondweed sp. are also present in deeper water around the margins.

Area around wetland.

This part of the survey site is located towards the eastern half. The main wetland contains a small area of open water that is surrounded by emergent wetland vegetation dominated by Bottle Sedge and with frequent Bog Cotton. The open water contains Pondweed sp. There is a small amount of Common Reed in one part of the wetland. Towards the margins the wetland vegetation becomes more diverse and species such as Marsh Pennywort, Lesser Tussock Sedge, Bulrush, Flea Sedge, Lesser Spearwort, Bog Cotton, Jointed Rush, Yellow Sedge, Spotted Orchid and Marsh Orchid are all present along with the Bottle Sedge.

Further south-east the vegetation becomes drier and is dominated by Purple Moorgrass in mosaic with emerging Birch scrub along a ridge before changing again to poor fen dominated by Bottle Sedge. There are also several drier areas of dry heath dominated by Heather and some better-developed Birch scrub (oBir). The scrub also contained species such as Male Fern, Broad Buckler Fern and Narrow Buckler Fern. The transition zone between the vegetation dominated by Purple Moorgrass and the vegetation dominated by Bottle Sedge generally had some large hummocks of *Sphagnum* spp. These also appeared in damper areas of dry heath.

The small area of cutaway south of the travel path is quite diverse and contains a mosaic of dry heath on low ridges interspersed with poor fen and potential rich fen communities in shallow hollows, and some embryonic bog communities. The peat is likely to be deeper in this area or some *Sphagnum* peat was left in situ. Black Bog-rush was noted in a potential rich fen community along with frequent Yellow Sedge and species such as Silverweed, Marsh Cinquefoil, Flea Sedge and Royal Fern. Brown mosses were also present. This community frequently transitioned to a similar community dominated by Bottle Sedge. Some of the drains also contained Lesser-tussock Sedge along with Water Horsetail and Bog Bean. Pondweed was also noted in some of the drains. Intermediate areas (in height) contained frequent large hummocks of *Sphagnum palustre* along with *S. subnitens*. *Aulacomnium palustre* was also present. Some sections also contained Bog Asphodel and White Beaked-Sedge, both of which are unusual in pioneer cutaway vegetation, interspersed with patches of Yellow Sedge and Bottle Sedge.

The way-marked trail passes through the eastern and northern sides of this section. The small area to the east of the trail is dominated by dry heath that is being invaded by Gorse and Birch scrub. Both sides of the trail have dry grassland dominated by Purple Moor-grass. This somewhat acidic grassland community is typical of dry grassland developing on cutover peat. The grassland community varies in places to become more calcareous in places

where there is greater sub-soil influence (possibly from spoil along the path or fen peat). These sections contain greater cover of Glaucous Sedge and species such as Wild Carrot and Knapweed. They also attracted more butterflies. The northern boundary contains similar habitats but the cover of Gorse scrub is greater. Common Reed was spreading into parts of the scrub in places. Some of the Purple Moorgrass-dominated sections within the scrub and woodland has attracted Marsh Fritillary Butterfly.

Designated areas on site (cSAC, NHA, pNHA, SPA other)

None

Adjacent habitats and land-use

The surrounding area is largely dominated by farmland and conifer forestry. Improved agricultural grassland (GA1) and wet grassland (GS4) extends to the majority of the margins around the bog. Conifer forestry is located adjacent to the north-west corner of the site. Other adjacent habitats include typical marginal peatland habitats such as scrub (WS1), Birch woodland (WN7) and degraded remnant high bog (PB1).

Watercourses (major water features on/off site)

- Lanespark is located within the River Suir catchment.
- The Lanespark former industrial peat production area is separated into three separate catchments. The majority of the former production bog drains north to a silt pond along the margin and onto the Black River. A smaller section to the south is pumped and drains towards the Ballyley River. A small third catchment to the west of the site also drains south to the Ballyley River.
- A new lake called Loch Doire Bhile has been developed on the site. This lake has been stocked with fish and has an inflow and outflow to the Black River. This small river is channelized and flows along the southern margin of the amenity area.
- There is also a series of silt ponds related to Lanespark Brickette factory. These flow south to the Ballyley River. (They may be considered under a different EPA licence related to the factory).

Peat type and sub-soils

Dark fen peat is exposed over most of this site. There are also several un-developed sections along the northern margin of the former production bog that now have degraded remnant and secondary high bog communities.

The former production bog is underlain by mixed glacial till. There is some shell marl exposed under peat in the cutaway area to the north of the site.

Calcareous sub-soil dug from the Loch Doire Bhile lake basin and landscaped around the lake has had a significant influence on the re-colonisation and development of plant communities in this area. There may be some shell-marl influence on the wetlands in this area.

Fauna biodiversity

Several bird species were noted on the site during the survey (15/07/2010 - Loch Doire Bhile).

- Moorhen
- Snipe
- More common bird species such as Swallow, Skylark, Meadow Pipit and Reed Bunting were also noted on the site
- Whooper Swan, Teal, Mallard, Pintail, Golden Plover and Lapwing have been recorded on the site in the past.

- The site is likely to have a much richer bird fauna than indicated from this list.
- Matt Alexander has recorded Little Grebe, Heron, Egret and Dipper around the site. There is no significant use in recent times by Whooper Swans.

20/09/2012 Lanespark Former Production Area

- Wren, Grey Crow (4), Swallow, Moorhen (factory silt ponds), Magpie, Pied Wagtail, Chaffinch, Reed Bunting, Meadow Pipit, Wheatear (2) and Blue Tit.

Mammals

- The local development group have been trapping Mink around Loch Doire Bhile with about 70 caught in the past few years.
- Hare (north-west Lanespark former production area 20/09/2012)
- Rabbits (signs along northern railway).

Butterflies

- Large White.
- The site has a richer butterfly fauna than indicated from this list. Matt Alexander (FAS) has been recording butterflies at Loch Doire Bhile as part of the National Biodiversity Centre butterfly monitoring scheme.
- **John Fogarty**: Marsh Fritillary (4), Small White (7), Green-veined White (2), Orange-tip (2), Speckled Wood (1), Derryville, Littleton ,Thurles, Tipperary S (H7), 30/5. Dingy Skipper (1), Derryville, Littleton, Tipperary, 10/5. http://www.butterflyireland.com/butterfly_records_2010.htm
- Small Tortiseshell, Speckled Wood. (Lanespark former production area 20/09/2012)

Other species

- White-clawed Crayfish present in Loch Doire Bhile (recorded by John Fogarty March 14th 2010). Crayfish remains also recorded after being eaten by Heron.
- Common Newt (recorded by John Fogarty) SE of the Loch Doire Bhile May 2010.

References

Cross, J.R. 2006. The Potential Natural Vegetation of Ireland. Biology and Environment: Proceeding of the Royal Irish Academy, Vol. 106B, No. 2, 65-116 (2006).

European Commission (2013). Interpretation manual of European Union Habitats. European Commission DG Environment Nature ENV B.3.

Fossitt, J. (2000). A guide to habitats in Ireland. Kilkenny. The Heritage Council.

NRA (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes (Revision 2). National Roads Authority.

Ecological Survey Report

Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value. The report outlines potential options for biodiversity management after industrial peat production has ceased.

Bog Name:	**Derryvella (Lanespark)**	**Area (ha):**	123.3 ha
Works Name:	Littleton	**County:**	Tipperary
Recorder(s):	MMC	**Survey Date(s):**	28/08/2012

Habitats present (in order of dominance)

The most common habitats present at this site include:

- Bare peat (Codes refer BnM classification of pioneer habitats of former peat production areas. See Appendix II).
- Pioneer poor fen dominated by Soft Rush (pJeff) and or Bog Cotton (pEang)
- Pioneer Purple Moorgrass-dominated communities (gMol) (around margins and in mosaic)
- Exposed gravel (Gr)
- Birch scrub (oBir, cBir) (generally in mosaic with other cutaway habitats)
- Pioneer dry heath (developing on some stock-piles and high fields)
- Scrub (WS1) (Codes refer to Heritage Council habitat classification, Fossitt 2000), See Appendix II)
- Birch woodland (WN7)
- Improved grassland (GA1)

Description of site

Derryvella Bog is located in Co. Tipperary, 5 km south-east of Littleton Village. Derryvella is part of the Littleton Bog group and is located north of the former Littleton/Lanespark briquette factory, and to the east of the Lough Doire Bhile amenity area and biodiversity area. A branch of the BnM railway network connects Derryvella and Lanespark.

Derryvella is a relatively small bog and is a sub-section of the larger Ballybeg-Lanespark-Derryvella bog unit. Former peat fields are orientated north to south. The bog property extends north to a local road that marks the northern boundary. The BnM railway extends along the southern margin of the site. The majority of the bog was formerly developed for peat production and the marginal zones within the BnM property line are rather narrow and dominated by scrub on old high bog. Improved grassland in adjacent farmland extends up to the BnM bog margin along the west side of the bog. There is some recent conifer forestry planted along the eastern margin of the site.

Up until 2017/2018, the majority of the bog was managed for milled peat production and is dominated by bare peat as a result. The narrower southern end of the site has been out of industrial peat production for several years. A ridge of glacial till extends under the peat layer and is exposed in parts. A new deep outfall has been recently dug through this ridge to help drain former production areas to the north. There is some light vegetation over this mound of glacial sub-soil and in the small area of peat trapped to the south of the mound that is now out of production. Purple Moorgrass and Soft Rush dominate the vegetation over the mound with some scattered Heather. However, it has been disturbed recently by the construction of the outfall. There is still significant bare substrate cover with exposed gravel . There is some Gorse scrub developed to the west of the mound and outfall on an old high field that is no longer in use. To the south and on remnant peat there is typical colonisation of pioneer Poor Fen with Soft Rush and Bog Cotton. There is also some scattered Birch scrub but again there is also significant bare peat cover still present. A small sub-basin has developed in this area between the margin of the bog and the mound and the lowest section is wetter and being vegetated by Bog Cotton. There is also a small

sub-basin to the east of the mound where there was water lying at the time of the survey. Both Bog Cotton and Bottle Sedge were present in this section.

Other sections that are vegetated include an old stock-pile that has been colonised with Heather and Purple Moorgrass. The south-east margin of the former production bog is situated along a channelized stream and there is a verge of grazed grassland (GS2) developed along this drain on spoil taken from the drain. Purple Moorgrass dominates the marginal vegetation along the western margin of the former production bog.

Designated areas on site (cSAC, NHA, pNHA, SPA other)

None

Adjacent habitats and land-use

The surrounding area is largely dominated by farmland, with improved agricultural grassland (GA1) and some wet grassland (GS4) that extends to the majority of the margins around the bog. Conifer Plantation has been developed along the eastern margin of the bog.

Watercourses (major water features on/off site)

- Derryvella is located within the River Suir catchment.
- Derryvella has a single catchment. The bog drains south towards the new outfall and on to a drain that flows east along the northern margin of Lough Doire Bhile amenity area and biodiversity area. The catchment is treated by a silt-pond that is located to the west of Lough Doire Bhile, where it then drains into the Black River.
- The Black River drains west towards the River Suir. It flows along the south-east and southern margins of the bog.

Peat type and sub-soils

Dark fen peat is exposed over most of this site.

The bog is underlain by mixed glacial till.

Fauna biodiversity

Birds

Several bird species were noted on the site during the survey.

- Blackbird, Wren, Meadow Pipit, Grey Crow (4), Kestrel, Wood Pigeon and Swallow.

Mammals

Signs of several mammal species were noted on the site during the survey.

- Rabbit were sighted along south-west margin and there are frequent signs of grazing.
- Fox droppings and Hare droppings were noted around the site.

Other species

- Butterfly species noted on the site included Large White and Meadow Brown.

References

Cross, J.R. 2006. The Potential Natural Vegetation of Ireland. Biology and Environment: Proceeding of the Royal Irish Academy, Vol. 106B, No. 2, 65-116 (2006).

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Appendix II Codes used for habitat classification.

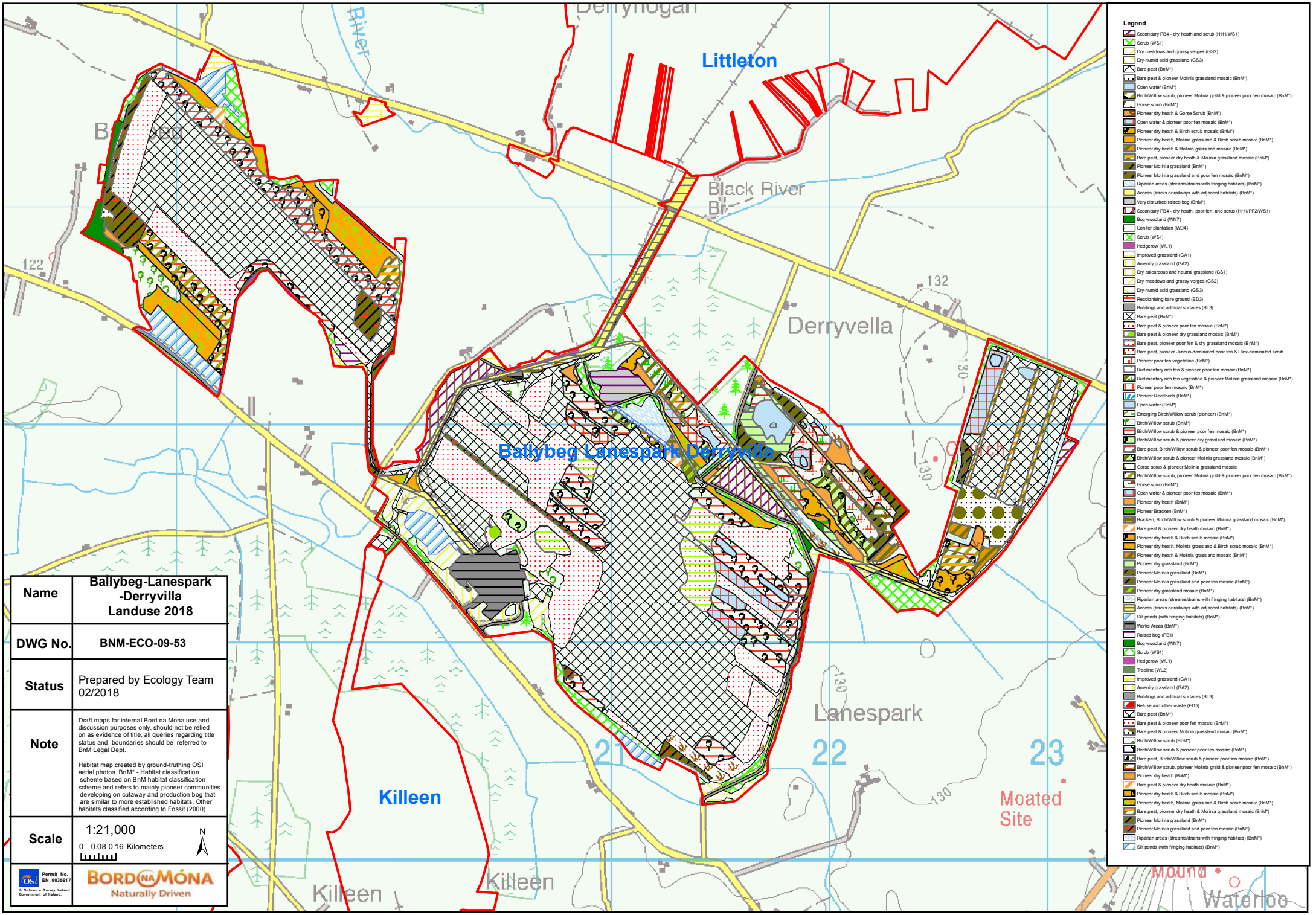
Bord na Mońa habitat classification scheme

	General	Vegetation community [1]	BnM habitat code	Equivalent Heritage Council codes [2]
Pioneer habitats of industrial cutaway	Peatland	Bare peat (0-50% cover)	BP	ED2
		Embryonic bog community (containing *Sphagnum* and Bog Cotton)	PBa	PB
		Embryonic bog community (Calluno-Sphagnion)	PBb	PB
	Flush and Fen	Pioneer *Campylopus*-dominated community	pCamp	PF2
		Pioneer *Juncus effusus*-dominated community (Soft Rush)	pJeff	PF2
		Pioneer *Eriophorum angustifolium*-dominated community (Bog Cotton)	pEang	PF2
		Pioneer *Juncus bulbosus*-dominated community (Bulbous Rush)	pJbulb	PF2
		Pioneer *Triglochin palustris*-dominated community (Marsh Arrowgrass)	pTrig	PF2
		Pioneer Caricion davallianae-Community with *Cladium* (rich fen)	pCladium	PF1
		pioneer *Schoenus nigricans* community (rich fen)	pSchon	PF1
		pioneer *Carex viridula*/brown moss community (rich fen)	pVir	PF1
	Emergent communities	Pioneer *Carex rostrata*-dominated community (Bottle Sedge)	pRos	PF2/FS1
		Pioneer *Phragmites australis*-dominated community (Common Reed)	pPhrag	FS1
		Pioneer *Typha latifolia*-dominated community (Reedmace)	pTyp	FS1
		Pioneer *Schoenoplectus lacustris*-dominated community (Bulrush)	pSch	FS1
	Open water	Charaphyte-dominated community	pChar	FL2
		Permanent pools and lakes	OW	FL2
		Temporary open water	tOW	
	Woodland and scrub	Emergent *Betula*/*Salix*-dominated community (A) (Birch/Willow)	eBir	WS1
		Open *Betula*/*Salix*-dominated community (B) (Birch/Willow)	oBir	WS1
		Closed *Betula*/*Salix*-scrub community (C) (Birch/Willow)	cBir	WS1
		Ulex europaeus-dominated community (Gorse)	eGor	WS1
		Betula/*Salix*-dominated woodland (Birch/Willow)	BirWD	WN7
	Heathland	Pioneer dry *Calluna vulgaris*-dominated community (Heather)	dHeath	HH1
		Dense *Pteridium aquilinum* (Bracken)	dPter	HD1
	Grassland	Pioneer dry calcareous and neutral grasssland (Centaureo-Cynosuretum)	gCal	GS1
		Dactylis-Anthoxanthum-dominated community (Cocksfoot-Sweet Vernalgrass)	gCo-An	GS2
		Anthoxanthum-Holcus-Equisetum community (Sweet Vernalgrass-Yorkshire Fog-Horsetail)	gAn-H-Eq	GS
		Molinia caerulea-dominated community (dry) (Purple Moorgrass)	gMol	GS4
		Marsh (Meadowsweet and other tall herbs) (Filipendulion ulmariae)	Mar	GM1
	Disturbed	*Tussilago farfara*-dominated community (vegetation > 50%) (Colt's Foot)	DisCF	ED3
		Epilobium-dominated community (vegetation > 50%) (Willowherb spp.)	DisWil	ED3
	General	Riparian areas (streams or drain with associated edge habitats (e.g. FW2/4 + WS1, GS2 etc)	Rip	FW2 +
		Silt Ponds (artificial ponds with associated bank habitats (e.g. FL8 + WS1, GS2, ED2, ED3)	Silt	FL8 +
		Access (tracks or railways with associated edge habitats (e.g. BL3 + gCal, gMol, eGor etc)	Acc	BL3 +
		Works areas (predominately built land but can include landscaped and brownfield habitats (e.g. GA2, WS3, WD4, ED2, ED3)	Works	BL3 +

[1] These are generally pioneer habitats of bare peat and the communities can contain a significant proportion of bare peat. Some habitats are more developed than others. They frequently occur in mosaic with each other.
[2] Not all these communities are equivalent to habitat classes used by The Heritage Council habitat classification scheme (Fossitt 2000) as some are quite rudimentary and undeveloped.

Heritage Council habitat classification scheme (Fossitt 2000)

	General	Habitat	Heritage Council code
Semi-natural and modified habitats	Peatlands	Raised Bog	PB1
		Lowland Blanket bog	PB3
		Cutover Bog	PB4
		Rich fen and flush	PF1
		Poor fen and flush	PF2
		Transition mire and quaking bog	PF3
	Woodland and scrub	Oak-Birch-Holly woodland	WN1
		Oak-Ash-Hazel woodland	WN2
		Wet Pendunulate Oak-Ash woodland	WN4
		Riparian Woodland	WN5
		Wet Willow-Alder-Ash woodland	WN6
		Bog woodland	WN7
		Mixed broad-leaved woodland	WD1
		Mixed broad-leaved/conifer woodland	WD2
		Conifer plantation	WD4
		Scrub (Gorse)	WS1
		Emergent Betula-dominated community	WS1
		Closed Betula scrub community	WS1
		Recently-planted woodland	WS2
		Ornamental scrub	WS3
		Short-rotation coppice	WS4
		Recently-felled woodland	WS5
	Linear woodland	Hedgerow	WL1
		Treeline	WL2
	Grasslands and Marsh	Improved grassland	GA1
		Amenity grassland	GA2
		Dry calcareous and neutral grassland	GS1
		Dry meadows and grassy verges	GS2
		Dry-humid acid grassland	GS3
		Wet grassland	GS4
		Freshwater Marsh	GM1
	Heath and Bracken	Dry Heath	HH1
		Dry calcareous Heath	HH2
		Wet Heath	HH3
		Dense Bracken	HD1
	Disturbed ground	Exposed sand, gravel or till	ED1
		Spoil and bare ground	ED2
		Recolonising bare ground	ED3
		Active quarry	ED4
	Freshwater	Acid Oligotrophic lakes	FL2
		Mesotrophic lakes	FW4
		Artificial ponds (slit ponds)	FL8
		Depositing rivers	FW2
		Canals	FW3
		Drains	FW4
	Cultivated and Built land	Stonewalls and other stonework	BL1
		Earth Banks	BL2
		Buildings and artificial surfaces	BL3
		Arable crops	BC1
		Horticulture	BC2
		Tilled land	BC3


Littleton
Black River
Derryvella
Ballybeg Lanespark Derryvilla
Lanespark
Killeen
Killeen
Killeen
Moated Site
Mound
Waterloo
21
22
23
122
132
130
130
130
130
Name
Ballybeg-Lanespark -Derryvilla Landuse 2018
DWG No.
BNM-ECO-09-53
Status
Prepared by Ecology Team 02/2018
Note
Draft maps for internal Bord na Mona use and discussion purposes only, should not be relied on as evidence of title, all queries regarding title status and boundaries should be referred to BnM Legal Dept.
Habitat map created by ground-truthing OSI aerial photos. BnM* - Habitat classification scheme based on BnM habitat classification scheme and refers to mainly pioneer communities developing on cutaway and production bog that are similar to more established habitats. Other habitats classified according to Fossit (2000).
Scale
1:21,000
0 0.08 0.16 Kilometers
N
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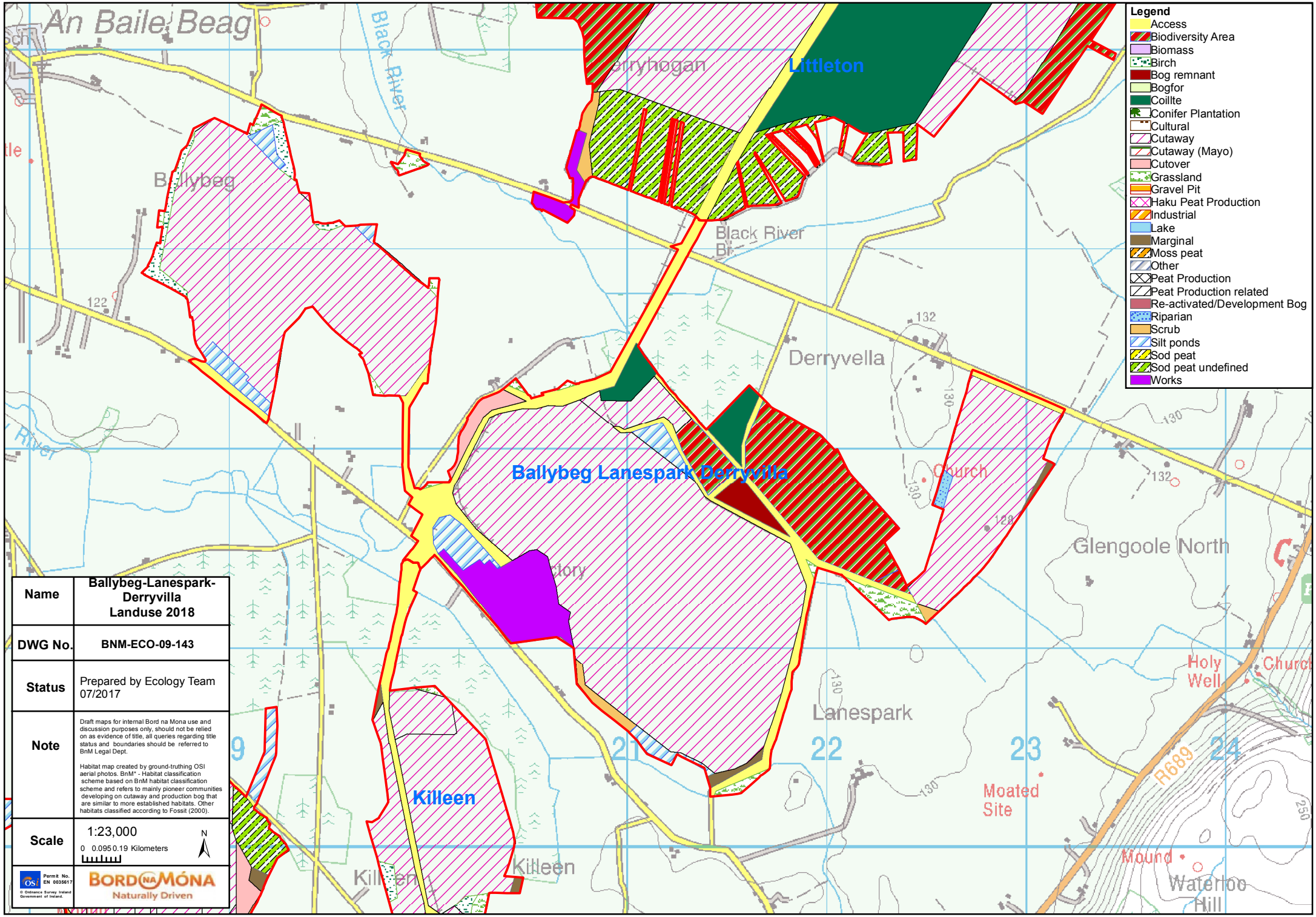
Legend
Secondary PB4 - dry heath and scrub (HH1/WS1)
Scrub (WS1)
Dry meadows and grassy verges (GS2)
Dry-humid acid grassland (GS3)
Bare peat (BnM*)
Bare peat & pioneer Molinia grassland mosaic (BnM*)
Open water (BnM*)
Birch/Willow scrub, pioneer Molinia grsld & pioneer poor fen mosaic (BnM*)
Gorse scrub (BnM*)
Pioneer dry heath & Gorse Scrub (BnM*)
Open water & pioneer poor fen mosaic (BnM*)
Pioneer dry heath & Birch scrub mosaic (BnM*)
Pioneer dry heath, Molinia grassland & Birch scrub mosaic (BnM*)
Pioneer dry heath & Molinia grassland mosaic (BnM*)
Bare peat, pioneer dry heath & Molinia grassland mosaic (BnM*)
Pioneer Molinia grassland (BnM*)
Pioneer Molinia grassland and poor fen mosaic (BnM*)
Riparian areas (streams/drains with fringing habitats) (BnM*)
Access (tracks or railways with adjacent habitats) (BnM*)
Very disturbed raised bog (BnM*)
Secondary PB4 - dry heath, poor fen, and scrub (HH1/PF2/WS1)
Bog woodland (WN7)
Conifer plantation (WD4)
Scrub (WS1)
Hedgerow (WL1)
Improved grassland (GA1)
Amenity grassland (GA2)
Dry calcareous and neutral grassland (GS1)
Dry meadows and grassy verges (GS2)
Dry-humid acid grassland (GS3)
Recolonising bare ground (ED3)
Buildings and artificial surfaces (BL3)
Bare peat (BnM*)
Bare peat & pioneer poor fen mosaic (BnM*)
Bare peat & pioneer dry grassland mosaic (BnM*)
Bare peat, pioneer poor fen & dry grassland mosaic (BnM*)
Bare peat, pioneer Juncus-dominated poor fen & Ulex-dominated scrub
Pioneer poor fen vegetation (BnM*)
Rudimentary rich fen & pioneer poor fen mosaic (BnM*)
Rudimentary rich fen vegetation & pioneer Molinia grassland mosaic (BnM*)
Pioneer poor fen mosaic (BnM*)
Pioneer Reedbeds (BnM*)
Open water (BnM*)
Emerging Birch/Willow scrub (pioneer) (BnM*)
Birch/Willow scrub (BnM*)
Birch/Willow scrub & pioneer poor fen mosaic (BnM*)
Birch/Willow scrub & pioneer dry grassland mosaic (BnM*)
Bare peat, Birch/Willow scrub & pioneer poor fen mosaic (BnM*)
Birch/Willow scrub & pioneer Molinia grassland mosaic (BnM*)
Gorse scrub & pioneer Molinia grassland mosaic
Birch/Willow scrub, pioneer Molinia grsld & pioneer poor fen mosaic (BnM*)
Gorse scrub (BnM*)
Open water & pioneer poor fen mosaic (BnM*)
Pioneer dry heath (BnM*)
Pioneer Bracken (BnM*)
Bracken, Birch/Willow scrub & pioneer Molinia grassland mosaic (BnM*)
Bare peat & pioneer dry heath mosaic (BnM*)
Pioneer dry heath & Birch scrub mosaic (BnM*)
Pioneer dry heath, Molinia grassland & Birch scrub mosaic (BnM*)
Pioneer dry heath & Molinia grassland mosaic (BnM*)
Pioneer dry grassland (BnM*)
Pioneer Molinia grassland (BnM*)
Pioneer Molinia grassland and poor fen mosaic (BnM*)
Pioneer dry grassland mosaic (BnM*)
Riparian areas (streams/drains with fringing habitats) (BnM*)
Access (tracks or railways with adjacent habitats) (BnM*)
Silt ponds (with fringing habitats) (BnM*)
Works Areas (BnM*)
Raised bog (PB1)
Bog woodland (WN7)
Scrub (WS1)
Hedgerow (WL1)
Treeline (WL2)
Improved grassland (GA1)
Amenity grassland (GA2)
Buildings and artificial surfaces (BL3)
Refuse and other waste (ED5)
Bare peat (BnM*)
Bare peat & pioneer poor fen mosaic (BnM*)
Bare peat & pioneer Molinia grassland mosaic (BnM*)
Birch/Willow scrub (BnM*)
Birch/Willow scrub & pioneer poor fen mosaic (BnM*)
Bare peat, Birch/Willow scrub & pioneer poor fen mosaic (BnM*)
Birch/Willow scrub, pioneer Molinia grsld & pioneer poor fen mosaic (BnM*)
Pioneer dry heath (BnM*)
Bare peat & pioneer dry heath mosaic (BnM*)
Pioneer dry heath & Birch scrub mosaic (BnM*)
Pioneer dry heath, Molinia grassland & Birch scrub mosaic (BnM*)
Bare peat, pioneer dry heath & Molinia grassland mosaic (BnM*)
Pioneer Molinia grassland (BnM*)
Pioneer Molinia grassland and poor fen mosaic (BnM*)
Riparian areas (streams/drains with fringing habitats) (BnM*)
Silt ponds (with fringing habitats) (BnM*)



Name	**Ballybeg-Lanespark-Derryvilla Landuse 2018**
DWG No.	**BNM-ECO-09-143**
Status	Prepared by Ecology Team 07/2017
Note	Draft maps for internal Bord na Mona use and discussion purposes only, should not be relied on as evidence of title, all queries regarding title status and boundaries should be referred to BnM Legal Dept. Habitat map created by ground-truthing OSI aerial photos. BnM* - Habitat classification scheme based on BnM habitat classification scheme and refers to mainly pioneer communities developing on cutaway and production bog that are similar to more established habitats. Other habitats classified according to Fossit (2000).
Scale	1:23,000 0 0.095 0.19 Kilometers N
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Rehabilitation Plan

2018

Littleton Bog

This rehabilitation plan is developed under Condition 10 of IPC Licence Ref. PO-409-01 (June 2018). It outlines measures that will provide for stabilisation of the bog area upon cessation of industrial peat production and decommissioning of the site. ***Rehabilitation*** *generally comprises natural colonisation with or without targeted management.* ***After-use*** *involves the development of cutaway peatland into other land-uses. Rehabilitation can be incorporated into after-use development (e.g. Mountlucas Windfarm). Bord na Móna has focused after-use development of cutaway bogs into forestry, agriculture, grassland, amenity and biodiversity, (Lough Boora Discovery Park) and commercial industrial development (Drehid Resource Recovery, renewable energy – Mountlucas Windfarm). This rehabilitation plan* ***does not*** *outline future after-use development for Littleton Bog. The general after-use strategy of Bord na Móna is outlined in the Bord na Móna Strategic Framework for Future-Use of Cutaway Bogs 2011 (currently being updated by Bord na Móna). Any consideration of future after-uses for Littleton Bog such as amenity, developments or mixed uses will be conducted following the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.*

Rehabilitation of industrial peatlands is a key objective of the Bord na Móna Biodiversity Action Plan 2016-2021. This action plan outlines the main objectives and actions around biodiversity on Bord na Móna lands.

Rehabilitation Plan			
Bog Name:	**Littleton**	**Area (ha):**	995 ha
Works Name:	Littleton	**County:**	Tipperary
Author(s):	BnM Ecology Team	**Survey/ Monitoring Date(s):**	23-24/08/2012, 10/05/2013, 12/08/2014, 24/09/2014, 20/2/2015 & 12/05/2017
Maps:	Habitats Map, Landuse Map		

Review status: Reviewed June 2018.

Background

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Littleton bog group (Ref. PO-409-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Littleton bog is part of the Littleton bog group. This plan is a specific rehabilitation plan for Littleton bog and outlines:

- criteria which define the successful rehabilitation,
- consultation to date with interested parties,
- main issues for rehabilitation,
- proposed rehabilitation programme,
- proposed timeframe to implement this programme, and,
- associated aftercare, maintenance and monitoring.

The basis for the proposed approaches and implementation is the experience gained in 40 years of research on the after-use development and rehabilitation of the Bord na Móna cutaway bogs (see reference documents).

Scope

The scope of the rehabilitation plan seeks to address issues of concern as identified by Bord na Móna and the consultees. The key issues identified are:

- Categorisation of the habitats developing on Littleton Bog (outlined in Appendix II)
- Environmental stabilisation of the former industrial peat production areas
- Maintenance of drainage and silt control through the site
- Remediation of water courses where necessary *(decommissioning)*
- The timeframe for bog rehabilitation/restoration
- The impact of any other proposed development on the site and rehabilitation plan

List of consultees to date

- Open consultation with range of stakeholders at annual BAP review days 2010-2018.
- Consultation with the North Tipperary Heritage Forum during the period 2010-2015.
- General consultation at a local community event in Littleton in Dec 2016.
- Meeting with local people at Loch Doire Bhile in June 2018.
- Consultation with local Birdwatch Ireland Tipperary Branch regarding Curlew breeding on the site (2018).

Site description

Littleton is located in north Co. Tipperary, 3km from Littleton village. It is part of the Littleton Bog group with Longfordpass Bog to the north and Ballybeg bog to the south. A BnM railway passes through the site and is connected to the northern BnM sites to the wider Littleton network. Littleton bog is found in a lowland landscape and is mostly surrounded by farmland and Coillte forestry. Littleton is a relatively long (extending for 7 km along the railway) and narrow bog. It is bordered to the north by a minor road (that separates Littleton from the adjacent Longford Pass BnM property). The bog has developed in a basin in the landscape and one noticeable feature of the site is that parts of the western margin are at a much higher level (10 m) compared to the central section along the railway. Up until 2017/2018, much of Littleton was managed for industrial milled peat production so there are still significant bare peat areas. There is also a substantial area of older cutaway areas that are vegetated.

Littleton was classed as a relatively old industrial peat production bog. Large-scale industrial peat production began in the 1940's when sod turf was produced for fuel, by manual labour. Sod peat production was mechanised during the 1950's. Milled peat production began in the 1970's and milled peat was supplied to the Briquette factory at Lanespark, which was constructed in 1981. Some of the sod peat production areas in the bog were converted to milled peat production. Some conifer plantation was developed at the southern end of the bog in the 1980's by Coillte. The main central part of the bog came out of production prior to 2000 and has been developing as cutaway. Much of the peat was cut out of this section and the underlying glacial subsoil was exposed in places, and some wetlands had developed by this stage. There is no longer active milled peat production on any part of the bog by Bord na Móna.

The central part of the bog is classed as cutaway for some time. The underlying glacial topography is quite influential. There are many localised wetlands where there are basins with open water and wet peatland vegetation, and some of these are divided by mounds or ridges where there is drier habitat development with Birch scrub, dry heath and some pioneer grassland communities. Pine is colonising the north-east section from an adjacent conifer plantation. This area has also been further sub-divided by a series of deep trench drains and associated high fields. These divide the bog into regularly grouped series of fields. The high fields act as berms to maintain small wetland areas. This part of the bog has a pumped drainage system and water levels rose when pumping was reduced. Pumping in this area has not ceased yet (up until 2018) as it is still required to protect milled peat stocks and the industrial railway.

These are several old former sod peat production areas that have naturally re-colonised over a long period. Re-vegetation tends to be dominated by Heather-dominated and Bog Cotton-dominated vegetation, in mosaic with scattered Birch scrub and small amounts of Purple Moor-grass dominated vegetation. There are also other elements of raised bog vegetation present, due to the presence of more acidic deeper peat, although *Sphagnum* re-generation in the drier areas is poor. Some of the wetter areas have excellent *Sphagnum* re-generation and can be classed as embryonic peat-forming *Sphagnum* communities. Overall re-vegetation has been excellent with only the travel paths still having significant bare peat. Several sod peat bays have been cut to a much lower level than the surrounding bog and have now developed as wet peatlands. These wetlands attract significant amount of wildfowl. There are also patches of significant *Sphagnum* re-generation associated with the more acidic water chemistry of these areas.

Industrial peat production programme, land-use and proposed developments

- In 2017, Bord na Móna announced the closure of the Littleton Briquette factory and the cessation of industrial peat production in a number of cutaway bogs within the Littleton Bog Group, including Littleton Bog. Under Condition 10 of IPC Licensing, rehabilitation measures outlined in this document will be carried out to ensure environmental stabilisation of the former production bog.
- A small area (10 ha) at the northern end of Littleton Bog has recently been planted with Eucalyptus as a commercial biomass trial (2018).
- Bord na Móna are currently assessing options for renewable energy and other commercial development across these lands.

Other considerations

- **Cessation of industrial peat production.** Bord na Móna announced in 2015 that industrial peat production for the generation of electricity was to cease by 2030 (http://www.bordnamona.ie/wp-content/uploads/2016/01/Sustainability_Statement_2015.pdf). Industrial peat production (with regard to all appropriate regulations) by Bord na Móna to supply other customers or sectors (e.g. horticulture) may continue after this date.
- **Peat extraction regulations.** New regulations for the extraction of peat are currently being drafted by government. Peat extraction on sites greater than 30 ha will be regulated through IPC licencing administered by the EPA. This draft rehabilitation plan has been prepared under the conditions of the original IPC licence.
- **Decommissioning.** Requirements for Decommissioning are outlined in Condition 10.1 of the IPC Licence. Decommissioning generally occurs prior to the rehabilitation phase. However, in some circumstances, both phases can be carried out together. Decommissioning of Littleton Bog will be carried out in full, as per requirements of Condition 10.1.
- **Bord na Móna infrastructure**. This bog railway was an active link to the former operational Littleton Briquette factory. Decommissioning of this infrastructure will be required in line with the cessation of industrial peat production at Littleton and the onset closure of Littleton Briquette factory.
- **Re-wetting potential.** Littleton has a partially pumped-drainage system. Several sub-basins formerly in in industrial peat production are likely to re-wet to some extent if pumps stop operating. Bogs with pumped drainage are more likely to develop wet peatland habitats as industrial peat production ceases. These pumps are likely to remain operational into the medium-term at least until the industrial railway is decommissioned. Any future after-use development of the site, such as renewable energy, may also have continued pumping requirements.
- **Private sod peat production**. There is some active private sod-peat cutting around the margins of the site.
- **Coillte forestry**. Coillte have developed a relatively large area of forestry on the site (area leased from Bord na Móna).

Key biodiversity features of interest (2018)

- Littleton contains a significant amount of wetland and open water scattered across the site. Some of this wet peatland provides breeding habitat for wetland birds (Copland, 2011)) as well as refuge for wintering wildfowl. Some duck (Mallard and Teal) were noted on one of the larger wetlands close to the margin of the site. The extent of wet peatland habitat is likely to increase in the future when the bog comes out of production. These wetland areas are likely to continue to mature and become more structurally diverse in the future. Shoveler Duck, a scarce breeder in Ireland, was confirmed breeding on the site in 2018 (Birdwatch Ireland Tipp).
- Littleton is used by wintering Hen Harrier, Merlin and by small flocks of Whooper Swans (Biosphere Environmental Services 2014). The small wetlands are regularly used by wintering wildfowl. Breeding Curlew has also been recorded on the site. This is a particularly rare Red-listed bird species. The wetlands also support a colony of Black-headed Gull, another Red-listed breeding species. Copland (2011) also recorded breeding Curlew in the south-west part of the site – this is a red listed species that prefers open Heather-dominated habitats. Copland (2011) recorded breeding Lapwing using some of the more open production areas. Curlew are still confirmed breeding on the site (2018).
- Marsh Fritillary butterfly, an Annex II species, has been recorded on the site.
- Littleton also contains a significant area of bog remnant that was formerly partially used for sod peat cutting. Much of these bog remnants and former sod peat areas have completely re-vegetated and have been zoned for biodiversity by BnM. The relatively deep remnant peat is indicative that there is a large mainly Heather-dominated area on the site. *Sphagnum*-rich vegetation is also present, indicating some regeneration.
- As much of the bog has developed secondary peatland habitats, it forms a relatively large refuge for wildlife.
- Plant species of particular conservation value that were recorded on the site include Blue Fleabane and Marsh Hellebore. Blue Fleabane is a Red Data Book species.

Current ecological rating ranges from County to Local Importance (lower value); following NRA (2009) Evaluation Criteria.

The site supports areas of bog remnant habitat that could qualify as the EU Annex I habitat 'degraded raised bog still capable of natural regeneration (7120)' deemed to be of **national importance**. In addition, the site supports breeding Curlew, a species whose breeding population has experienced drastic declines on a national level, presence of wintering Hen Harrier; and the establishment of *Sphagnum*-rich poor fen habitat deemed to be of **County Importance**. Other sections of the site support semi-natural habitats such as birch woodland, pioneer cutaway habitats and smaller sections of high bog deemed to be of **local importance; higher value**. Areas of bare peat are characterised as **local importance; lower value**.

Part of the forestry plantation on site has been classified as a biodiversity area by Coillte.

It is expected that the overall ecological value of the new cutaway areas will increase somewhat in the future as the site re-vegetates and forms semi-natural habitats, such as more extensive wet peatland mosaics.

Criteria defining successful rehabilitation

- The main criteria are stabilisation of the industrial peat production area and mitigation of potential silt run-off.

Industrial peat production has now ceased at Littleton Bog and the decommissioning and rehabilitation phases will start immediately. Natural colonisation will form the basis for the environmental stabilisation of the bare peat areas. A significant part of the site has already developed as cutaway and some has quite well-established secondary peatland habitats already. Comparison of 1995 aerial photos to more recent aerial photo series shows that there have been significant changes in the central cutaway area in the past 20 years, as much of this part of the bog was in full industrial milled peat production in 1995. Now the majority of this area is vegetated. The bare peat cutaway has varying environmental characteristics including a variable topography. Re-wetting of the cutaway, where possible, is a general rehabilitation strategy.

Blocking of former peat production field drains will be carried out across the site to rewet the dry peat surface and facilitate vegetation establishment. This will mitigate against drying out of the peat soil surface and facilitate stabilisation of the peat with naturally colonising plants. Turning off the pump(s) and outfall modifications can also help raise water levels and re-wet peat. The main objective of hydrological management and re-wetting will be to re-establish surface drainage across the cutaway, where possible. These wetter areas will aid the trapping of silt within the site, by slowing down water movement and acting as natural silt control areas. Some of the site will remain relatively dry due to natural conditions. The central and southern areas are low-lying and have pumped drainage. These areas are likely to naturally re-wet and develop wet peatland habitats with open water if pumps are turned off. There may be some potential for some development of rich fen in the wetlands, as potential rich fen indicators have already been recorded on site. Future after-use of the site will be considered when planning pump decommissioning. Hydrological management will be key in relation to managing optimum water levels across the site and avoiding any negative impacts, for example to neighbouring land. This is likely to require adjustment of outfall levels on a phased basis.

No drain-blocking will be carried out drains around the margin of the site. Rehabilitation will be carried out in a manner that does not impact on neighbouring land. It is expected that water will still flow out of the site at the various emission points, through existing silt ponds, which will be maintained until it is deemed that rehabilitation and site stabilisation has been successful.

Littleton contains several relatively large sections of deep peat along the western margin, which have been classed as peat reserves in the past but have now been zoned for biodiversity by BnM. These areas were partially used for industrial sod peat production in the past but were abandoned and have largely re-vegetated completely already. There will be an assessment of these sections to block drains and promote re-establishment of more typical bog communities such as *Sphagnum* (embryonic peat-forming communities). Already there is excellent development of embryonic *Sphagnum* communities where there are favourable conditions. A localised intensive drain-blocking programme could have the potential to enhance raised bog re-generation in these areas. This is only possible where an acidic layer of peat remains in situ and where the water level of drains can be returned to the surface of the peat. This would require a level survey and a comprehensive drain blocking regime. The main objective of hydrological management and re-wetting will be to re-establish surface drainage across these areas,

where possible. Some of the former peat reserve areas would not be suitable for this type of rehabilitation as they are likely to remain relatively dry. These drier areas are likely to revert to a mosaic of Heather-dominated dry heath and Birch scrub.

No active rehabilitation is anticipated for any of the other remnant raised bog (PB1) around the margins of the site as these areas are still being used for private sod peat cutting or are too small for any active raised bog restoration and will be allowed to develop naturally.

- Remediation of silt ponds and watercourses where required.
- At this point in time, a large proportion of (~42%) the site is expected to develop as woodland and scrub, about 13% is likely to develop as a wet peatland habitat mosaic, and 32% has the potential to develop as embryonic raised bog communities, with the remainder being other habitats.

Proposed Rehabilitation programme

Completed

- A significant part of the site has already re-vegetated, with pioneer vegetation maturing and developing a mosaic of typical cutaway peatland habitats with Birch woodland predominating. Bare peat areas within the older cutaway areas are limited. Natural re-colonisation of the cutaway so far has been quite effective.
- A portion of the site has already been developed as a conifer plantation by Coillte.

Ongoing

- Other parts of the site (younger cutaway) are naturally colonising for > 10 years and are developing a mosaic of cutaway habitats. Natural re-colonisation of the cutaway so far has been quite effective. Bare peat areas within the cutaway parts of the site are shrinking as vegetation develops and consolidates.

Short-term (0-3 years)

- There will be ongoing monitoring of the site and appropriate rehabilitation planning related to any changes in land-use or proposed developments in the future at Littleton.
- Assessment of re-wetting scenarios and site drainage to be carried out to assess the potential to enhance peat re-wetting and potential impacts on adjacent lands, including potential impacts of turning pump off.
- Carry out a trial programme of rehabilitation works.
- Assessment of potential ecological impacts associated with active rehabilitation management measures at Littleton Bog.
- Significant bare peat areas within the site and the progress of natural re-colonisation of the cutaway areas will be monitored.
- All stock-piles will be removed from the site as part of the decommissioning phase of industrial peat production operations.
- Implementation of re-wetting measures such as drain blocking and, outfall modification.
- Natural colonisation is expected to proceed almost immediately once industrial peat production ceases. The most sustainable management option for un-vegetated areas within the site is to allow continued natural re-colonisation, in association with re-wetting, where possible.
- Significant bare peat areas through the site and the progress of natural re-colonisation of the cutaway areas will be monitored.
- Silt-ponds will be monitored during this period and there will be continued maintenance and cleaning (if required) to prevent silt run-off from the site during the rehabilitation phase.

Medium-term (5 years)

- Targeted active management such as seeding of a nursery crop or use of fertiliser to help promote natural re-colonisation (see Drumman Rehabilitation Trials) will be carried out, if natural re-colonisation of significant bare peat areas within the active production areas has not progressed satisfactorily at this stage.
- The effect of any targeted active management will be monitored and further work determined.
- Silt-ponds will be monitored during this period and there will be continued maintenance and cleaning (if required) to prevent silt run-off from the site during the rehabilitation phase.

Long-term (>5 years)

- Monitoring of the site to ensure stabilisation and complete re-vegetation.
- Evaluate success of short-term rehabilitation measures outlined above and enhance where necessary (to be determined by selected short-term management above).
- Decommissioning of silt-ponds will be assessed.
- Reporting to the EPA will continue until the site is deemed environmentally stable.
- IPC License surrender process begins.

Timeframe for rehabilitation

Short-term (2018-2021)

- Assessment of re-wetting scenarios and site drainage to be carried out to assess the potential to enhance any re-wetting of peat in Littleton Bog and potential impacts on adjacent lands, including potential impacts of turning pumps off.
- Assessment of potential ecological impacts associated with active rehabilitation management measures at Littleton.
- All stock-piles should be removed from the site as part of the decommissioning phase of industrial peat production operations.
- Implementation of any required re-wetting measures including drain blocking and outfall modification.
- Significant bare peat areas through the site and the progress of natural re-colonisation of the cutaway areas will be monitored.
- On-going monitoring of the overall site; monitoring of Curlew and other targeted species of conservation interest.
-

Medium-term (2023)

- Targeted active management such as seeding of a nursery crop or use of fertiliser to help promote natural re-colonisation (see Drumman Rehabilitation Trials) will be carried out, if natural re-colonisation of significant bare peat areas has not progressed satisfactorily at this stage.
- The effect of any targeted active management will be monitored and further work determined.

Long-term (2023 -)

- Continued monitoring and planning will take place to assess further rehabilitation requirements at this site.
- Evaluate success of short-term rehabilitation measures outlined above and enhance where necessary (to be determined by selected short-term management above).
- Reporting to the EPA will continue until the site is deemed environmentally stable.
- IPC License surrender process begins.

After-care and maintenance

- There will be annual assessments of the site to determine the progress of the rehabilitation work and requirements for further enhancement measures.
- It is not expected that there will be any requirement for after-care and maintenance other than ecological monitoring.
- Where other uses are proposed for the site, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the appropriate assessment and planning procedures.

Potential future natural habitats on the site

This section attempts to predict the development of natural habitats on the site, assuming current land-use and known after-use plans for the cutaway (no specific BnM development planned yet for Littleton Bog). This prediction is based on research and methods used to predict the natural vegetation of Ireland (Cross, 2006). Cross (2006) predicted that cutaway bog is likely to develop a mosaic of Birch forest, alder and ash-alder carr, fen and heath in the future. There is no time-line given for the development of these habitats, although it could be expected that the development of natural climax habitats could take hundreds of years. The complexity is the result of small scale variations in the substrate and other environmental factors such as drainage and ground-water influence.

- A large part of the site is expected to develop dry species-poor Birch woodland (WN7) in the drier areas. There is likely to be a succession from a mosaic of Birch scrub, dry grassland, and poor fen/wet grassland vegetation types to this type of woodland. The time required for development of closed woodland from cutaway is likely to vary significantly. If significant well-drained gravel areas are exposed with further production, these may develop somewhat differently with woodland with some elements of Oak-Ash-Hazel woodland developing.
- Wetland mosaics (FL3/FS1/PF2/WN6) could be expected to develop in the central zone and northern former production area due to the influence of the local topography and hydrology. Some wetlands have already developed in this area. The extent of wet peatland habitats could be increased with suitable management. Some open water could be created depending on the final depth of water.
- The former peat reserve areas with disturbed deeper peat could be expected to develop secondary raised bog communities (PB1), Sphagnum-rich peat-forming transition mire communities and pools (PF3/FL2), some heathland habitats (HH1/HH3/PF2) in mosaic with scrub and Birch woodland (WN7).
- Some of the dry mounds where gravel is exposed would be expected to develop Birch woodland with some elements of Oak-Ash-Hazel woodland (WN2).
- Several small areas some indicators of potential rich fen (PF1). This habitat is expected to develop on the site in association with some of the wetlands. However, it is difficult at this time to assess the future extent of this habitat.
- Most of the smaller dry high bog remnants and cutover bog around the margins are likely to be slowly invaded by scrub and develop into Birch woodland (WN7) and mixed heathland (PB1/HH1/PF2/HH3) as they dry out, if they are not cut for sod-peat.
- Grassy areas along the access zones are likely to remain as meadow grassland (GS3), with continual grazing. This could aid the development of species-rich grassland.

Budget and costing

- It is anticipated that the majority of the rehabilitation at this site will be through natural re-colonisation. Some preliminary budgeting can be carried out assuming that approximately 32% of the site will be developed as embryonic raised bog communities with an appropriate drain-blocking programme. 12% will be developed as wetlands with some active management required (drain-blocking) enhance re-wetting. The allocated rehabilitation provision will be based on this estimate. This will be subject to change related to future peat requirements and the utilisation of peat reserve areas.

APPENDIX I

Ecological Survey Report

Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value. The report outlines potential options for biodiversity management after industrial peat production has ceased, (if this is the proposed main land-use for the site).

Bog Name:	**Littleton**	**Area (ha):**	995 ha
Works Name:	Littleton	**County:**	Tipperary
Recorder(s):	MMC	**Survey Date(s):**	23-24/08/2012

Habitats present (in order of dominance)

The most common pioneer habitats present in the former production areas include:

- Bare peat (BP) (Codes refer BnM classification of pioneer habitats of production bog. See Appendix II).
- Birch/Willow scrub (eBir/oBir/cBir)
- Pine-dominated scrub (ePine/oPine)
- Pioneer Soft Rush-dominated or Bog Cotton-dominated poor fen (pJeff/pEang)
- Open water (wetlands also contain emergent pioneer poor fen – pEang/pJeff/pRos)
- Pioneer dry heath (dHeath) (in mosaic frequently with pEang)
- Embryonic raised bog community (Bog Cotton-dominated vegetation with *Sphagnum* (EM –pEangS)
- Embryonic raised bog community (*Sphagnum*-rich vegetation with PB1 species)
- Pioneer Purple Moorgrass-dominated vegetation (gMol) (frequently in mosaic with dHeath and oBir along high fields and other areas),
- Bulrush-dominated Reedbeds (pTyph) (small infilled wetlands)
- Common Reed-dominated Reedbeds (pPhrag)
- Pioneer poor fen with Marsh Arrowgrass (pTrig)
- Pioneer acidic grassland (gAn-H-Eq) (in mosaic with scrub, gMol and pJeff on some of the drier mounds where gravel was exposed)
- Pioneer potential rich fen (pRos/pVir with some Black Bog-rush)
- Railway (Acc) (with some exposed gravel - ED2/ED3/DisTuss)

The most common habitats found around the margins of the former production bog and other sections include:

- Conifer plantation (WD4) (Codes refer to Heritage Council habitat classification, Fossitt 2000), See Appendix II)
- Cutover Bog (PB4)
- Secondary cutover bog – now mosaic of dry heath, poor fen and scrub (HH1/HH3/PF2/WS1)
- Scrub (WS1)
- Raised bog (PB1) (minor remnants) with poor fen flushes (PF3)
- Birch woodland (WN7)
- Dense Bracken (HH3)

- Acid grassland (GS3)
- Improved grassland (GA1) (privately-managed land along margins)

Description of site

Littleton is located in north Co. Tipperary, 3km from Littleton village. It is part of the Littleton Bog group with Longfordpass Bog to the north and Ballybeg bog to the south. A BnM railway passes through the site and connects the northern BnM sites to the wider Littleton network. Littleton bog is found in a lowland landscape and is mostly surrounded by farmland and Coillte forestry. The bog has developed in a basin in the landscape and one noticeable feature of the site is that parts of the western margin are at a much higher level (10 m) compared to the central section along the railway and in the former milled peat production areas. The site comprises a relatively long and narrow bog (extending for 7 km along the railway). It is bordered to the north by a minor road (that separates Littleton from the adjacent Longford Pass BnM property). One feature of Littleton Bog is that much of it is relatively remote and inaccessible and the main access points are at the northern and southern ends where there are railway crossings. There is also a travel path along the railway, but this is over peat in places and in poor condition. This inaccessibility probably means that there is less unauthorised access to this bog compared to other BnM bogs in the Littleton group. As of 2017/2018, industrial peat production has ceased on all parts of the bog with onset closure of Littleton Briquette factory.

Some of the marginal remnant high bog at the southern end is being privately cut for sod peat. There is also some sod peat production along the eastern boundary. Some of this turbary overlaps with the BnM property line. There are several large private sod peat production areas adjacent to the bog. One of these areas at the south-west corner of the bog is expanding quite rapidly and beginning to use some of the remnant high bog within the BnM property line that was previously designated as a peat reserve prior to the cessation of industrial peat production at Littleton Bog.

Littleton is a relatively old industrial peat production bog. Large-scale industrial peat production began in the 1940's where sod peat was produced for fuel. Sod peat production was mechanised during the 1950's. Milled peat production began in the 1970's and milled peat was supplied to the Briquette factory (constructed in 1981) at Lanespark up until 2017/2018. Some of the former sod peat production areas in the bog were converted to milled peat production in the past. However, some of the former sod peat production areas along the western side were abandoned and have naturally re-colonised and since this time. The main central part of the bog was out of production prior to 2000. Much of the peat was cut out of this section and the underlying glacial subsoil was exposed in places and some wetlands had developed by this stage.

Northern area (former milled-peat production bog)

This sub-section is divided into two main parts by the BnM railway and central travel path. It extends to the west where it borders an area formerly classed as a peat reserve area with a deep trench drain marking the boundary. The majority of this northern sub-section was managed for milled peat production prior to the cessation of industrial peat production in 2017/2018. The north-east section has the deepest remnant peat and some of the peat is still relatively light and brown in colour. Several fields within this area were developing dry bog vegetation (Ling Heather) where there has not been any activity for several years. There is some recent drainage development with a new pipe being constructed at the northern end of the site to drain a localised basin towards a new pump at the outfall.

There is some recent wetland development in localised basins in small sections in the southern end. The south-west part of this sub-section has also come out of industrial peat production recently (prior to 2017/2018). Fields on both sides of the railway have also been out of production for some time. Those nearest to the railway and travel path tend to have somewhat deeper peat and the vegetation is dominated by dry heath with Heather and Birch scrub, with small amounts of Purple Moor-grass. Some of this has developed into closed Birch scrub and woodland. Other fields further out from the railway (and lower down) have been out of production for a shorter period and are also on thinner fen peat. The vegetation tends to be dominated by Soft Rush-dominated poor fen with patches of emerging or open Birch scrub. There are also some intermediate vegetation communities with mixed Heather and Purple Moor-grass as well as Soft Rush. The youngest fields out of production tend to have scattered patches of pioneer poor fen vegetation with Marsh Arrow-grass, Bog Cotton and/or Soft Rush dominating. Bog Cotton tends to dominate in the wetter sections, while Soft Rush tends to dominate where it is drier and where the peat is thinner and some sub-soil may be exposed.

The central railway has been constructed on the underlying glacial sub-soil. Marsh Hellebore was noted at several locations along the travel path adjacent to the railway. There has been some excavation along the railway towards

the southern end associated with the re-alignment of the track. This produced a large spoil heap of sub-soil adjacent to the travel path. This spoil heap is now vegetating with several species of conservation interest including Blue Fleabane and Marsh Helleborine.

Central area (former production-related cutaway)

The majority of this sub-section has been out of industrial peat production for some time (prior to 2017/2018). It is bordered to the south by the BnM/Coillte conifer plantation and to the west by the railway. Much of the cutaway area is almost completely vegetated, apart from high fields and travel paths. Some of the younger cutaway areas to the east are still vegetating, as is the central mound around the old tea centre. Comparison of 2000 aerial photos to more recent aerial photo series shows that there have been significant changes in this sub-section in the past 12 years as there seemed to be much more bare peat visible in 2000. Only a small portion of the cutaway seemed to be vegetated at this stage.

The landscape of this sub-section is more typical of midlands cutaway and not like adjacent bogs such as Bawnmore. Much of the peat seems to have been cutaway so the remaining peat is fen peat and much of the habitat development is dominated by pioneer poor fen communities. There is less influence from acidic peat and less dry heath/Purple Moor-grass dominated communities. As peat has been cutaway, the underlying topography is also quite influential. There are many localised wetlands were there are basins and some of these are divided by mounds or ridges where there is drier habitat development with Birch scrub and some pioneer grassland communities. This area has also been further sub-divided by a series of deep trench drains and associated high fields. These divide the bog into regularly grouped series of fields. The high fields act as berms to enhance wetland development and hold water within these areas. The high fields tend to be vegetated with dry heath, Purple Moor-grass-dominated vegetation and scrub.

The wetland development is likely to have been enhanced by the pumped drainage in this area and the fact that some of the pumps have been turned off in the past. There are significant wetlands scattered across this area. The largest and deepest wetlands have open water and are fringed by Bog Cotton-dominated poor fen. Some smaller wetlands have infilled with poor fen vegetation usually dominated by Bog Cotton, but also containing Soft Rush. There are also several small wetlands that have infilled with Reedmace. There is some development of Bottle-Sedge-dominated vegetation associated with the wetlands towards the northern end, perhaps indicating some shell-marl influence (although no shell marl was noted on the site). The lower lying drier land is usually vegetated with Birch scrub and with Soft Rush-dominated pioneer poor fen. Gravel mounds also tend to have well-developed Birch scrub development, and this is associated with somewhat more grassy vegetation with Sweet Vernal-grass (gAn-HO-Eq) and Purple Moor-grass (gMol). Some of the younger cutaway towards the east and the south also has Marsh Arrow-grass present.

Comparison of aerial photo series (2000 and 2009) seems to indicate that there has been significant re-vegetation and development of scrub and wetlands within this period. This comparison also indicates that there has also been new wetland development (possibly attributed to pumps being turned off). There also seems to have been some new re-wetting and wetland development between 2009-2012 in the south-east section.

The central area (where railway branches) around the old tea centre is located on a low mound. This area is still re-vegetating and there is a significant amount of bare peat. The re-vegetation along the railway tracks tends to be dominated by Purple Moor-grass with some open Birch and dry heath mosaic where there has been no disturbance for a longer period of time.

There is a small area of cutaway located south-east of the conifer plantation. This area seems to have been developed for milled peat production but had much less production compared to the other central cutaway. However, there is much more dry heath development in this section, perhaps indicating that there is deeper remnant peat.

Dry Heath was developing in association with open Birch scrub and with Bog Cotton-dominated poor fen. There were also patches of purple Moor-grass vegetation. *Sphagnum* was also noted in this area, although not in any great quantity and the drains tends to have a poor fen influence, rather than a more acidic influence.

The north-east section is located adjacent to conifer plantation. This is having a significant impact on the re-vegetation of the cutaway, with much of the drier sections being colonised by Pine-dominated scrub. There is a similar topography/landscape and Pine-dominated areas and high fields are interspersed with wetlands. Some of the wetlands contain significant Reedbed development. The proportion of Pine decreased further away from the plantation, but was significant over a relatively large area. Some of the Pine scrub was burnt in the recent past but is regenerating (ca. 2006). A small part of the cutaway was developing potential rich fen vegetation where there was some wetland development close to the margin that was dominated by Yellow Sedge and Bottle Sedge. Black Bog-rush was also present. Other species present included Star Sedge and Flea Sedge and Large-leaved

Sundew. However, there was no indication of any brown moss development. This area is located adjacent to a natural poor fen area, some of which is found in the marginal remnant bog. This section was dominated by Purple Moor-grass dominated vegetation and also contains patches of Bog Myrtle, as well as scattered Birch scrub. It has also been burnt in the recent past.

South-western area (former peat reserve area)

This sub-section includes all of the bog between the railway/conifer plantation and the south-west margin. A portion of this area along the railway was developed for milled peat production in the past. The majority of this area was re-vegetating with pioneer habitats and there seemed to be no production in this area in recent times. The habitat development is similar to the central cutaway area in that pioneer poor fen communities dominate. It also has a similar topography with dry mounds and wet basins appearing. A pump is located midway along this section. These communities are much younger in terms of development, and the majority of this area was in full production in 2004 (apart from mounds). The wet basins are vegetating with a range of poor fen communities including Bog Cotton, Marsh Arrowgrass and Soft Rush, depending on water depth. There is also some permanent open water and a significant proportion of bare peat with scattered pioneer vegetation. As of 2017/2018, industrial peat production has ceased on all parts of the bog with onset closure of Littleton Briquette factory.

The adjacent old sod peat sections are somewhat different in character. These are divided into long wide bays and are also drained by deep trench drains. There are also some high travel fields separating the bays. The bays to the east have been cut to some extent and are lower than bog to the west. Re-vegetation tends to be dominated by dry heath and Bog Cotton-dominated vegetation, in mosaic with scattered Birch scrub and small amounts of Purple Moorgrass-dominated vegetation. This section was abandoned in ca. 1970's and has been subject to approximately 40 years of regeneration. Overall, re-vegetation has been performing well with only the travel paths still having significant bare peat.

Bog Cotton-dominated vegetation dominates in the wetter areas while Heather dominates in drier sections. Some the drier Heather-dominated sections still have a proportion of bare peat between the Heather stands and the moss layer is poorly developed, being dominated by *Campylopus introflexus* and *Hypnum jutlandicum*. The peat is generally quite firm. The wettest vegetation also contains elements of high bog not usually found on typical cutaway such as Hare's-tail Bog Cotton, White-beak Sedge, Carnation Sedge, Bog Asphodel and Deer-grass. There is also some extensive *Sphagnum* development. This includes a mat of dense *S. cuspidatum* associated with the Bog Cotton where there is surface water and extensive hummocks of *S. subnitens*, *S. palustre*, S. *papillosum* and *S. capillifolium* where it is just water-logged . The areas of standing water with the *Sphagnum* mat and Bog Cotton had generally developed over firm peat (not quaking bog). Some of the *S. subnitens* hummocks are up to 40 cm high. Some of the wetter sections are dominated by White-beak Sedge, creating a pool/hollow type raised bog community. *Sphagnum* cover reaches 100% in small patches. Birch, Pine and Willow saplings and young trees are also present. Much of this vegetation has been classified as an embryonic raised bog vegetation type rather than pioneer poor fen. Other sections of similar vegetation have less scattered *Sphagnum* cover. There has been some recent drainage work (in past few years) to let off water from some of these areas. It is likely that the *Sphagnum* regeneration was greater in the past prior to this recent drainage work.

Further west, there is a wide sod peat bay that was cut to a much greater extent and is therefore much lower, and sandwiched between two higher bays. This section has re-wetted to create a large wetland. There is a significant area of open water along with emergent wetland vegetation. This wetland vegetation is dominated by Bog Cotton with a small amount of Bottle Sedge. There are also extensive patches of *S. cuspidatum* mat associated with the emergent Bog Cotton, and this vegetation has been classified as an embryonic bog vegetation community (similar to those found in Mayo). This mat of *Sphagnum*-dominated vegetation is similar to transnational mire communities found at some other intact peatland sites. Patches that are intermediate in elevation have greater Heather cover as well as scrub with Pine and Birch. This wetland had attracted a large flock of Mallard as well as some Teal.

The northern margin around this section is planted with conifer forestry. Pine and some Spruce are spreading from this plantation and into the scrub areas with Birch. These trees are growing in association with Heather-dominated vegetation.

There is a small high bog remnant (PB1) at the north-east corner of this section. This area of bog is in relatively good condition. It was wet in places with a high *Sphagnum* cover. Other sections were firm and dried out. Ecotope quality varies between sub-central and sub-marginal. Bog Rosemary and Cranberry were both present.

Mid-western area (former peat reserve area)

This sub-section is found about midway along the western margin of the bog. It includes the lobe of the bog found west of the railway and the central production related cutaway area. Two series of fields adjacent to the railway were converted to milled peat production but have since been abandoned. These fields were in industrial peat

production in 2000. In the intervening period, peat production stopped and these fields have generally re-vegetated with Soft Rush-dominated poor fen and emergent Birch scrub. There is also some Bog Cotton-dominated poor fen.

Further west, there is a large old sod peat area that was abandoned and has now regenerated. The main feature is a wide bay where sod peat was cut with bagger machines that was largely cutaway and has re-wetted, sandwiched between two higher bays where there was less production. A large wetland has been created with a significant area of open water and emergent vegetation. There is also some development of embryonic raised bog vegetation with the development of *Sphagnum* mats associated with the Bog Cotton. There is some development of scrub and Birch woodland at both ends of this bay with occasional Spruce and Pine. The intermediate zones tend to have good *Sphagnum* hummock development with *S. palustre* and *S. subnitens*.

The high bog areas on the edge of the wetland area contain deep peat. Some of this high bog had been developed for milled peat production with field drains in the past but production had never started. The vegetation is dominated by Heather in the dry sections and is typical of pioneer dry heath communities on cutaway. However, there are wetter areas where water accumulates midway along the bay and these sections have more Hare's-tail Bog Cotton, as well as some *Sphagnum* cover. The *Sphagnum* development is less impressive compared to the south-west sod peat area. Some wet areas are also dominated by White-beak sedge. Overall, vegetation cover is about 90%, with a small amount of bare peat cover still present. There is not likely to have been significant peat production over these high bog areas however these areas have been disturbed or had vegetation cleared in the past. There are no indications of original *Sphagnum* hummocks present or old features such as pools.

Further west, there is some old remnant high bog that has been drained with field drains but has not been significantly disturbed with industrial peat production in the past.

A mineral ridge divides this mid-west sod peat production area (and peat reserve) from the north-west sod peat production area. This ridge extends to the edge of the bog and there is a small section within the BnM property on this high bog where acidic grassland (GS3) has developed. This grassland has developed on a thin layer of peat that is relatively dry. It contains Sweet Vernal-grass, Red Clover, Creeping Bent, Heath Bedstraw Bramble, Purple Moorgrass, Heather, Silverweed, Hawthorn, Yorkshire Fog, Tormentil, Heath Sorrel, Soft Rush, Devil's Bit and Wild Rose. This is an area of high ground with significant slopes and a fall towards the adjacent cutaway areas.

North-western area (former peat reserve area)

This sub-section includes the old sod peat production area along the north-west margin of the site. There are significant slopes and falls from high ground towards the western margin towards the lower cutaway close to the railway. The eastern margin is marked by a deep trench drain that separates this section from the adjacent former area previously managed for milled peat production (ceased 2017/2018).

There is another wetland found on the higher slopes along the western margin. Again, this was created by old sod peat production with baggers. The wetland is similar in nature to the previous two sod peat wetlands and contains a large open water area with emergent vegetation. One feature of note is that the water level within the wetland is at a significant elevation above the adjacent cutaway areas. The surrounding high bog is dominated by dry heath and Bog Cotton-dominated vegetation. There seems to have been some milled peat bog development on the lower slopes of this section, with fields and bare peat present in the aerial photos in 2000. However, this area is now re-vegetating with pioneer dry heath and Bog Cotton (poor fen). *Sphagnum* is much rarer in this section compared to the other old sod peat production areas. There is some Birch scrub, but this is relatively light and there is a wide expanse of Heather-dominated vegetation.

Pine and Birch have colonised the bog towards the northern end of this section. These trees are found in association with Heather-dominated dry heath. Some wetter communities have developed down the slope and adjacent to the deep trench drain. Bog Cotton-dominated vegetation has developed in one section and further north there is some Reed Bed development.

Designated areas on site (cSAC, NHA, pNHA, SPA other)

None in the immediate vicinity of Littleton bog.

Adjacent habitats and land-use

Adjacent habitats include conifer plantation (WD4), wet grassland (GS4), improved agricultural grassland (GA1), scrub (WS1), Birch woodland (WD7) and cutover bog (PB4).

Watercourses (major water features on/off site)

- Littleton is located within the Suir catchment.
- There are several main sub-catchments within the bog. These drain off the bog at various locations, with the majority of the bog draining to the west. There are several channelized streams/drains that drain the bog towards the Clover River, which drains towards the Dinish River. Some of the southern section drains south towards the Black River, which also drains towards the Dinsh River.
- The majority of the northern area (formerly managed for industrial peat production) is the only section where the catchment runoff is treated by silt-ponds. Part of this production area is not treated at all. Silt-ponds are required in some other sections of the bog. Much of the catchment runoff from the cutaway areas is treated by outfalls.

Peat type and sub-soils

Much of the peat exposed in the cutaway is fen peat. The conifer plantation was planted on a range of *Phragmites* peat and *Sphagnum* peat. The northern area (formerly managed for industrial peat production) is somewhat younger and exposed comprising light brown peat. The old sod peat areas along the western side have much deeper remnant acidic peat.

The bog is generally underlain by a mixed glacial till. This is exposed around the site at various locations. There are no indications of any significant shell-marl deposits exposed around the site.

Fauna biodiversity

Birds

Several bird species were noted on the site during the survey.

- Hen Harrier. This bird was noted roosting in the centre of the site.
- Kestrel. Kestrel was noted hunting over the site several times during both days of the survey.
- The large wetlands associated with the old sod peat cutting areas attracted some wildfowl. A small flock of Teal (6) were noted roosting on the south-west wetland in the old sod peat cutting areas. A larger flock of Mallard (60) were also noted at this location. The northern wetland also had Teal (9) and Mallard (1).
- The smaller wetlands towards the centre of the site had relatively few wildfowl, apart from 1 pair of Mallard.
- Other species noted on the site included Snipe, Heron, Magpie, Pheasant, Rook (2) Raven, Swallow (30) northern section), Grey Crow, Wren, Blackbird, Blue Tit, Goldcrest, Wood Pigeon, Meadow Pipit and Reed Bunting.
- This site was also surveyed by Copland (2011). Breeding Lapwing and Common Sandpiper were noted using the more exposed sections of cutaway to the east of the site. Curlew was recorded on the bog to the west and was suspected of breeding.

Mammals

Signs of several mammal species were noted on the site during the survey.

- Rabbit – at several places along the central line
- Signs of Fox were noted around the site.

- Signs of Badger were noted around the site.
- Several Hares were noted on the site.

Other species

- Butterfly species noted on the site included Meadow Brown, Ringlet and Small Tortoise-shell

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Appendix II Codes used for habitat classification.

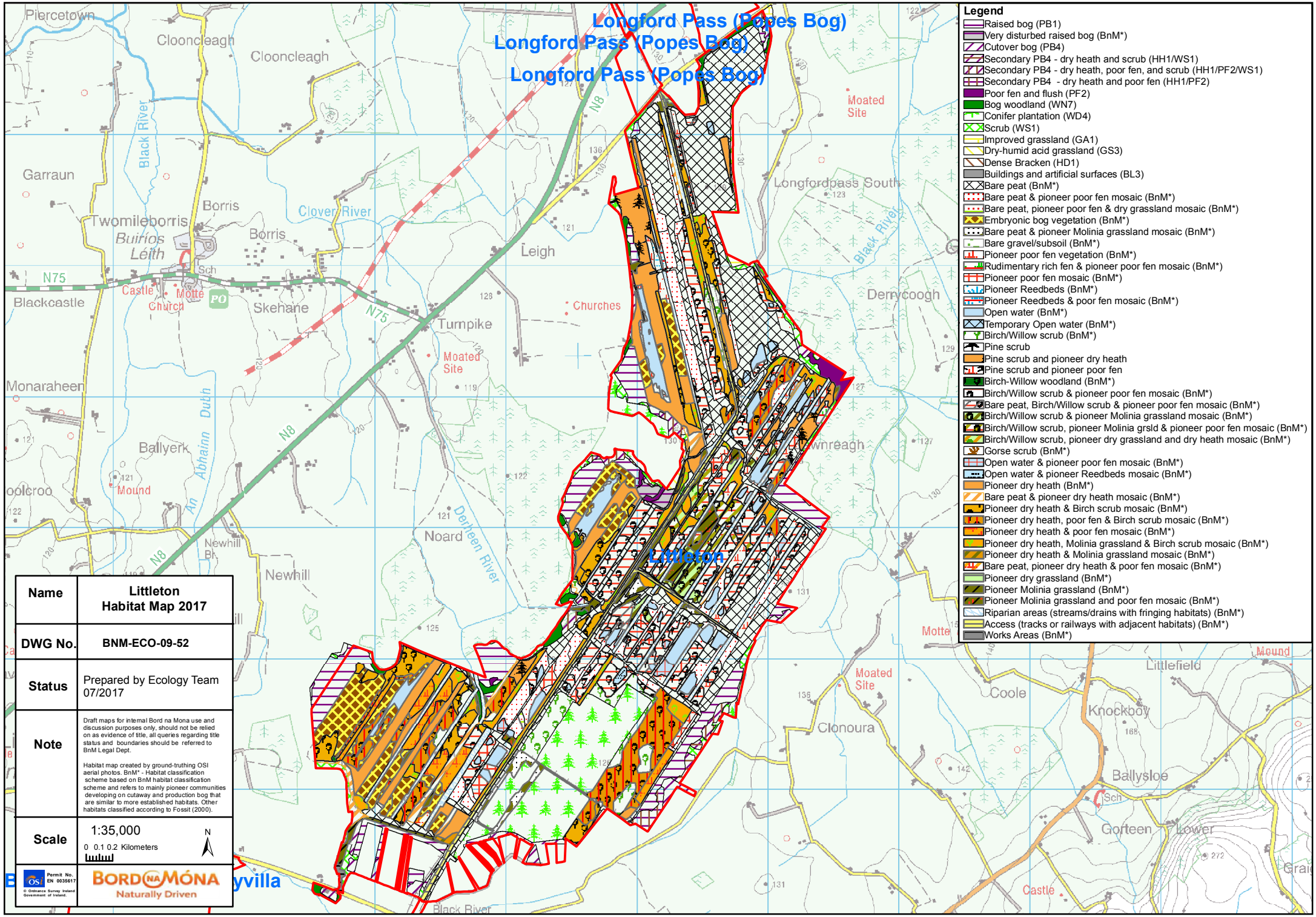
Bord na Moṅa habitat classification scheme

	General	Vegetation community [1]	BnM habitat code	Equivalent Heritage Council codes [2]
Pioneer habitats of industrial cutaway	Peatland	Bare peat (0-50% cover)	BP	ED2
		Embryonic bog community (containing *Sphagnum* and Bog Cotton)	PBa	PB
		Embryonic bog community (Calluno-Sphagnion)	PBb	PB
	Flush and Fen	Pioneer *Campylopus*-dominated community	pCamp	PF2
		Pioneer *Juncus effusus*-dominated community (Soft Rush)	pJeff	PF2
		Pioneer *Eriophorum angustifolium*-dominated community (Bog Cotton)	pEang	PF2
		Pioneer *Juncus bulbosus*-dominated community (Bulbous Rush)	pJbulb	PF2
		Pioneer *Triglochin palustris*-dominated community (Marsh Arrowgrass)	pTrig	PF2
		Pioneer Caricion davallianae-Community with *Cladium* (rich fen)	pCladium	PF1
		pioneer *Schoenus nigricans* community (rich fen)	pSchon	PF1
		pioneer *Carex viridula*/brown moss community (rich fen)	pVir	PF1
	Emergent communities	Pioneer *Carex rostrata*-dominated community (Bottle Sedge)	pRos	PF2/FS1
		Pioneer *Phragmites australis*-dominated community (Common Reed)	pPhrag	FS1
		Pioneer *Typha latifolia*-dominated community (Reedmace)	pTyp	FS1
		Pioneer *Schoenoplectus lacustris*-dominated community (Bulrush)	pSch	FS1
	Open water	Charaphyte-dominated community	pChar	FL2
		Permanent pools and lakes	OW	FL2
		Temporary open water	tOW	
	Woodland and scrub	Emergent *Betula*/*Salix*-dominated community (A) (Birch/Willow)	eBir	WS1
		Open *Betula*/*Salix*-dominated community (B) (Birch/Willow)	oBir	WS1
		Closed *Betula*/*Salix*-scrub community (C) (Birch/Willow)	cBir	WS1
		Ulex europaeus-dominated community (Gorse)	eGor	WS1
		Betula/*Salix*-dominated woodland (Birch/Willow)	BirWD	WN7
	Heathland	Pioneer dry *Calluna vulgaris*-dominated community (Heather)	dHeath	HH1
		Dense *Pteridium aquilinum* (Bracken)	dPter	HD1
	Grassland	Pioneer dry calcareous and neutral grasssland (Centaureo-Cynosuretum)	gCal	GS1
		Dactylis-Anthoxanthum-dominated community (Cocksfoot-Sweet Vernalgrass)	gCo-An	GS2
		Anthoxanthum-Holcus-Equisetum community (Sweet Vernalgrass-Yorkshire Fog-Horsetail)	gAn-H-Eq	GS
		Molinia caerulea-dominated community (dry) (Purple Moorgrass)	gMol	GS4
		Marsh (Meadowsweet and other tall herbs) (Filipendulion ulmariae)	Mar	GM1
	Disturbed	*Tussilago farfara*-dominated community (vegetation > 50%) (Colt's Foot)	DisCF	ED3
		Epilobium-dominated community (vegetation > 50%) (Willowherb spp.)	DisWil	ED3
	General	Riparian areas (streams or drain with associated edge habitats (e.g. FW2/4 + WS1, GS2 etc)	Rip	FW2 +
		Silt Ponds (artificial ponds with associated bank habitats (e.g. FL8 + WS1, GS2, ED2, ED3)	Silt	FL8 +
		Access (tracks or railways with associated edge habitats (e.g. BL3 + gCal, gMol, eGor etc)	Acc	BL3 +
		Works areas (predominately built land but can include landscaped and brownfield habitats (e.g. GA2, WS3, WD4, ED2, ED3)	Works	BL3 +

[1] These are generally pioneer habitats of bare peat and the communities can contain a significant proportion of bare peat. Some habitats are more developed than others. They frequently occur in mosaic with each other.
[2] Not all these communities are equivalent to habitat classes used by The Heritage Council habitat classification scheme (Fossitt 2000) as some are quite rudimentary and undeveloped.

Heritage Council habitat classification scheme (Fossitt 2000)

	General	Habitat	Heritage Council code
Semi-natural and modified habitats	Peatlands	Raised Bog	PB1
		Lowland Blanket bog	PB3
		Cutover Bog	PB4
		Rich fen and flush	PF1
		Poor fen and flush	PF2
		Transition mire and quaking bog	PF3
	Woodland and scrub	Oak-Birch-Holly woodland	WN1
		Oak-Ash-Hazel woodland	WN2
		Wet Pendunulate Oak-Ash woodland	WN4
		Riparian Woodland	WN5
		Wet Willow-Alder-Ash woodland	WN6
		Bog woodland	WN7
		Mixed broad-leaved woodland	WD1
		Mixed broad-leaved/conifer woodland	WD2
		Conifer plantation	WD4
		Scrub (Gorse)	WS1
		Emergent Betula-dominated community	WS1
		Closed Betula scrub community	WS1
		Recently-planted woodland	WS2
		Ornamental scrub	WS3
		Short-rotation coppice	WS4
		Recently-felled woodland	WS5
	Linear woodland	Hedgerow	WL1
		Treeline	WL2
	Grasslands and Marsh	Improved grassland	GA1
		Amenity grassland	GA2
		Dry calcareous and neutral grassland	GS1
		Dry meadows and grassy verges	GS2
		Dry-humid acid grassland	GS3
		Wet grassland	GS4
		Freshwater Marsh	GM1
	Heath and Bracken	Dry Heath	HH1
		Dry calcareous Heath	HH2
		Wet Heath	HH3
		Dense Bracken	HD1
	Disturbed ground	Exposed sand, gravel or till	ED1
		Spoil and bare ground	ED2
		Recolonising bare ground	ED3
		Active quarry	ED4
	Freshwater	Acid Oligotrophic lakes	FL2
		Mesotrophic lakes	FW4
		Artificial ponds (slit ponds)	FL8
		Depositing rivers	FW2
		Canals	FW3
		Drains	FW4
	Cultivated and Built land	Stonewalls and other stonework	BL1
		Earth Banks	BL2
		Buildings and artificial surfaces	BL3
		Arable crops	BC1
		Horticulture	BC2
		Tilled land	BC3


Longford Pass (Popes Bog)
Longford Pass (Popes Bog)
Longford Pass (Popes Bog)
Littleton
Piercetown
Clooncleagh
Clooncleagh
Garraun
Twomileborris
Buiríos Léith
Borris
Borris
Clover River
Black River
N75
Blackcastle
Castle
Motte
Church
Skehane
N8
Leigh
Turnpike
Churches
Moated Site
Longfordpass South
Derrycoogh
Monaraheen
Ballyerk
Mound
An Abhainn Dubh
Noard
Derheen River
Newhill
Newhill Bk
Moated Site
Clonoura
Coole
Littlefield
Knockboy
Ballysloe
Gorteen
Lower
Castle
Black River
Name
Littleton Habitat Map 2017
DWG No.
BNM-ECO-09-52
Status
Prepared by Ecology Team 07/2017
Note
Draft maps for internal Bord na Mona use and discussion purposes only, should not be relied on as evidence of title, all queries regarding title status and boundaries should be referred to BnM Legal Dept.
Habitat map created by ground-truthing OSI aerial photos. BnM* - Habitat classification scheme based on BnM habitat classification scheme and refers to mainly pioneer communities developing on cutaway and production bog that are similar to more established habitats. Other habitats classified according to Fossit (2000).
Scale
1:35,000
0 0.1 0.2 Kilometers
N
Permit No. EN 0035617
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BORD NA MÓNA
Naturally Driven
Legend
Raised bog (PB1)
Very disturbed raised bog (BnM*)
Cutover bog (PB4)
Secondary PB4 - dry heath and scrub (HH1/WS1)
Secondary PB4 - dry heath, poor fen, and scrub (HH1/PF2/WS1)
Secondary PB4 - dry heath and poor fen (HH1/PF2)
Poor fen and flush (PF2)
Bog woodland (WN7)
Conifer plantation (WD4)
Scrub (WS1)
Improved grassland (GA1)
Dry-humid acid grassland (GS3)
Dense Bracken (HD1)
Buildings and artificial surfaces (BL3)
Bare peat (BnM*)
Bare peat & pioneer poor fen mosaic (BnM*)
Bare peat, pioneer poor fen & dry grassland mosaic (BnM*)
Embryonic bog vegetation (BnM*)
Bare peat & pioneer Molinia grassland mosaic (BnM*)
Bare gravel/subsoil (BnM*)
Pioneer poor fen vegetation (BnM*)
Rudimentary rich fen & pioneer poor fen mosaic (BnM*)
Pioneer poor fen mosaic (BnM*)
Pioneer Reedbeds (BnM*)
Pioneer Reedbeds & poor fen mosaic (BnM*)
Open water (BnM*)
Temporary Open water (BnM*)
Birch/Willow scrub (BnM*)
Pine scrub
Pine scrub and pioneer dry heath
Pine scrub and pioneer poor fen
Birch-Willow woodland (BnM*)
Birch/Willow scrub & pioneer poor fen mosaic (BnM*)
Bare peat, Birch/Willow scrub & pioneer poor fen mosaic (BnM*)
Birch/Willow scrub & pioneer Molinia grassland mosaic (BnM*)
Birch/Willow scrub, pioneer Molinia grsld & pioneer poor fen mosaic (BnM*)
Birch/Willow scrub, pioneer dry grassland and dry heath mosaic (BnM*)
Gorse scrub (BnM*)
Open water & pioneer poor fen mosaic (BnM*)
Open water & pioneer Reedbeds mosaic (BnM*)
Pioneer dry heath (BnM*)
Bare peat & pioneer dry heath mosaic (BnM*)
Pioneer dry heath & Birch scrub mosaic (BnM*)
Pioneer dry heath, poor fen & Birch scrub mosaic (BnM*)
Pioneer dry heath & poor fen mosaic (BnM*)
Pioneer dry heath, Molinia grassland & Birch scrub mosaic (BnM*)
Pioneer dry heath & Molinia grassland mosaic (BnM*)
Bare peat, pioneer dry heath & poor fen mosaic (BnM*)
Pioneer dry grassland (BnM*)
Pioneer Molinia grassland (BnM*)
Pioneer Molinia grassland and poor fen mosaic (BnM*)
Riparian areas (streams/drains with fringing habitats) (BnM*)
Access (tracks or railways with adjacent habitats) (BnM*)
Works Areas (BnM*)