



Derrycashel Bog

Cutaway Bog Decommissioning and Rehabilitation Plan 2021

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0504-01:

“The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.”

This licence condition requires Bord na Móna agree with the EPA the measures that will provide for rehabilitation, i.e. stabilisation of Derrycashel Bog upon cessation of peat production and compliments the licence requirement to decommission the site.

Rehabilitation generally comprises site stabilisation with natural colonisation with or without targeted management.

Industrial peat production has now fully ceased at Derrycashel Bog.

In addition, to preparing this document to comply with Condition 10 of IPC Licence Ref. P0504-01, due regard was also given to the proposed Peatlands Climate Action Scheme (PCAS) announced by the Minister. This Scheme will see the Minister support, via the Climate Action Fund, Bord na Móna in developing a package of measures, ‘the proposed Scheme’, for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as, the Peatlands Climate Action Scheme’. However, only the additional costs associated with the additional and enhanced rehabilitation, i.e. measures which go beyond the existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support. The additional costs of the proposed Scheme will be supported by Government through the Climate Action Fund, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator.

While this document outlines the enhanced rehabilitation measures planned for Derrycashel bog, activities which goes beyond that required by Condition 10 in the Licence, rehabilitation necessary to comply with the ‘standard’ requirement of Condition 10 (in the absence of the proposed Scheme) is also included, to estimate costs. The inclusion of the ‘standard’ rehabilitation together with the enhanced rehabilitation in this document allows the Scheme Regulator to distinguish and objectively determine the specific activities (and their associated costs) eligible for support under the proposed Scheme.

Bord na Móna have defined the key rehabilitation outcome at Derrycashel Bog as environmental stabilisation, re-wetting and setting the bog on a trajectory towards development of naturally functioning peatland and wetland habitats.

Document Control Sheet						
Document Name:	Derrycashel Bog Decommissioning and Rehabilitation Plan 2020					
Document File Path:	G:\Ecology Team\EPA draft rehab plans 2017 word docs\Mountdillon ref.504 (Lough Ree)\Derrycashel					
Document Status:	Final					
This document comprises:	DCS	TOC	Text (Body)	References	Maps	No. of Appendices
	1	3	31	3	(3)	10
Rev.	1.0	Author(s):		Checked By:		Approved By:
Name(s):		CC		MMC		MMC
Date:		21/10/2020		11/11/2020		11/11/2020
Rev.	1.1	Author(s):		Checked By:		Approved By:
Name(s):		SD		MMC		MMC
Date:		16/04/2021		19/04/2021		05/07/2021
Rev.	1.2	Author(s):		Checked By:		Approved By:
Name(s):				MMC		MMC
Date:				9/07/2021		9/07/2021

Note: This finalised version of the Rehabilitation Plan has been updated to take account that several planning actions listed in Section 8.1 have been completed and have been incorporated into the plan. This includes an Appropriate Assessment of the rehabilitation plan. See Derrycashel Decommissioning and Rehabilitation Plan – Addendum 1 for more details of the AA screening.

Table of Contents

Summary.....	7
1. Introduction.....	10
1.1 Constraints and Limitations.....	11
2. Methodology	13
2.1 Desk Study	13
2.2 Consultation	15
2.3 Field Surveys	15
3. Site Description.....	16
3.1 Status and Situation.....	16
3.1.1 Site history	16
3.1.2 <i>Current land-use</i>	16
3.1.3. Socio-Economic conditions.....	16
3.2 Geology and Peat Depths	18
3.3 Key Biodiversity Features of Interest.....	18
3.3.1 Current habitats.....	18
3.3.2 Species of conservation interest	24
3.3.3 Invasive species	25
3.4 Statutory Nature Conservation Designations.....	25
3.4.1 Other Nature Conservation Designations	26
3.5 Hydrology and Hydrogeology	26
3.6 Emissions to surface-water and water-courses.....	27
3.7 Fugitive Emissions to air	32
3.8 Carbon emissions.....	32
3.9 Current ecological rating	32
3.10 Derrycashel Bog Characterisation Summary	32
4. Consultation	34
4.1 Consultation to date.....	34
4.2 Issues raised by Consultees	34
4.2.1 Assessments of rehabilitation	35
4.2.2 Restoration scope	35
4.2.3 Monitoring.....	35
4.2.4 Flooding of adjacent land	35

4.2.5	Land Management.....	35
4.2.6	Other issues (including amenity).....	35
4.3	Bord na Móna response to issues raised during consultation	36
4.3.1	Assessments of rehabilitation	36
4.3.2	Restoration scope.....	36
4.3.3	Monitoring.....	36
4.3.4	Flooding of adjacent land	37
4.3.5	Land Management.....	37
4.3.6	Other issues (including amenity).....	37
4.3.7	Concluding statement.	38
5.	Rehabilitation Goals and Outcomes	39
6.	Scope of Rehabilitation.....	41
6.1	Key constraints	41
6.2	Key Assumptions	42
6.3	Key Exclusions.....	42
7.	Criteria for successful rehabilitation	43
7.1.	Criteria for successful rehabilitation to meet EPA IPC licence conditions:	43
7.2.	Critical success factors needed to achieve successful rehabilitation as outlined in the plan.....	47
8.	Rehabilitation Actions and Time Frame	49
8.1	Short-term planning actions (0-1 years).....	50
8.2	Short-term practical actions (0-2 years).....	51
8.3	Long-term (>3 years)	51
8.5	Budget and costing.....	52
9.	Aftercare and Maintenance.....	58
9.1	Programme for monitoring, aftercare and maintenance.....	58
9.2	Rehabilitation plan validation and licence surrender – report as required under condition 10.4	59
10.	References.....	61
	Appendix I: A standard peatland rehabilitation plan to meet conditions of the IPC Licence	65
	APPENDIX II: Bog Group Context.....	69
	APPENDIX III: Ecological Survey Report.....	75
	APPENDIX IV. Environmental Control Measures to be applied to bog rehabilitation.....	79
	APPENDIX V. Biosecurity.....	80
	Appendix VI. Policy and Regulatory Framework	81
	APPENDIX VII. Decommissioning.....	88

APPENDIX VIII. Glossary.....	91
APPENDIX IX. Extractive Waste Management Plan.....	93
APPENDIX X. Mitigation Measures for the Application of Fertiliser.....	97
APPENDIX XI. Consultation Summaries	98
APPENDIX XII. Archaeology	104

SUMMARY

Name of bog: Derrycashel Bog

Area: 389 ha

Site description:

- Peat Production at Derrycashel bog commenced in 1951 and ceased in 2018. The peat was formerly used as fuel peat in Lough Ree Power in Lanesborough.
- Derrycashel Bog has a pumped drainage regime. Pumping has been reduced at present. There has already been significant rise in water-level and development of pioneer wetland habitats at this site.
- The majority of the former peat production footprint is a mosaic of open water, wetland habitat, or pioneering bare peat. Active drainage channels are still present.
- Residual peat depths at Derrycashel are shallow for the most part (i.e. <1m) apart from the SE Portion where depths reach ca.2m adjacent to the extant raised bog remnant.

Rehabilitation goals and outcomes

Bord na Móna is committed to discharging the obligations arising from Condition 10 of the IPC licence.

This is defined as:

- Meeting conditions of the IPC licence;
- Stabilisation or improvement in water quality parameters (e.g. suspended solids);
- Environmental stabilisation.
- Optimising hydrological conditions for the further development of wetland, Reed swamp, wet woodland and fen habitats on shallow cutaway peats, along with management of existing wetlands.
- Rehabilitation will support the National Policies on Climate Action and GHG mitigation by maintaining and enhancing the current residual peat storage capacity of the bog (locking the carbon into the ground). It is expected that the bog will have reduced emissions (reduced source) as it develops naturally functioning wetland and peatland habitats. It will also support Ireland's commitments towards Water Framework Directive and the National River Basin Management Plan 2018-2021.
- Optimising hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future.

Scope of rehabilitation

The principal scope of this rehabilitation plan is defined by:

- The area of Derrycashel Bog.
- EPA IPC Licence - Ref. P0504-01. 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. The key objective of 'rehabilitation', as required by this licence, is achieved by the **environmental stabilisation** of the bog.
- **The proposed Scheme (PCAS)** includes enhanced measures which are designed to exceed/meet the standard stabilisation requirements as defined by the IPC Licence and to enhance the ecosystem services of Derrycashel Bog, in particular, optimising **climate action benefits**.
- The key goals and outcomes of rehabilitation at this bog outlined above.
- To minimise potential impacts on neighbouring land, some boundary drains around Derrycashel Bog will be left unblocked, as blocking boundary drains could affect adjacent land.
- Other constraints including a number of Rights of Way (RoW).

Criteria for successful rehabilitation:

The Criteria for successful rehabilitation to meet Condition 10 of the IPC Licence have been defined as:

- Rewetting of residual peat in the former area of industrial peat production to slow water movement across the site to retain silt, encouraging development of vegetation cover via natural colonisation, and reducing the area of bare exposed peat through management of existing wetlands, and the creation of further wetland or fen habitat (IPC Licence validation). The target will be the delivery of measures and this will be measured by an aerial survey after rehabilitation is completed. (IPC Licence validation).
- Stabilising/improving potential emissions to water (e.g. suspended solids). This will be measured via water quality monitoring (suspended solids and ammonia) for at least 2 years after the rehabilitation has been completed. (IPC Licence validation).
- Reducing pressure from peat production on the local river catchment (WFD) (IPC Licence validation). This will be measured by the EPA WFD monitoring programme.
- Optimising the extent of suitable hydrological conditions for climate action (Climate action verification). This will be measured by an aerial survey after rehabilitation has been completed.
- Reduction in carbon emissions (Climate action verification). Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Setting the site on a trajectory towards establishment of a mosaic of compatible habitats including wetland, fen, Reed swamp, wet woodland, heath, embryonic *Sphagnum*-rich peat forming communities, scrub and Birch woodland communities, where conditions are suitable, and eventually towards a reduced Carbon source (Climate action verification). Some areas will naturally be dry and develop Birch woodland and other drier habitats. It will take some time for stable naturally functioning habitats to fully develop at Derrycashel Bog.
- Improvement in biodiversity and ecosystem services. (Climate action verification).

Meeting climate action verification criteria and monitoring of these criteria after the Scheme is completed is dependent on support from the Climate Action Fund or other sources of funding.

Summary of measures:

The below section is a summary of measures proposed for rehabilitation.

- Planning actions, including developing a detailed site plan and carrying out a hydrology and drainage appraisal.
- Carry out an ecological appraisal of the potential impacts of the planned rehabilitation.
- Carry out proposed measures, which will be a combination of hydrological management, drain blocking, peat field re-profiling, wetland creation and fertiliser applications targeting bare peat sections of headlands, high fields and other areas.
- Silt ponds will continue to be maintained during the rehabilitation and decommissioning phase.
- Evaluate success of short-term rehabilitation measures outlined above and remediate, where necessary.
- Decommissioning of silt-ponds will be assessed and carried out, where required.

Timeframe:

- 2020-2021: Short-term planning actions.
- 2021: Short-term practical actions.
- 2021-2024: Any Long term practical actions; Evaluate success of short-term rehabilitation measures outlined above and remediate, where necessary.
- 2024: Decommission silt-ponds, if necessary.

Budget and Costing

- The rehabilitation plan outlined in this document is predicated on the understanding that it is the Minister's intention to support, via the Climate Action Fund, Bord na Móna in developing a package of measures, 'the proposed Scheme', for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as, the Peatlands Climate Action Scheme'. *However, only the additional costs associated with the additional and enhanced rehabilitation, i.e, measures which go beyond the existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support.*
- In relation to the pre-existing Condition 10 IPC Licence requirement to carry out what can be termed the 'standard' decommissioning and rehabilitation, Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. This is updated every year. For more information see the Bord na Móna Annual Report (Bord na Móna 2020). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

Monitoring, after-care and maintenance

The monitoring, after-care and maintenance programme for Derrycashel Bog, as required to meet Condition 10 of the IPC Licence, is defined as:

- Quarterly monitoring assessments of the site to determine the general status of the site, assess the condition of the rehabilitation work, assess the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to additional rehabilitation, if needed.
- **Water quality monitoring** will be established. Monitoring of key water quality parameters for 2 years after rehabilitation will include: Ammonia, Phosphorous, Suspended solids (silt) & pH.
- 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 required assessment and planning procedures.

Additional Monitoring:

- The monitoring and validation of re-vegetation via natural colonisation and changes in bog condition will be carried out using an aerial survey, after rehabilitation measures are implemented. It is proposed that sites can be monitored against this baseline in the future.
- Biodiversity Ecosystem services will be monitored using specific indicators.
- Carbon emissions monitoring only be carried out on a small proportion of BnM sites to develop better understanding of carbon emissions and GHG emission factors from different types of BnM sites and will be developed on association with other established research programmes. Reduction in carbon emissions will be modelled by a combination of habitat condition assessment and application of appropriate carbon emission factors derived from other sites. Baseline monitoring (habitat condition) will be carried after rehabilitation is completed (during the Scheme). It is proposed that sites can be monitored against this baseline in the future.

Validation and IPC Licence surrender

Reporting to the EPA will continue until the IPC License is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites EPA, 2012, when:

- The planned rehabilitation has been completed.
- Water quality monitoring demonstrates that water quality indicators are stabilising/improving.
- The site has been environmentally stabilised.

1. INTRODUCTION

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Mount Dillon bog group (Ref. P0504-01). 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. The bog is part of the Mount Dillon bog group (see Appendix II for details of the bog areas within the Mount Dillon Bog Group). Derrycashel Bog is located in Co. Roscommon.

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

- Description of site management and status.
- Main issues and approaches to rehabilitation.
- Consultation to date with interested parties.
- Interaction with other policy and legislative frameworks (Appendix VI).
- The planned rehabilitation goals and outcomes.
- The scope of the rehabilitation plan.
- Criteria which define the successful rehabilitation and key targets to validate rehabilitation.
- Proposed rehabilitation actions.
- Proposed timeframe to implement these measures.
- Budget and Costings.
- Associated aftercare, maintenance and monitoring.

It is proposed by Government that Bord na Móna carry out a Peatlands Enhanced Decommissioning, Rehabilitation and Restoration Scheme on its peatlands. Note this proposal is also known colloquially as the 'Peatlands Climate Action Scheme' (PCAS). The additional costs of the proposed Scheme will be supported by Government through the Climate Action Fund, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator. Bord na Móna have identified a footprint of 33,000 ha as peatlands suitable for this scheme. This proposed Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations (Appendix VII & IX) under existing EPA IPC licence conditions. Improvements supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered.

Only the costs associated with the additional, enhanced and accelerated rehabilitation, i.e. those measures which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10, will be eligible for support under the proposed Scheme. Bord na Móna have now announced the complete cessation of industrial peat production across its estate (January 2021).

It is expected that the proposed Scheme (PCAS) will have benefits accruing from biodiversity provision, water quality and storage attenuation as well as increased carbon storage, reduced carbon emissions and acceleration towards carbon sequestration. The Scheme will also facilitate monitoring of carbon fluxes (Greenhouse Gases and fluvial carbon) in selected areas (in addition to other established Research programmes), to monitor changes in where the interventions will accelerate the trajectory towards a naturally functioning peatland ecosystem.

It is envisaged that the Enhanced Rehabilitation Scheme will support activities, interventions, or measures across the Bord na Móna cutaway peatlands which accelerate the original timelines. Selected rehabilitation measures

will take account of site environmental conditions, which can vary significantly. These measures potentially include:

- more intensive management of water levels through pump management, drain-blocking and cell bunding;
- re-profiling that will deliver suitable conditions for development of wetlands, fens and bog habitats;
- targeted fertiliser applications,
- seeding of targeted vegetation; and
- proactive inoculation of suitable peatland areas with *Sphagnum*.

These are collectively designed to optimise hydrological conditions (ideally and where possible water-levels <10 cm) for climate action benefits and to accelerate the trajectory of the site towards a naturally functioning ecosystem, and eventually a reduced carbon source/carbon sink again. (In some areas of dry cutaway this trajectory will be significantly longer and it is not feasible in the short-term to re-wet some areas. These areas will develop other habitats. The key to optimising climate action benefits is the restoration of suitable hydrological conditions and more intensive intervention means that the extent of suitable hydrological conditions can be optimised.

These measures are designed to encourage the development of peat-forming habitats, where possible. They are also designed to further slow the movement of water across the site (with the site acting similarly to a constructed wetland), slowing the release of water (improving local water attenuation) and water quality is also expected to improve as the site returns to a naturally functioning peatland ecosystem. The measures will also accelerate the development of new habitats for a range of species under pressure in the wider landscape and will have the potential to develop habitats (e.g. Annex I raised bog, wetlands that support wader water birds of conservation interest) that will contribute towards the delivery of national biodiversity objectives.

Derrycashel Bog is proposed to be part of this proposed Scheme (PCAS) and this rehabilitation plan outlines the approach taken.

1.1 Constraints and Limitations

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0504-01:

“The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.”

It also seeks to outline measures to optimise climate action and other ecosystem services benefits, mainly through hydrological management.

This document covers the area of **Derrycashel Bog**.

Future land-use at Derrycashel Bog has not been defined by Bord na Móna.

Bord na Móna will continue to review the future after-use of its land-bank. Any consideration of any other future after-uses for Derrycashel Bog, will be conducted in adherence to the relevant planning legislation and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.

Industrial peat extraction at Derrycashel Bog permanently ceased in 2018 (having commenced in 1951). Currently the former peat production area comprises a mosaic of various different pioneering habitats, in addition to open water/wetland habitats (influenced annually by winter inundation), bare peat and raised bog remnants. Part of the site was previously (winter 2014/15) subject to some rehab trials. It is anticipated that the combination of

active enhanced rehabilitation measures and natural colonisation will quickly accelerate environmental stabilisation. Nevertheless, it will still take some time (30-50 years) for naturally functioning wetland and peatland ecosystems to fully re-establish.

Parts of Derrycashel Bog (outside the areas owned and under the control of Bord na Móna) are currently be used by domestic turf cutters to harvest peat. These areas are ecologically and hydrologically linked to the area owned by Bord na Móna where rehabilitation is planned. It is beyond the scope of this rehabilitation plan to address turf cutting issues on Derrycashel Bog that are outside of the control of Bord na Móna. Nevertheless, Bord na Móna are aware of such issues which may constrain the proposed rehabilitation actions, and this rehabilitation plan considered potential impacts of these on the delivery of the stated objectives.

Rehabilitation in other areas of the bog may also be constrained due to other property issues or issues such as rights of way. A number of Rights of Way exist at Derrycashel.

Parts of Derrycashel become inundated during the winter months due to its proximity to the River Shannon. A significant portion of the former industrial peat production areas lie below the winter water level of the Shannon and pumping was critical to sustaining former industrial peat production areas. Consequently, the issues to be considered during rehabilitation of bogs such as Derrycashel require further detail in terms of understanding the fluctuating water regime during, and post-industrial peat production. Pumping has now ceased at Derrycashel, resulting in increased levels of standing water onsite.

The rail line on site at Derrycashel connects to Lough Ree Power Station and will be in operation for several years until all peat stocks have been removed from the adjacent bogs.

2. METHODOLOGY

This rehabilitation plan was developed with a combination of desktop and field surveys, consultations with internal and external stakeholders and cognisance of the proposed Scheme (PCAS). The development of this rehabilitation plan considered **recently published** guidance issued by the EPA in 2020 – **Guidance on the process of preparing and implementing a bog rehabilitation plan**.

The ecological information and site information collected during the Bord na Móna ecological baseline survey, additional confirmatory site visits (covering the period 2011 to 2020 inclusive) and monitoring and desktop analysis forms the basis for the development of the rehabilitation plan for the bog, along with:

- Experience of 40 years of research on the after-use development and rehabilitation of the Bord na Móna cutaway bogs (Clarke, 2010; Bord na Móna, 2016);
- Significant international engagement during this period with other counties in relation to best-practise regarding peatland rehabilitation and after-use through the International Peat Society and the Society for Ecological Restoration (Joosten & Clarke, 2002; Clarke & Rieley, 2010; Gann *et al.*, 2019);
- Consultation and engagement with internal and external stakeholders;
- GIS Mapping;
- BNM drainage surveys;
- Bog topography and LIDAR data;
- Previous rehab trials at Derrycashel;
- Previous research studies on site;
- Hydrological modelling; and
- The development of a Methodology Paper (draft) outlining the proposed Scheme (PCAS). This rehabilitation includes enhanced measures defined in the Methodology Paper which are designed to exceed the standard stabilisation requirements as defined by the IPC Licence and to enhance the ecosystem services of Derrycashel Bog, in particular, optimising climate action benefits.

2.1 Desk Study

The desk study involved collecting all relevant environmental and ecological data for the study area. The development of the rehabilitation plan also takes account of research, experience and engagement with other peatland restoration and rehabilitation projects and peatland research including Irish, UK, European and International best-practise guidance (full citations are in the References Section):

- Anderson *et al.* (2017). An overview of the progress and challenges of peatland restoration in Western Europe.
- Barry, T.A. *et al.* (1973). A survey of cutover peats and underlying mineral soils. Soil Survey Bulletin No. 30. Dublin, Bord na Móna and An Foras Taluntais.
- Bonn *et al.* (2017). Peatland restoration and ecosystem services- science, policy and practice.
- Carroll *et al.* (2009). *Sphagnum* in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16.
- Clark & Rieley (2010). Strategy for responsible peatland management.
- Eades *et al.* (2003). The Wetland Restoration Manual.
- Farrell & Doyle (2003). Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland.

- Feehan, J. (2004). A long-lived wilderness. The future of the north midlands peatland network. Department of Environmental Resource Management, UCD.
- Foss, P.J., Crushell, P. & Gallagher, M.C. (2017) Title: Counties Longford & Roscommon Wetland Study. Report prepared for Longford and Roscommon County Councils.
- Gann *et al.* (2019). International Principles and Standards for the practice of Ecological Restoration.
- Hinde *et al.* (2010). *Sphagnum* re-introduction project: A report on research into the re-introduction of *Sphagnum* mosses to degraded moorland. Moors for the Future Research Report 18.
- Joosten & Clarke (2002). Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making.
- Lindsay (2010). Peatbogs and Carbon: a Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change.
- Mackin *et al.* (2017). Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service,
- McBride *et al.* (2011). The Fen Management Handbook (2011), Scottish Natural Heritage.
- McDonagh (1996). Drain blocking by machines on Raised Bogs. Unpublished report for National Parks and Wildlife Service.
- NPWS (2017a). National Raised Bog Special Areas of Conservation management plan. Department of Arts, Heritage and the Gaeltacht.
- Quinty & Rochefort (2003). Peatland Restoration Guide, second edition. Canadian *Sphagnum* Peat Moss Association and New Brunswick Department of Natural Resources and Energy.
- Regan, *et al.* (2020). Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. EPA Research Report. Prepared for the Environmental Protection Agency by Trinity College Dublin.
- Renou-Wilson *et al.* (2011). BOGLAND - Sustainable Management of Peatlands in Ireland. STRIVE Report No 75 prepared for the Environmental Protection Agency.
- Schouten (2002). Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. Dúchas - The Heritage Service of the Department of the Environment and Local Government, Ireland;
- Thom (2019). Conserving Bogs – Management Handbook.
- Wheeler & Shaw (1995). Restoration of Damaged Peatlands – with Particular Reference to Lowland Raised Bogs Affected by Peat Extraction.
- Wittram *et al.* (2015). A Practitioners Guide to *Sphagnum* Reintroduction. Moors for the Future Partnership.

Additional on-line resources were also incorporated into the desk study, including:

- Moundillion Integrated Pollution Control Licence;
- Moundillion Annual Environmental Reports;
- Review of the National Biodiversity Data Centre (NBDC) webmapper;
- Inland Fisheries Ireland (IFI) Reports;
- Environmental Protection Agency database (www.epa.ie);
- EPA Guidance on Requests for Alterations to a Licensed Industrial or Waste Activity;
- BirdWatch Ireland online data (including I-WeBS and CBS datasets; www.birdwatchireland.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);

- Historic Environment Viewer at <https://webgis.archaeology.ie/historicenvironment/>
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive catchments.ie/maps/ Map Viewer (www.catchments.ie);
- OPW Indicative Flood Maps (www.floodmaps.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie);
- River Basin Management Plan for Ireland 2018 – 2021;
- Bord na Móna Annual Report 2020.
- Spatial data in respect of Article 17 reporting, available online at <https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17>.

2.2 Consultation

A number of stakeholders have been identified during the course of Bord na Móna's rehabilitation and Biodiversity Action Plan activities and are contacted during the rehabilitation planning process for their views. See Section 4.

2.3 Field Surveys

Bord na Móna carried out a baseline ecological survey of all of its properties in 2009-2012 and developed habitat maps. As part of this exercise, Derrycashel Bog was surveyed in April of 2011. Additional ecological walk-over surveys and visits have taken place at Derrycashel Bog between 2011-2020 (visited during 2013, but also in the period September 2014 to February 2015 to monitor previous rehabilitation trials, and a final confirmatory survey took place in October of 2020). Habitat maps have been updated, where required. This rehabilitation plan is informed by the original baseline survey as well as subsequent confirmatory site walk-over surveys and visits, and updates to baseline data.

Habitat mapping followed best-practise guidance from Smith *et al.* (2011). Map outputs including all habitat maps and target notes were produced using GIS software application packages (ArcGIS). General marginal habitats and other habitats that had not been modified significantly by industrial peat extraction were classified using Fossitt *et al.* (2000). Plant nomenclature for vascular plants follows Stace (2010), while mosses and liverworts nomenclature follows identification keys published by the British Bryological Society (2010). A more detailed Bord na Móna classification system was previously developed for classifying pioneer cutaway habitats as Fossitt categories were deemed not to be detailed enough for cutaway bog (much of cutaway bog could be classified as Cutover Bog - PB4). Much of the pioneer cutaway vegetation is still at an early stage of its development and cannot be assigned to Fossitt Level 3 categories yet.

A detailed ecological survey report for Derrycashel Bog is contained in Appendix II.

3. SITE DESCRIPTION

Derrycashel bog is located in Co. Roscommon along the River Shannon. It is situated 5 km north of Lanesborough and the N5 Dublin-Westport Road is situated ca.1 km to the north. It is part of the Mount Dillon bog group that formerly supplied peat to Lough Ree Power. The Mount Dillon home bog (i.e. Mount Dillon Bog) is situated immediately to the south of Derrycashel while there are other bogs in close proximity to the north and west but also on the east side of the River Shannon in Co. Longford. A Bord na Móna railway passes through the centre of Derrycashel. The main landscape feature in this area is the River Shannon and its associated riparian zone and floodplain.

Derrycashel is one of a cluster of bogs that has developed along the floodplains of the River Shannon. It is one of a group with the Mount Dillon bog group that frequently is inundated with water during winter periods. In each of these bogs, a significant portion of the former industrial peat production areas lie below the winter water level of the Shannon and pumping of these bogs was critical to sustaining industrial peat production.

See Figure 3.1, overleaf for bog context.

3.1 Status and Situation

3.1.1 Site history

Derrycashel bog is a relatively old production bog and was in production from 1951 until 2018. The peat was formerly used as fuel peat in Lough Ree Power in Lanesborough.

3.1.2 Current land-use

Future land-use at Derrycashel Bog has not been defined by Bord na Móna. A bog railway crosses through the site (Figure 3.8).

There are a number of Rights of Way overlapping the bog boundary. Other constraints considered include annual winter inundation from the adjacent Shannon, and the cessation of former pumping. A small area at the southern end of Derrycashel was used as a trial area (commenced in the early 2000's) for establishment of crops to attract bird species such as Linnet (in association with NPWS). This area is now developed into scrub.

3.1.3 Socio-Economic conditions

Bord na Móna has historically been a vital employer for the rural community of the Midlands of Ireland. Bord na Móna compiled a report on the role of peat extraction in the midlands historically in which they report that in 1986, by the end of Bord na Móna's Third Development Programme, a total of twenty-three work locations had been established around the country. The company had an average employment of approximately 4,688 in the mid 1980's, with a peak employment of 6,100 during the production season, which placed it among the country's largest commercial employers. The importance of such levels of employment were largely due to its regional concentration in the Midlands and the lack of alternative employment opportunities at the time.

According to the Energy Crop Socio-Economic Study undertaken by Fitzpatrick Associates in 2011, there were an estimated 1,443 jobs supported by the peat-to-power industry in Ireland at the time, some 81% of which were located in the catchment areas of the three peat-fired generating stations (Lough Ree, West Offaly, and Edenderry Power Stations). These constituted jobs in the plants and in peat extraction, jobs indirectly supported in upstream supply industries and jobs induced through the trickle-down effects of the wages and salaries of those supported directly or indirectly.

In respect of Derrycashel Bog, jobs included in the above study would have included those to facilitate extraction of peat at this site, and associated processing and transfer to the relevant power station.

As the primary employer in many Midland counties, Bord na Móna played a central role in building communities through several initiatives, including Education bursaries, support of local sporting clubs, the provision of community gain funds, charity programmes and the provision and building of amenity areas.”

These job numbers have now declined with the cessation of peat extraction at this bog. It is anticipated that the proposed scheme (PCAS) will provide some employment for a team of workers at this site for a period of time (> 1 year).

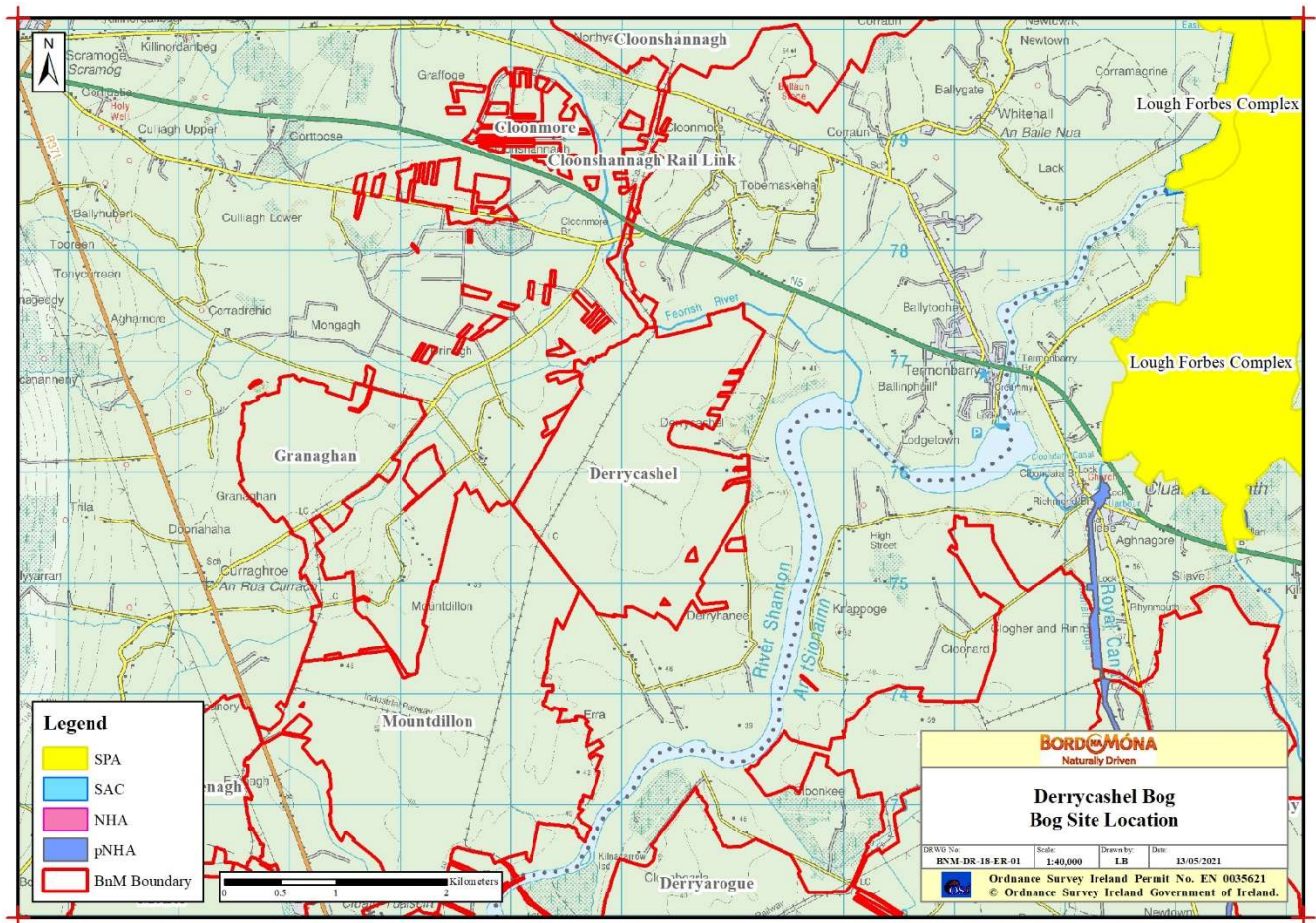


Figure 3.1 Location of Derrycashel in context to designated natural heritage and European sites and surrounding area.

3.2 Geology and Peat Depths

3.2.1 Sub-soil geology

The underlying geology at Derrycashel Bog comprises Visean Limestones (undifferentiated)¹. The underlying geology and subsoil of Derrycashel bog is calcareous. Gravel has also been exposed at several locations through the bog where there are ridges and mounds. Sapropel, an organic-rich layer of mud that was deposited as a river sediment, underlies much of the basal peat in Derrycashel.

3.2.2 Peat type and depths

There is somewhat more detailed knowledge of peat types and sub-soils at Derrycashel due to older survey work carried out by Barry *et al.*, (1973) (see Feehan 2004 – A long-lived wilderness).

The exposed peat at Derrycashel is black fen peat, which is mostly reed fen peat, and minor cover of forest peat/woody fen peat (Barry *et al.*, 1973). Much of the former production area now contains little or no peat (Figure 8.2). Remaining peat depths are shallow for the most part (i.e. <1m) apart from the SE Portion where depths reach ca.2m adjacent to the extant high bog.

3.3 Key Biodiversity Features of Interest

Derrycashel bog is bounded by a minor road along its southern boundary, which divides the bog from the adjacent Mount Dillon bog. There is some intact high bog along the eastern boundary of Derrycashel (some of which extends close to the Shannon channel) and midway along this boundary there is a mineral ridge that extends (westwards) into the bog and comprises typical farmland. Further north along the eastern boundary there is more cutover bog. The Feorish River flows along the northern boundary and there is some development of callows-type grassland in the floodplain of this river within and adjacent to Derrycashel. Farmland, intact high bog and cutover bog is found along the western boundary.

3.3.1 Current habitats

The majority of the former production bog at Derrycashel is now developing pioneer cutaway habitats. In the winter of 2014/15 a section (60ha) to the north east of the central rail line was rehabilitated. This work involved the creation of peat berms along with blocking drainage channels in order to re-wet this area of cutaway. As a consequence of this and the (more recent) cessation of pumping, large portions of the former production area are now wetland habitat.

The most recent milled industrial peat production was mainly confined to peripheral areas along the southern and eastern margins. The former production fields are orientated north-east to south-west and arranged in blocks that are separated by major drainage channels. These drainage channels are mapped as riparian zones but frequently have some of the best developed vegetation along their banks with tall Birch (*Betula* spp.)-dominated woodland (WN7) or dense scrub (WS1) developing. There is also some pioneer heath (HH1) in places along narrow bands of intact raised bog along the edges of these deep drains (FW4) where the peat has dried out

¹ <https://www.gsi.ie/en-ie/data-and-maps/Pages/Bedrock.aspx>

and become dominated by Heather (*Calluna vulgaris*). Travel paths (Fossitt Code PB4) are also frequently found along these drainage zones.

The longest established cutaway vegetation is found along the south of the bog over a glacial mound. This area is separated from the road by a long trough of lower ground. This relatively dry area is mostly developing a mosaic of open Birch scrub (WS1) and pioneer poor fen dominated by Soft Rush (*Juncus effusus*) (PF1). There are also some sections with less peat and more gravel that have a greater element of dry calcareous grassland species in combination with Rushes such as Glaucous Sedge (*Carex flacca*), Common Knapweed (*Centaurea nigra*) and Wild Strawberry (*Fragaria vesca*). This area also has several patches where pioneer dry heath dominated by Heather has developed. This is mostly found in conjunction with Birch scrub, which is spread through this vegetation. Pioneer dry heath is found on the highest part of this mound, which may not have been harvested to any great extent or may even have been excluded as the peat was so thin in this area.

Further north there is some much lower ground where there is a significant contrast in the vegetation and habitat development. This lower ground has been affected by winter inundation and still retains open water in several of the lower blocks. In the past this open water was not permanent and reduced in extent over the summer-note however that, at the time of visiting in October 2020, pumps had been off and this area still retained substantial extents of water.

The blocks in this area with the longest established vegetation are dominated by Soft Rush and Willow (*Salix* spp.). The water level has had a significant effect on the development of habitats in these older low lying sections. The Soft Rush-dominated vegetation seems to have died off leaving standing-dead tussocks. Some of this standing dead Soft Rush is being recolonised by other species such as Creeping Bent (*Agrostis stolonifera*), Yorkshire Fog (*Holcus lanatus*), Jointed Rush (*Juncus articulatus*), and Willowherb (*Epilobium*) spp. The other main feature of this vegetation is the layer of emergent Willow (mainly *S. cinerea*/*S. alba*) that has developed. This layer only has a max height of 2-3 m high, and Birch and other woody species are virtually absent.

Other lower blocks have less established vegetation and Soft Rush and Willow appear in mosaic with bare peat. These younger areas also have some cover of Bog Cotton (*Eriophorum* spp.) and Bottle Sedge (*Carex rostrata*). There are several blocks where the open water seems to be permanent and Bottle Sedge is much more extensive. These wetland areas are still in a pioneer phase and are relatively young in development. Bulrush (*Typha latifolia*) and Common Reed (*Phragmites australis*) are present. Other semi-aquatic and aquatic species are also present such as Mint (*Mentha* spp.), Marsh Pennywort (*Hydrocotyle vulgaris*), and Pondweed (*Potamogeton*) spp.

A small area at the southern end of the bog has been used as a trial area for establishment of crops to attract bird species such as Linnet (*Linaria cannabina*). Plants such as Oats (*Avena* spp.) and Linseed (*Linum usitatissimum*) were originally sown. This area is still relatively dry and now has dense vegetation that is now dominated by Reed Canarygrass (*Phalaris arundinacea*).

Pitcher Plant (*Sarracenia purpurea*) was originally introduced to Derrycashel in 1906 (Foss and O'Connell 1985). It covered an area of 32 ha and was then transplanted to other bogs around Ireland before Bord na Móna began to harvest peat on this bog.

A habitat map of Derrycashel Bog is shown in Figure 3.7.



Figure 3.3 Rail Line and fringing vegetation at Derrycashel (October 2020)



Figure 3.4 Pioneer wetland cutaway at Derrycashel (October 2020)



Figure 3.5 Recolonising vegetation at Derrycashel Bog (October 2020)



Figure 3.6 Bare Peat with colonising vegetation at Derrycashel Bog (October 2020).

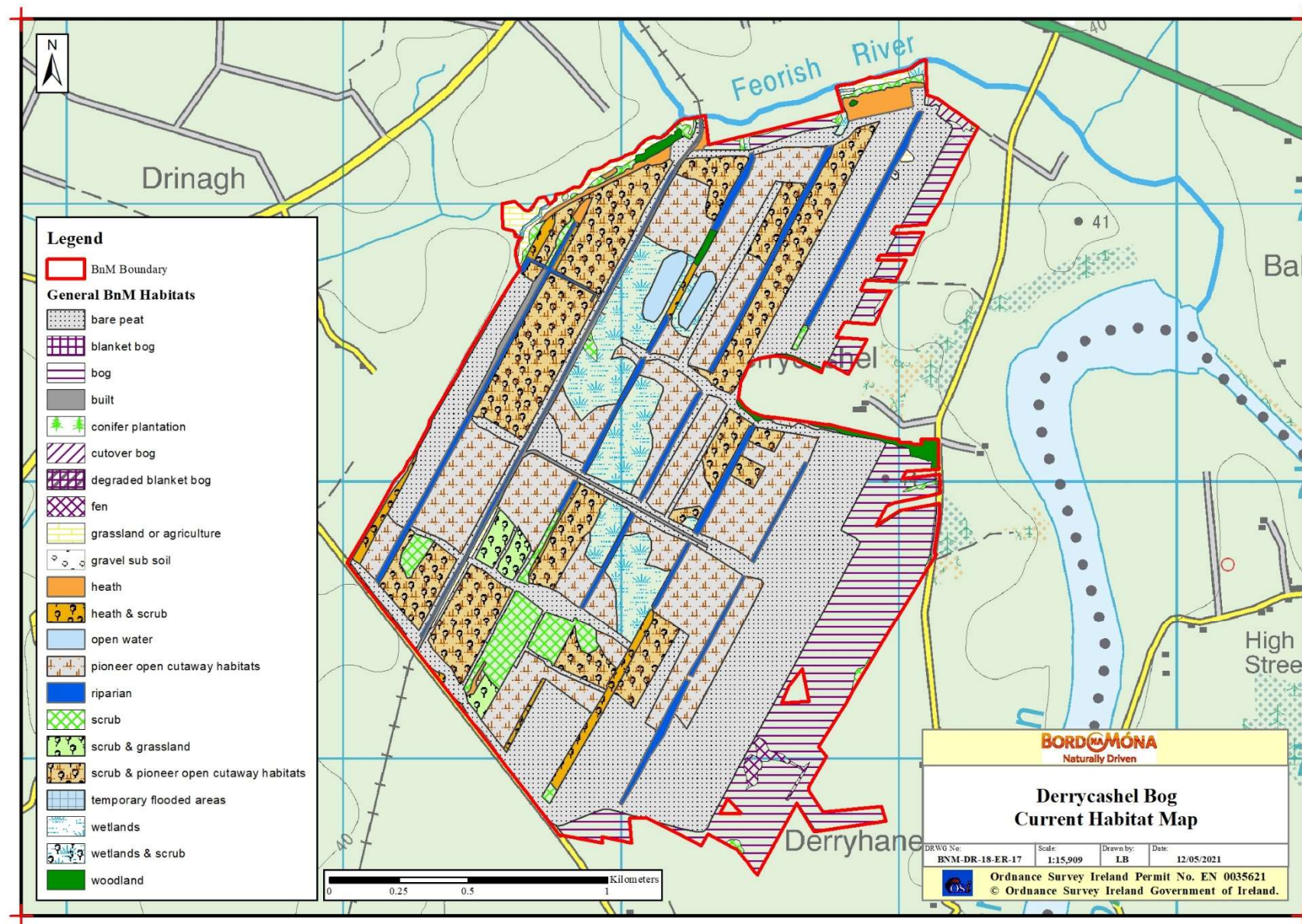


Figure 3.7 Habitat map of Derrycashel Bog. Based on survey in 2015.

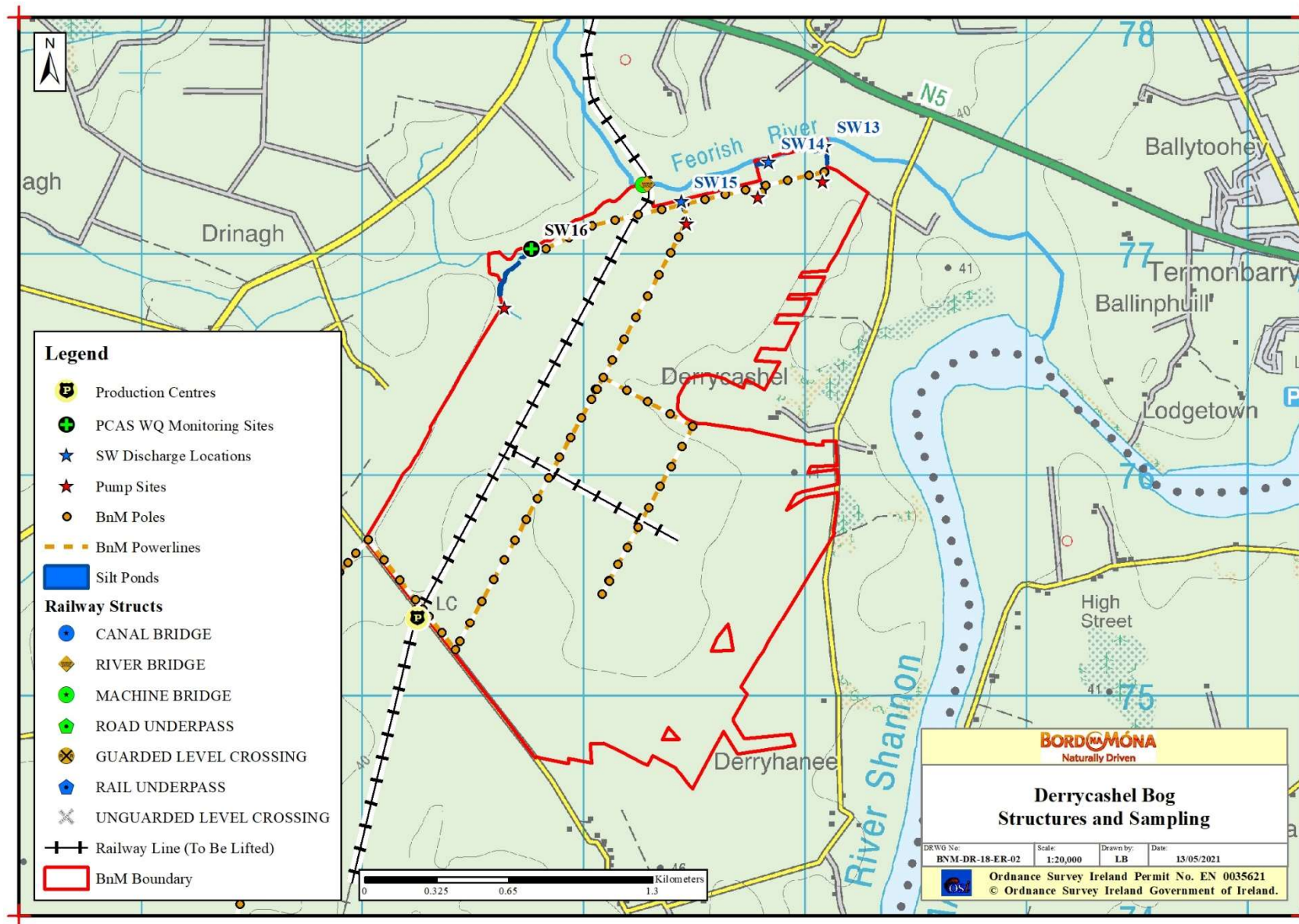


Figure 3.8. Map of Derrycashel Bog showing structures and designated emission points.

3.3.2 Species of conservation interest

A review of available Biodiversity records from the National Biodiversity Data Centre (hereafter NBDC) of bird records from the recent 2007-2011 Bird Atlas, found 70 species of birds have been recorded at or near Derrycashel Bog. Northern Lapwing (*Vanellus vanellus*), Black-headed Gull (*Larus ridibundus*) and Common Redshank (*Tringa tetanus*) are the only Red-listed species to be recorded across the recent atlas period within the 10km square (N07) wherein Derrycashel Bog is located.

In recent years' winter inundation at Derrycashel has increased available habitat suitability for wintering and breeding wildfowl. Northern Lapwing has been recorded at Derrycashel in April exhibiting typical breeding behaviour. Potentially suitable habitat does exist for Black-headed Gull but no breeding has been proven. There are records of Common Redshank at Derrycashel (assigned 'probable breeder') from the nearby proposed Derryadd Wind Farm EIAR.

Suitable habitat does exist at Derrycashel for all six Amber listed species (Common Coot (*Fulica atra*), Common Kingfisher (*Alcedo atthis*), Eurasian Teal (*Anas crecca*), Eurasian Wigeon (*Anas penelope*), Hen Harrier (*Circus cyaneus*), and Whooper Swan (*Cygnus cygnus*)) recorded within N07. BnM Ecologists have confirmed Whooper Swan wintering previously at Derrycashel (n=25, recorded in January of 2011) whilst in October of 2020 a total of 12 were present. Eurasian Teal (n=52) and Eurasian Wigeon (n=8) were present onsite in October of 2020. Common Kingfisher (confirmed breeding in N07) may occur in winter onsite – it is unknown whether this species breeds on the nearby Feorish River. Hen Harrier was recorded in the study area for the proposed Derryadd Wind Farm, located ca.2km from Derrycashel at its closest, and the EIAR for same describes a known winter roost south of the study area. It is considered that they may occur at Derrycashel during their respective non-breeding season.

The wetlands present onsite at Derrycashel were also surveyed as part of the above EIAR studies (as 'Mount Dillon wetlands'). Regarding potentially breeding waders, both Ringed Plover (*Charadrius hiaticula*) ('probable breeder'), and Common Snipe (*Gallinago gallinago*) ('possible breeder') are described. Ringed Plover has been observed by BnM ecologists previously during the breeding season – in 2011 up to 4 no. pairs were recorded as probable breeders. In a recent visit in October 2020, further records of wintering Common Snipe (n=13), Northern Shoveler (*Spatula clypeata*) (n=3) and various other species including Grey Heron (*Ardea cinerea*), Water Rail (*Rallus aquaticus*) and Mute Swan (*Cygnus olor*) were observed.

Meadow pipit (*Anthus pratensis*) (Red listed) breeds at Derrycashel, and both Curlew (*Numenius arquata*) and Merlin (*Falco columbarius*) have been recorded in Spring, however breeding is unproven.

Signs of several mammal species have been noted by Bord na Móna ecologists during surveys of Derrycashel including Red Fox (*Vulpes vulpes*), Badger (*Meles meles*), and Otter (*Lutra lutra*) (signs recorded along the north-east margin in a silt-pond complex). Irish Hare (*Lepus timidus subsp. hibernicus*), Pine marten (*Martes martes*) and American Mink (*Mustela vison*) are known to occur in suitable habitat at Derrycashel.

Based on records from the NBDC website, bat species including Daubenton's Bat (*Myotis daubentonii*), Lesser Noctule (*Nyctalus leisleri*) and Soprano Pipistrelle (*Pipistrellus pygmaeus*) are likely to occur.

Common Frog (*Rana temporaria*) almost certainly occurs at Derrycashel.

Marsh Fritillary (*Euphydryas aurinia*) have been recorded to the southeast of Derrycashel at Derryrogue Bog, Co. Longford (NBDC data viewer) and in the adjacent 10km square to the north west but there are no on-site records yet. NBDC butterfly records for the locality include Brimstone (*Gonepteryx rhamni*), Green-veined White (*Pieris napi*), Meadow Brown (*Maniola jurtina*), Orange-tip (*Anthocharis cardamines*), Peacock (*Inachis io*), Ringlet (*Aphantopus hyperantus*), Small Copper (*Lycaena phlaeas*), Small Tortoiseshell (*Aglais urticae*), and Small White

(*Pieris rapae*). A Peacock (*Aglais io*) and Small tortoiseshell (*Aglais urticae*) were observed onsite in October of 2020 along with a Common Hawker (*Mosaic darners*) dragonfly.

3.3.3 Invasive species

Invasive alien species known to occur at the subject bog (or desktop review suggests presence is likely), and for which reasonably foreseeable source impact pathways for dispersal may result from the proposed PCAS are described here. Both Zebra mussel (*Dreissena polymorpha*) and Asian clam (*Corbicula fluminea*) were recorded upstream of Derrycashel in available EPA reporting², and Zebra Mussel is known to occur in the Royal Canal, to the east of Derrycashel³. Pitcher plant (*Sarracenia purpurea*) as already noted has been recorded from Derrycashel. This has spread on the south-east raised bog remnant. A broad range of common garden escapes are occasionally present around the margins of Bord na Móna bogs, and although spatial overlap with the PCAS is expected to be limited, these are, where necessary, to be treated in line with Best Practice during PCAS activities.

3.4 Statutory Nature Conservation Designations

The Lough Forbes Complex pNHA (Site code 001818) is ca.3km to the east of Derrycashel, as is the Royal Canal pNHA (Site code 002103).

The Lough Forbes Complex SAC (Site Code 001818) and the overlapping Ballykenny-Fisherstown Bog SPA (Site Code 04101) are also both ca. 3km to the east.

Brown Bog NHA and SAC (Site Code 002346) is ca.6km east of Derrycashel.

The Lough Forbes Complex SAC is designated for habitats including Naturally eutrophic lakes; Active raised bogs, Degraded raised bogs still capable of natural regeneration, Depressions on peat substrates of the Rhynchosporion; and Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (www.npws.ie).

Ballykenny-Fisherstown Bog SPA is designated for Greenland White-fronted Goose (*Anser albifrons flavirostris*) (www.npws.ie).

The ecological value of the Royal Canal pNHA lies more in the diversity of species it supports along its linear habitats than in the presence of rare species. It crosses through agricultural land and therefore provides a refuge for species threatened by modern farming methods.

Lough Ree NHA (Site Code 00040), Lough Ree SAC (Site Code 000440) and Lough Ree SPA (Site Code 004064) share a hydrological link to Derrycashel Bog via the River Shannon (EPA Name: Shannon [Upper]), and are located 6km to the south of Derrycashel.

Lough Ree SAC (and pNHA) is designated for the natural eutrophic lake as well as active raised bogs, degraded raised bogs capable of natural regeneration, bog woodland and Otter. Lough Ree SPA is designated for the assemblage of wintering wildfowl, many species of which occur in nationally important numbers, in addition to

² [https://catchments.ie/wp-content/files/subcatchmentassessments/26C_8%20Shannon\[Upper\]_SC_070%20Subcatchment%20Assessment%20WFD%20Cycle%202.pdf](https://catchments.ie/wp-content/files/subcatchmentassessments/26C_8%20Shannon[Upper]_SC_070%20Subcatchment%20Assessment%20WFD%20Cycle%202.pdf)

³ NBDC Website Mapping at: <https://maps.biodiversityireland.ie/Map>

breeding Common Tern (*Sterna hirundo*) and Common Scoter (*Melanitta nigra*). No rehabilitation measures are proposed for the area of Derrycashel that overlaps with any designations.

3.4.1 Other Nature Conservation Designations

The Ramsar Convention entered into force in Ireland on 15th March 1985. Ireland currently has 45 sites/wetlands designated as Wetlands of International Importance (Ramsar Sites). These cover a surface area of 66,994ha. There are no Ramsar Sites in the local vicinity of Derrycashel Bog (i.e. within 3km) The closest Ramsar Sites to Derrycashel Bog include Mongan Bog (Offaly) and Lough Glen (Longford/Westmeath).

<https://www.arcgis.com/apps/MapTour/index.html?appid=cd6e1a247bdc4179b9dfc0461e950f1e#>

3.5 Hydrology and Hydrogeology

Derrycashel Bog currently has a pumped drainage regime. It is expected that when pumping is further reduced or stopped that water levels will increase across much of the site. Initial hydrological modelling indicates the bog has basins that will develop a mosaic of wetland habitats when pumping is reduced or stopped. Some sections are expected to revert to a mosaic of wetland habitat with deeper water (> 2 m). Water levels will also fluctuate across the bog due to seasonal inundation. There is a strong alkaline influence on the ground water chemistry of this bog due to exposed alkaline marls that are strongly alkaline (See also Table 3.1).

Derrycashel Bog is located in the Upper River Shannon (Shannon [Upper]) catchment. The bog is drained via field drains to the Feorish [Tarmonbarry] River (EPA Code 26F03) which joins the Shannon ca.1km due east of Derrycashel (ca.2km hydrologically downstream).

The drainage system had a series of pumps with one pump pumping into the next section, which is subsequently pumped on and so on until the water reaches the outflow drainage system. The former (intact) bog originally had a stream flowing westwards across it to the Feorish River. The route of this former stream corresponds with some of the lowest topographical land in Derrycashel. The former bog also had a small lough/open soak system that also corresponds now to a low area with wetlands and pioneer poor fen (PF1) development.

The bog is located in an area with a regionally important aquifer- Karstified (conduit)(Rkc)). (EPA map-viewer). An aquifer is an underground body of water-bearing rock or unconsolidated materials (gravel or sand) from which groundwater can be extracted in useful amounts. GSIs Aquifer classes are divided into three main groups based on their resource potential, and further subdivided based on the type of openings through which groundwater flows. There are nine aquifer categories in total.

Regionally important aquifers can supply regionally important abstractions (e.g. large public water supplies). The continuous aquifer unit generally has an area of >25 km². Groundwater flow predominantly occurs through fractures, fissures and joints.

Rkc aquifers are those aquifers in which the degree of karstification limits the potential to develop groundwater. They have a high 'flashy' groundwater throughput, but a large proportion of flow is concentrated in conduits, numerical modelling using conventional programs is not usually applicable, well yields are variable with a high proportion having low or minimal yields, large springs are present, storage is low, locating areas of high permeability is difficult and therefore groundwater development using bored wells can be problematical.

The bog is located in an area mapped by GSI as of low groundwater vulnerability (GSI Mapviewer). Groundwater Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that

determine the ease with which groundwater may be contaminated by human activities. Groundwater vulnerability maps are based on the type and thicknesses of subsoils (sands, gravels, glacial tills (or boulder clays), peat, lake and alluvial silts and clays), and the presence of karst features. Groundwater is most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes. These data indicate there is generally low risk of any groundwater contamination occurring at this site.

The peat is underlain by glacial deposits interbedded with glacio-fluvial deposits over limestone bedrock. The glacial deposits generally consist of grey gravelly clay/silt. Sapropel, an organic-rich layer of mud that was deposited as a river sediment, underlies much of the basal peat in Derrycashel. The bog water table across the site is now high, and perched above the underlying regional groundwater table. The ability of the surface water to interact with the underlying regional groundwater flows is limited by the permeability of the underlying glacial deposits. As such the potential for bog restoration to interact or impact on underlying groundwater is very low.

3.6 Emissions to surface-water and water-courses

Drainage is an important feature of industrial peat production and there were extensive field drains maintained throughout bog areas to facilitate industrial peat production annually, each of which eventually drains into a terminal silt pond that allows for settlement of suspended solids before entering the main river systems. In accordance with the existing Integrated Pollution Control licence, all drainage water from boglands in a licensed area is discharged via an appropriately designed silt pond treatment arrangement as required in Condition 6.6. of the licence. Industrial peat production has now permanently ceased at Derrycashel Bog.

Silt ponds are the key silt control infrastructure to control potential emissions from industrial peat production sites. As required under licence, BNM have a number of procedures for how it manages and maintains its silt pond network. The silt that builds up in silt ponds is excavated on a regular basis by Bord na Móna to facilitate an efficient level of silt control. Silt ponds will continue to be maintained during the rehabilitation and decommissioning. Silt pond decommissioning will be considered when sites are deemed to be on a trajectory of environmental stability and peatland rehabilitation has been completed.

Derrycashel bog has 4 treated surface water outlets to the Feorish IE_SH_26F030400 and eventually the Shannon Upper IE_SH_26S021600. Peat extraction was identified as a pressure in second cycle of the river basin management plan, in both these rivers and is indicated as remaining so in the third cycle, currently under preparation. Details of silt ponds, associated surface water emission points and those being monitored and sampled as part of the PCAS scheme are detailed on the attached water quality map (Figure 3.6A).

There is a robust monitoring program to track and verify any changes in baseline water quality conditions pre and post decommissioning and rehabilitation so that the success or otherwise can be tracked and verified for the National Parks & Wildlife Service, Environmental Protection Agency and Local Authority Water Program, amongst a range of stakeholders. The main emission limit value associated with this bog is 35mg/l suspended solids, with trigger levels for ammonia of 1.42mg/l and COD 100mg/l. Initial monthly ammonia concentrations from April to May 2021 have a range of 0.042 to 0.107mg/l with an average of 0.069mg/l (Table 3.1). From an analysis of any monitoring over the past 5 yrs. of the IPC licence environmental monitoring programme, indicate that results were under the ELV for SS and the trigger level for Ammonia, and with the majority of the trigger level for COD (Table 3.1).

Table 3.1.

Bog	SW	Monitoring	Sampled	pH	SS	TS	Ammonia	TP	COD	Colour
Derrycashel	SW-13	Q2 18	30/04/2018	8	5	380	0.11	0.05	53	198
Derrycashel	SW-14	Q2 18	30/04/2018	7.6	5	206	0.06	0.05	58	423
Derrycashel	SW-15	Q2 18	02/05/2018	8.2	5	392	0.08	0.05	53	99
Derrycashel	SW-16	Q2 18	02/05/2018	7.7	5	258	0.63	0.05	107	283
Derrycashel	SW-13	Q3 13	09/09/2013	6.8	5	136	0.29	0.16	91	180
Derrycashel	SW-14	Q4 13	25/11/2013	4.8	5	154	0.21	0.05	129	383
Derrycashel	SW-15	Q4 13	25/11/2013	6.6	5	172	1.1	0.05	71	184
Derrycashel	SW-16	Q4 13	25/11/2013	7.7	8	358	0.36	0.05	50	92

Rehabilitation of cutaway peatland is closely linked with control of emissions. One of the criteria for successful rehabilitation is stabilisation through re-vegetation, which will stabilise all substrates and in turn remove the need for further silt control measures. This site is already largely vegetated. Re-wetted peat also aid the primary objective of stabilizing peat, as when peat is re-wetted it is not vulnerable to wind erosion. Re-wetted peat and the development of wet peatland habitats can also act as sinks for silt and mobile peat, and increases additional retention time for solids, and the peatland vegetation can quickly stabilise this material within blocked drains on site (by acting like constructed wetlands).

Water quality of water discharges from restored peatlands normally improves as a result of bog restoration measures and the restoration of natural peatland processes (Bonn *et al.*, 20017). Bog restoration is also expected to improve water attenuation of the site as the drains are blocked, slowing water movement and water release from the site. Restored peatlands help slow the release of water and aid the natural regulation of floods downstream (Minayeva *et al.*, 2017). The National River Basin Management Plan (NRBMP) 2018-2021 (DHPCLG, 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). The NRBMP outlines how key actions such as the Bord na Móna peatland rehabilitation is expected to have a positive impact on water quality and help the NWBMP deliver its objectives in relation to the WFD.

Water will still discharge from designated emission points when rehabilitation at Derrycashel has been completed. This discharge will have improving water quality and there will be increased wetland attenuation, meaning slower release of water. This is expected to have a positive impact on status of the key water body receptor, the Shannon [Upper]_100, and is expected to support the future status of the waterbody as being of Good Status.

Decommissioning and Rehabilitation Programme Water Quality Monitoring.

The licence obligation of quarterly sampling regime on a selected number of ponds to be sampled over a 3 year cycle will not be sufficient to be able to appropriately track the changing water chemistry that will occur as part of this enhanced rehabilitation programme, so this sampling regime will occur on a monthly basis.

In order to assist in monitoring surface water quality from this bog, it was agreed to increase the existing licence monitoring requirements of the IPC Licence, to sampling for the same parameters every month.

This new sampling programme commenced in November 2020 and is enabling a baseline to be established, with sampling to progress during the scheduled works, and for a period of up to 2 years post rehabilitation. Depending on the period required to confirm that the main two parameters, suspended solids and ammonia as remaining compliant with the licence emission and trigger limit values and there is an improving trajectory in these two

parameters i.e. reduction in concentration, the monitoring programme and intensity will be periodically reviewed and amended.

In the preparation of this monitoring programme, Bord na Moña have been providing the Local Authority Water Programme (LAWPRO) with details of the surface water emissions points associated with this bog and will be amending some of the proposed monitoring locations on foot of this engagement. LAWPRO have in turn provided details of their 2021 monitoring programme and these are included in the Water Quality Map.

This is necessary to ensure that there is alignment with the WFD monitoring programme and that where possible, the monitoring programme will enable any improvements in water quality or establishing trends to be quantified against any available WFD monitoring data. It will also enable the periodic sharing of data which will inform the monitoring reports, success criteria and enable LAWPRO under the Water Framework Directive to track any changes in pressures and be aware of changes in water chemistry.

This enhanced monitoring programme will aim to include a minimum of 70% of a bog's drainage catchments, whatever number of surface water outlets these include.

Monitoring results will be maintained, trended every six months and reported on each year and as required, as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, and will be provided to LAWPRO and the EPA as required to inform progress and national monitoring requirements under the WFD. These results will also be available in April each year as a requirement of the Annual Environmental Report at www.epa.ie.

The parameters to be included as per condition 6.2 of the IPC Licence include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour & COD. In addition, DOC has been included as a parameter to try and identify any changes in carbon in the surface water, and where required by LAWPRO, to assist in investigating other changes in water chemistry, the series of parameters can be reviewed and amended.



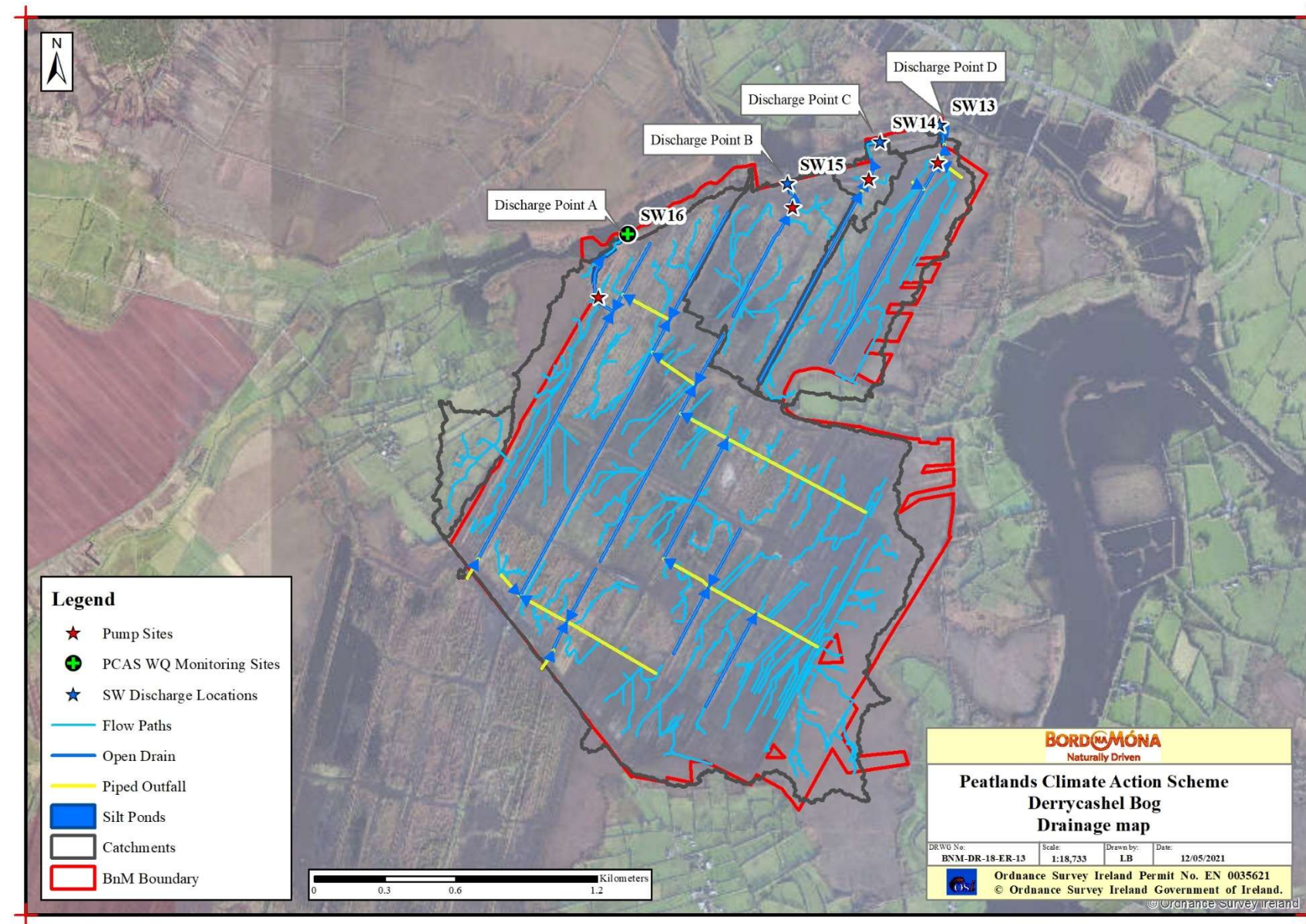


Figure 3.6b Drainage map

3.7 Fugitive Emissions to air

The bog is no longer in industrial peat production. Rehabilitation of the cutaway peatland will seek to re-wet the dry peat where possible, and re-vegetate all areas (whether wet or dry). Collectively, ceasing industrial peat production, re-wetting and re-vegetating will minimise any risk of emission to air from dust.

3.8 Carbon emissions

The bog is likely to be a carbon source as it is a drained (degraded) peatland with some active drainage, which facilitates the oxidation of peat. Peat extraction generally transforms a natural peatland which acts as a modest carbon sink into a cutaway ecosystem which is a large source of carbon dioxide (2–5 t C/ha/year) (Waddington & McNeil, 2002; Alm *et al.*, 2007; Wilson *et al.*, 2007, Wilson *et al.*, 2015). Furthermore, they are also a significant source of methane (Huttunen *et al.*, 2003; Laine *et al.*, 2007a) as a consequence of the conditions within the peat body that provide a suitable environment for the microbial breakdown of plant litter and root exudates. Degraded peatlands also release carbon/GHG emissions via the fluvial/aquatic pathway (Dissolved Organic Carbon – DOC, Suspended Solids/Particulate Matter, degassing of GHGs from water).

The EPA-funded CarbonRestore Project (Renou-Wilson *et al.* 2012) found that rewetting of drained peatlands can lead to restoration of functional peatland, such as the return of typical plant and animal species, which in turn may lead to the restoration of peat-formation and the C-sink function. The EPA NEROS project carried out GHG flux research at Moyarwood Bog and found that Moyarwood Bog was overall a Carbon sink (sink for CO₂ and a source for Methane) 6 years after bog restoration was carried out (Renou-Wilson *et al.* 2018).

It is expected that Derrycashel Bog will become a reduced Carbon source following rehabilitation. The potential of any cutaway site to develop as a carbon sink in the longer-term depends on the success of the rehabilitation measures, the extent of development of *Sphagnum*-rich or other peat-forming habitats, the balance of carbon fluxes from different cutaway habitats and future climatic conditions. Much of this site is expected to develop wetland habitats with open water, Reed Swamp and fen habitats with alkaline emission factors. Birch woodland is expected to develop on the drier mounds and peripheral headlands.

3.9 Current ecological rating

(Following NRA (2009) Evaluation Criteria)

The wetland habitats at this bog are deemed to be of **Local Importance (higher value)** due to its suitability for wintering wildfowl and breeding waders, whilst any bare peat is considered of **Local Importance (lower value)**. The intact remnant high bog located at the eastern section of the site is deemed to be of **National Importance**. The callows grassland along the Feorish River is rated to be of **County Importance**.

3.10 Derrycashel Bog Characterisation Summary

The bog is situated 5 km north of Lanesborough and the N5 Dublin-Westport Road is situated ca.1 km to the north. It is part of the Mount Dillon bog group. Peat production began at Derrycashel in 1951 and permanently ceased in 2018. Derrycashel Bog is situated in the floodplain of the River Shannon. In order to develop this bog for peat harvesting a pumped drainage system was installed.

Most of the former production area has been cutaway and active field drains running in a northeast to south west direction remain in place. Pioneer cutaway habitats have started to develop on the site in recent years, including

Birch woodland and scrub on the higher (and drier) areas with a mosaic of rush-dominated poor fen and bare peat over much of the remainder of this area. Some smaller areas of wetland habitats and open water are also present in the central portion of the site. The small area of Derrycashel Bog to the east that has never been in production forms a strip of bog remnant.

For the purpose of restoration, the bog can be divided into several distinct categories. In reality there are transitional zones between these areas but for the purpose of rehabilitation these areas are described as follows;

- 1) Shallow Cutaway Bog modelled as wetland; These areas are predicted to develop wetland habitats such as reedbeds. This habitat is predicted to form in the areas of shallow topographical depressions. Rehabilitation will facilitate the development and establishment of wetland vegetation.
- 2) Shallow Cutaway bog modelled as deeper water; These areas are predicted to develop deep open water habitats. This habitat is predicted for the deep topographical basin in the central areas of the site. A few smaller basins are present throughout the rest of the former production area also. An open water body (2-3m depth) will develop in these areas.
- 3) Shallow Cutaway Bog modelled as dry; These areas are modelled as dry and are predicted to develop dry cutaway vegetation communities such as birch and heath scrub.
- 4) High Bog Remnant, Rehabilitation for the high bog remnant on the eastern side of the site is proposed. This will be carried out through the blocking of drains to reduce water run off and increase water attenuation in this area. Invasive pitcher plant control is also proposed for this area.
- 5) Marginal areas, including headlands and high fields are likely to remain relatively dry. Drain-blocking and some fertiliser application is proposed on these area, where Birch woodland and other drier habitats are expected to develop.

4. CONSULTATION

4.1 Consultation to date

Consultation seeks to engage an audience of relevant stakeholders at both a national and local level. National stakeholders have been identified from varied bog restoration and rehabilitation efforts undertaken by Bord na Móna over the past 40 years, with particular emphasis on engagement with stakeholders during their Biodiversity Action Plan programme, since 2010. National Stakeholders includes relevant government departments and agencies, relevant semi-state bodies, NGOs and other environmentally-focused groups with a national remit.

There has been ongoing consultation about rehabilitation, biodiversity and other general issues over the years about Mount Dillion group bogs including Derrycashel Bog with various stakeholders in relation to:

- Feehan, J. (2004) A Long-Lived Wilderness; the future of the north midlands peatland network UCD/NWWPC.
- NPWS crop trial (2008-2010) to grow oats and linseed to support seed-eating farmland species such as Linnet.
- Lauder, A. & O'Toole L. (2017). Concept development for a landscape-scale Wetland Wilderness Park in the Mid Shannon Region. A report funded by the Heritage Council's Heritage Grant Scheme.
- Foss, P.J., Crushell, P. & Gallagher, M.C. (2017). Counties Longford & Roscommon Wetland Study. Report prepared for Longford and Roscommon County Councils.
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans).
- Sub-committee on Shannon Flooding Work Programme and Measures (OPW, Waterways Ireland, ESB, LA's, Fisheries Ireland, NPWs etc).
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans).
- Sub-committee on Shannon Flooding Work Programme and Measures (OPW, Waterways Ireland, ESB, LA's, Fisheries Ireland, NPWs etc).
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).
- Proposed greenway development (Roscommon County Council).
- Bord na Móna have led several guided walks at Derrycashel as Heritage Week events in the past few years.

To inform the current Plan, both national and local stakeholders, including neighbours whose land adjoins Derrycashel Bog and local representatives of national bodies (such as Regional National Parks and Wildlife Service staff) and relevant offices in County Councils (such as the Heritage or Environmental Offices) have been contacted. Any identified local interest groups have been sought and informed of the opportunity to engage with this rehabilitation plan, and when identified have been invited to submit their comments or observations in relation to the proposed rehabilitation at Derrycashel Bog (see Appendix XI).

4.2 Issues raised by Consultees

To date, a number of issues have been raised by consultees during the consultation process for both the current and previous drafts of the rehabilitation plan for Derrycashel Bog – these are summarised below.

4.2.1 *Assessments of rehabilitation*

Queries on pre-rehabilitation assessments were raised by NPWS and the National Museum of Ireland in relation to Appropriate Assessment, Environmental Impact Assessment and Strategic Environmental Assessment.

4.2.2 *Restoration scope*

Restoration/rehabilitation of marginal habitats was raised by IPCC, Irish Wildlife Trust and BCI as worthy of consideration within the rehabilitation measures to support carbon sequestration and biodiversity objectives.

4.2.3 *Monitoring*

Further details on monitoring of ecological metrics, including water quality, carbon sequestration and biodiversity, and how and where reporting on this monitoring would take place, was raised by the IPCC, Irish Wildlife Trust, Offaly County Council and Trinity College.

The ICMSA queried if a hydrological baseline was being established on surrounding private land in relation to assessing ex-situ impacts arising from re-wetting. Michael Fitzmaurice TD queried what monitoring was being undertaken to assess carbon emission reductions and storage within the bogs as part of PCAS.

4.2.4 *Flooding of adjacent land*

Michael Fitzmaurice TD, IFA and ICMSA queried likely impacts arising from the proposed re-wetting associated with the rehabilitation in general, in relation to flooding on adjoining lands and, specifically, with regards to the maintenance of drains. The IFA also raised the general issue of Health and Safety in relation to raising water levels as well as possible impacts on land and property prices.

4.2.5 *Land Management*

The ICMSA queried the long-term management of the Bord na Móna's estate, particularly in relation to maintenance of boundary fencing to exclude livestock from the bogs and maintenance of drainage.

The NARGC suggested that heather be established on large area of the cutaways as this is beneficial from biodiversity and pollinators. NARGC were also keen to minimise the spread of scrub and woodland habitats to reduce habitats from predators (such as foxes) and were keen to seek control of so-called "vermin" species on the rehabilitated bogs.

4.2.6 *Other issues (including amenity)*

Opportunities to develop amenities on the bog to support local communities was raised by IPCC.

Other issues (raised by IPCC and Irish Wildlife Trust) included after use of the bog and turf cutting on the margins of the bog (outside of the area owned by Bord na Móna).

Archaeological end of life survey of all the bogs were requested by National Museum of Ireland and National Monuments Unit.

The Irish Wildlife Trust also raised the issue of statutory protection for PCAS sites following rehabilitation and the adoption of a re-wilding strategy, including species reintroductions (specifically mentioning Beaver).

For a complete summary of submissions received and replies, see Appendix XI.

4.3 Bord na Móna response to issues raised during consultation

4.3.1 Assessments of rehabilitation

AA screening will be undertaken on all the bogs as part of PCAS and this is currently being undertaken by external consultants for Derrycashel Bog. Where required, Natura Impact Statements shall be completed and submitted to the Minister in accordance with 42(9) and 42(10) of the Habitats Regulation, noting that Bord na Móna is prescribed as a ‘public authority’ under this legislation. In relation to the SEA Directive and EIAR Directive, this has been considered and the legal advice to date is that the scheme does not come under these Directives.

An Archaeological Impact Assessment (AIA) has been undertaken on all the bogs in PCAS. The aim for known archaeology on these bogs is to accomplish preservation in situ and we are taking steps to identify and avoid all known archaeology. We are doing this by including all known archaeology on our GIS from the AIA process, and either excluding or defining a buffer zone around these features, which will then be excluded from any ground works in these areas in the final plan. Currently there are no known archaeological sites within Derrycashel Bog. Nevertheless, it is anticipated that any archaeology will benefit from the ultimate remit of the rehabilitation, in that water tables will be raised thereby preserving in-situ. There is also an identified procedure for managing reports of stray finds that may arise during rehabilitation works.

An archaeological end of life survey of all the bogs as requested by National Museum of Ireland and National Monuments Unit is not part of the current scope of the scheme. Bord na Móna would be happy to assist such a survey, where possible.

4.3.2 Restoration scope

The scope of this rehabilitation plan covers the former Derrycashel Bog industrial peat production area. As part of the PCAS, all restoration/rehabilitation options have been developed to support climate action and biodiversity objectives.

4.3.3 Monitoring

As part of the PCAS, a monitoring and verification plan has been developed to support climate action and biodiversity objectives. This will include stratified monitoring of bog condition, habitats and biodiversity at several different scales. Some fauna monitoring (pollinator transect) is proposed as part of the monitoring and verification at Derrycashel Bog during the period of the scheme (2021-2025). However, note that fauna typically take longer to respond to the changes in vegetation colonisation and habitats arising from the proposed rehabilitation measures identified for Derrycashel Bog

Water monitoring is undertaken as part of Bord na Móna’s IPC licence obligations, and this will continue until such a time as the licence can be surrendered.

4.3.4 *Flooding of adjacent land*

It is the intention of Bord na Móna that the re-wetting of the bogs will be carried out in such a manner that does not impact on third party lands including adjoining private turf banks.

External consultants have been appointed to carry out a hydrological assessment, to identify any potential impacts to neighbouring lands and, where required, the rehab design will be amended to prevent any identified impact. Please note that climate change is considered in the hydrological assessment. Information on these hydrological assessments will be made available through our website.

The rehabilitation measures will generally result in reduced runoff and drainage from the existing peat fields through a mixture of techniques including, drain blocking, cell bunding and re-profiling. It is intended that these measures will not significantly alter the existing topographical catchments and that the spine of the drainage networks will be retained by Bord na Móna. Based on evidence from other bogs, rehabilitation measures will reduce the run-off from the bog by returning the peatlands towards its natural water retention function

Bord na Móna will continue to manage their land bank into the future. As peat production has now ceased on Bord na Móna lands and rehabilitation measures will be carried out, a regular drainage maintenance programme will not be required or carried out as would have been the case in the past. However, if issues arise with the Bord na Móna internal drainage system that affects upstream or downstream landowners, then these issues will be addressed by Bord na Móna.

4.3.5 *Land Management*

Bord na Móna will continue to have responsibilities for managing the land in their ownership as any landowner would. In addition, land still under an IPC licence will need to be managed in accordance with that licence.

It is expected that re-wetting will reduce area being colonised by Birch and other scrub species as conditions will be more suitable for wetter species. However, in drier areas that cannot be re-wetted, particularly where there is shallow (or no) residual peat, it is inevitable that drier vegetation communities, including Birch woodland will develop.

However, it is expected that as some naturally functioning peatland ecosystems develop that are analogous to embryonic raised bog (SW corner of the western side), these will colonise with Heather and other ericoid species in time and typical raised bog hummocks will re-develop.

4.3.6 *Other issues (including amenity)*

Creating amenity such as walking tracks is not part of the direct scope of PCAS. However, PCAS will enable and support future amenity development. Future amenity proposals can be positively aligned and integrated to after-use plans following the completion of the proposed rehabilitation at Derrycashel Bog. Suggested Rehabilitation measures proposed for Derrycashel Bog do not need to be amended to integrate any future amenity track positioned along the margin of the former production bog or along the former bog railway.

There would be local long-term interest for the inclusion of Derrycashel Bog in a Mid-Shannon Wetland Wilderness Park, promoted by John Fallon (See Feehan 2004). This potential future land-use is compatible with the proposed rehabilitation (Note that Bord na Mona have not made any permanent decision around the future land-use of Derrycashel Bog yet).

Other issues, including after-use and management issues outside the boundary of Derrycashel Bog, are acknowledged but are specifically outside the scope of this rehabilitation plan. This includes reference to the

cessation of turf-cutting on private lands. Bord na Móna rehabilitation proposals will not impact on private turf-cutting and will have no impact on private turf-cutting outside Bord na Móna boundaries.

It is not possible to confirm whether or not Derrycashel Bog (or any other PCAS site) will become a designated area in the future, however this is unlikely given the current status of the bog. It should be noted that such a designation is purely a decision for the Government and not Bord na Móna.

4.3.7 *Concluding statement.*

- No specific issues were raised during consultation that required significant changes to the substance of the rehabilitation plan.
- Issues raised by several consultees in relation to potential impacts on adjacent land had already been accounted for during the hydrological analysis. Several marginal drains will not be blocked to avoid impacts on adjacent lands or turf-banks.
- No changes were required to the rehabilitation plan to enable any potential future amenity.

5. REHABILITATION GOALS AND OUTCOMES

The rehabilitation goals and outcomes outline what Bord na Móna want to achieve by implementing the rehabilitation. These include:

- Meeting conditions of IPC Licence.
- Stabilisation or reduction in water quality parameters of water discharging from the site (e.g. suspended solids).
- Reducing pressure on receiving water-bodies that have been classified as At Risk from peatlands and from peat extraction, via stabilization or improving water-quality from this bog, and therefore, reducing pressures.
- Optimising hydrological conditions for **climate action benefits as part of PCAS**.
- Optimising hydrological conditions for the development of reed swamp and fen on shallow more alkaline peat and other subsoils.
- Optimising hydrological conditions for the protection of any exposed archaeological structures, their retention in situ and preservation into the future, where possible.
- Optimising hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future, where possible.
- The main goal and outcome of this plan is the successful rehabilitation (environmental stabilisation) of peatlands used for industrial peat production at the bog in a manner that is acceptable to both external stakeholders and to Bord na Móna and which optimise climate action and other ecosystem service benefits.

The rehabilitation goals and outcomes take account of the following issues.

- It will take some time for stable naturally functioning habitats to fully develop at Derrycashel Bog. This will happen over a longer time-frame than the implementation of this rehabilitation plan.
- Re-wetting residual peat will initially maintain and enhance the carbon storage capacity of the bog. There is scientific consensus that restoration of hydrology in damaged bog can improve carbon storage, water storage and attenuation and help support biodiversity both on the site and in the catchment (See Section 3.8). This will reduce carbon emissions from the site from a larger carbon source to a smaller carbon source. In time, the site has the capacity to develop in part as a carbon sink. PCAS is expected to deliver significant contributions to Ireland's climate action.
- It is not expected that the site has the potential to develop active raised bog (ARB) analogous to the priority EU Habitats Directive Annex I habitat within the foreseeable future (c.50 years). Furthermore, only a proportion of the bog has potential to develop *Sphagnum*-rich habitats in this timeframe. Nevertheless, re-wetting across the entire bog, as part of the Scheme, will improve habitat conditions of the whole bog. Other peatland habitats will develop in a wider mosaic that reflects underlying conditions.
- Rehabilitating former industrial peat production bog will also in the longer-term support other ecosystem services such as the development of new habitat to support biodiversity and local attenuation of water flows from the bog.
- WFD status in receiving water bodies can be affected by peatlands and peat extraction, but is also affected by other sources such as agriculture. In addition, receiving water bodies that are assessed as At Risk from peatlands and from peat extraction are likely to have several contributory sources of impacts (private peat extraction and Bord na Moña). Reducing pressures due to former peat extraction activities

at Derrycashel will contribute to stabilising or improving water quality status of receiving water bodies in general. Ultimately, improving the WFD status of the receiving water-body will depend on reducing pressure from a range of different sources., including peatlands in general (private and Bord na Mona).

- Bord na Móna are also planning rehabilitation measures in some adjacent bogs (e.g. Knappogue) in 2022. There are expected to be cumulative water quality and other ecosystem service benefits to receiving water bodies such as the River Shannon from rehabilitating more than one bog in the same catchment.
- Re-wetting in general will benefit the future preservation of most known and unknown archaeological features.

6. SCOPE OF REHABILITATION

The principal scope of this enhanced rehabilitation plan is to rehabilitate the bog. This is defined by:

- The area of Derrycashel Bog (Figure 3.1).
- EPA IPC Licence - Ref. P0504-01. 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. Derrycashel bog is part of the Mount Dillon Bog group.
- The proposed Scheme is designed to exceed the stabilisation requirements as defined by the IPC Licence. This scheme is designed to enhance the ecosystem services of Derrycashel Bog, in particular, optimising **climate action benefits**. The proposed interventions will mean that environmental stabilization is achieved (meaning IPC obligations are met) and, in addition, significant other ecosystem service benefits particularly for climate action will be accrued.
- The local environmental conditions of Derrycashel Bog mean that wetland creation is the most suitable rehabilitation approach for this site. Derrycashel Bog had a pumped drainage regime and a significant area is likely to develop as wetland habitats. There is only a small portion of residual deep peat.
- The key goals and outcomes of rehabilitation set by Bord na Móna. Bord na Móna have defined the key goal and outcome of rehabilitation at Derrycashel Bog **environmental stabilisation, optimising residual peat re-wetting, and the development of wetlands/Reed Swamp and fen on shallow more alkaline peat and other subsoils and areas where there is likely to be deeper water**.
- Rehabilitation of Derrycashel Bog will support multiple national strategies of climate action, biodiversity action and other key environmental strategies such as the Water Framework Directive.
- The time frame for the delivery of the planned rehabilitation will be undertaken according to available resources and appropriate constraints.
- It is proposed to carry out some targeted rehabilitation (drain-blocking) on the raised bog remnant in BnM ownership located at the eastern side of the site.
- It is not proposed to carry out any rehabilitation in the other marginal cutover bog zones. Generally, these bog remnants are narrow, or are subject to turbary, and do not have positive bog restoration prospects.

6.1 Key constraints

- **Bog conditions.** Rehabilitation outcomes of sites are constrained by the environmental characteristics of these particular areas. For example, there is potential for raised bog restoration at some sites where there has not been significant industrial peat extraction and the peat body is largely intact (deep peat sites that are drained). At other sites, most of the peat mass has been removed, the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status, etc.) and there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland).
- Peat Production at Derrycashel bog commenced in 1951, and finished in 2018. Remaining peat depths are therefore shallow for the most part (i.e. <1m) apart from the SE Portion where depths reach ca.2m adjacent to the extant high bog. In addition, this bog was formerly pumped to facilitate peat extraction – however pumps are now switched off resulting in seasonally increased levels of standing water. These are local factors that will influence the future trajectory of this bog, which need to be considered as part of the wider rehabilitation work.

- **Surrounding landscape and neighbours.** Another key constraint is the interaction between the Bord na Móna sites and the surrounding landscape. Care has to be taken that no active rehabilitation management is carried out that could negatively and knowingly impact on surrounding land. This includes any hydrological management on neighbouring farmland. It is anticipated that the work proposed here (blocking drains and re-wetting cutaway peatlands) will not have any flooding impacts on adjacent land.
- **Archaeology.** The discovery of monuments or archaeological objects during peatland rehabilitation may potentially constrain the rehabilitation measures proposed for a particular area. While the rehabilitation will optimise hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future, any new archaeology may require rehabilitation measures will be reviewed and adapted. If this occurs, rehabilitation measures will be reviewed and adapted. An Archaeological Impact Assessment (Appendix XII) was carried out to mitigate against any impact on found archaeology at Derrycashel Bog. The proposed rehabilitation will have no impact on any known archaeological material in the application area or the vicinity. In the worst-case scenario works affecting the surface and sub-surface of the bog might disturb previously unknown archaeological deposits or artefacts without preservation by record taking place. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should be avoided and reported to Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.
- **Public Rights of Way.** Where a public right of way or similar burden exists on Bord na Móna property, consideration will be given to ensuring that this remain intact where possible. In some instances, depending upon previous land uses and management, alternative solutions may be required. These will be explored in consultation with local communities and statutory bodies during the consultation work associated with the decommissioning and rehabilitation work described here.

6.2 Key Assumptions

- It is assumed that Bord na Móna will have all resources required to deliver this project.
- It is expected that weather conditions will be within normal limits over the rehabilitation plan timeframe. Long periods of wet weather have the capacity to significantly affect ground conditions and constrain drain blocking and other ground activities.

6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

- The longer-term development of stable naturally functioning habitats to fully develop at Derrycashel Bog. The plan covers the short-term rehabilitation **actions** and **an additional monitoring and after-care programme** to monitor the rehabilitation and to respond to any needs.
- This plan is not intended to be an after-use or future land-use plan for Derrycashel Bog.
- The longer-term management of this site, potentially as a nature conservation site, or for amenity, or for other uses in the future.

7. CRITERIA FOR SUCCESSFUL REHABILITATION

This section outlines what criteria will be used to indicate successful rehabilitation and what critical success factors are needed to achieve successful rehabilitation. All criteria used to indicate successful rehabilitation will be measured to validate the achievement of the rehabilitation goals and outcomes and validate the completion of the rehabilitation.

The key objective of this enhanced rehabilitation plan is **environmental stabilisation** and the stabilisation of any emissions from the site that related to the former industrial peat extraction activities.

Rehabilitation is generally defined by Bord na Móna as

- stabilisation of bare peat areas via targeted active management (e.g. drain-blocking/re-wetting) slowing movement of water across the site and encouraging natural colonisation; and
- mitigation of key emissions (e.g. potential silt run-off).

In addition, Bord na Móna wish to optimise climate action and other ecosystem service benefits via enhanced rehabilitation measures.

7.1. Criteria for successful rehabilitation to meet EPA IPC licence conditions:

- Rewetting of residual peat in the former area of industrial peat production to offset potential silt run off and to encourage and accelerate development of vegetation cover via natural colonisation, and reducing the area of bare exposed peat. See Table 7.1 for a summary of the criteria for successful rehabilitation and associated monitoring. The target will be the delivery of measures and this will be measured by an aerial survey after rehabilitation is completed.
- That there is a stabilizing/improving concentration of suspended solids and ammonia in discharges from Bord na Móna sites, associated with the measures undertaken to stabilize the peat surface by the blocking of the internal drainage system and the maximized rewetting of the peat surface. This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be measured via water quality monitoring (suspended solids and ammonia) for at least 2 years after the rehabilitation has been completed.
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are At Risk from peatlands and peat extraction. The success criteria will be that the At Risk classification will see improvements in the associated pressures from this peatland or if remaining At Risk, that there is an improving trajectory in the pressure from this peatland.

With regard to predicting and estimating likely trends that might materialize or could be considered as a target, monitoring of surface water ammonia emissions from Longfordpass bog in Littleton over 3 yrs., post cessation of peat extraction with ongoing rehabilitation, were considered. These are indicating a downward trend in Ammonia concentrations (Figure 7.1).

Similarly monitoring of surface water ammonia emissions from a Corlea bog in Mountdillon over the past 3 yrs. post cessation of peat extraction with ongoing rehabilitation, indicate downward trends.

As the monthly monitoring program at Derrycashel continues in 2021 during the rehabilitation works, and data from the 2020 monitoring program is compiled, further trending will be produced to verify any ongoing trends.

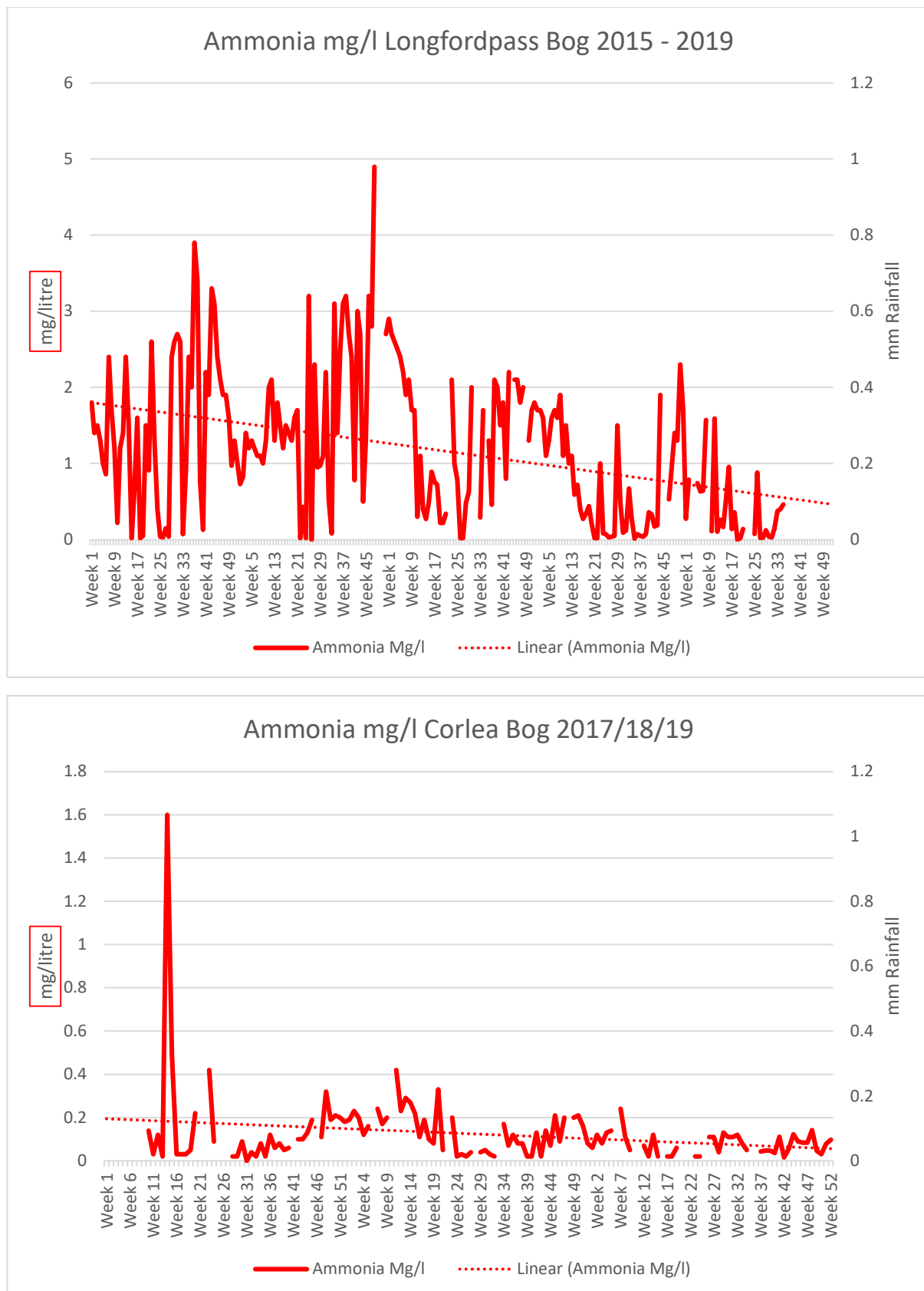


Figure 7.1. Ammonia levels over the period 2015-2019 at Longfordpass and Corlea.

Additional criteria for successful rehabilitation to optimise climate action and other ecosystem service benefits:

- Optimising the extent of suitable hydrological conditions to optimise climate action and other ecosystem service benefits (optimising and maximising residual peat re-wetting). This will be measured by an aerial survey after rehabilitation has been completed.
- Accelerating the trajectory of the bog towards becoming a reduced carbon source/carbon sink. This will be measured through habitat mapping and the development of cutaway bog condition assessment. This cutaway bog condition assessment will include assessment of environmental and ecological indicators such as vegetation cover, vegetation communities, presence of key species, *Sphagnum* cover, bare peat cover and water levels (similar to ecotope mapping). Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Reduction in carbon emissions. This will be estimated via a combination of habitat condition assessment and application of appropriate carbon emission factors derived from other sites. Baseline monitoring (habitat condition) will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Setting the site on a trajectory towards establishment of a mosaic of compatible habitats including wetland, fen, Reed swamp, heath, scrub, poor fen, embryonic *Sphagnum*-rich peatland communities and Birch woodland, where conditions are suitable. Some of these habitats have already in part established as pioneer vegetation/wetlands. It will take some time for stable naturally functioning habitats to fully develop at Derrycashel Bog. This will be demonstrated and measured via aerial photography, habitat mapping and cutaway/habitat condition assessment. Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Improvement in biodiversity and ecosystem services. This will be demonstrated by metrics outlined in Section 9.1 that can be used to measure changes in ecosystem services (e.g. water quality parameters, development of pioneer habitats, breeding bird monitoring). This will be measured by collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services. Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.

Table 7.1. Summary of Success criteria, targets, how various success criteria will be measured and expected time-frames.

Criteria type	Criteria	Target	Measured by	Expected Time-frame
IPC validation	Rewetting in the former area of	Delivery of rehabilitation measures Reduction in bare peat.	Aerial photography after rehabilitation has been completed – to	2021-2025

	industrial peat production		demonstrate measures (drain-blocking) Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition.	
IPC validation	Key water quality parameters Ammonia, Phosphorous, Suspended solids, pH and conductivity	Reduction or stabilisation of key water quality parameters associated with this bog	Water quality monitoring for a period after rehabilitation has been completed	2021-2023
IPC validation	Reducing pressure from peat production on the local water body catchment (WFD)	Where this section of the water body, that this bog drains to, has not been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body, confirms that its classification remains at not being at risk from peat extraction associated with activities at this bog.	EPA WFD monitoring programme	WFD schedule
Climate action verification	Optimising the extent of suitable hydrological conditions to optimise climate action	Optimal extent of suitable hydrological conditions	Aerial photography and Habitat mapping to map extent of suitable hydrological conditions. Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re-monitored in the future and	2021-2025

			compared against this baseline.	
Climate action verification	Reduction in carbon emissions.	Reduction in carbon emissions	Carbon emissions – estimated using a bog condition assessment and appropriate carbon emission factors.	2021-2025
Climate action verification	Setting the site on a trajectory towards establishment of a mosaic of compatible habitats	Establishment of compatible cutaway habitats	Habitat map, Cutaway bog condition map Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re-monitored in the future and compared against this baseline.	2021-2025
Climate action verification	Biodiversity and ecosystem services. Habitat establishment Presence of key species – Sphagnum Breeding and wintering birds Pollinators	Improvement in biodiversity and ecosystem services.	Metrics that relate to selected biodiversity and ecosystem services Presence of key species – Sphagnum – Walkover survey Breeding birds – Breeding bird survey Pollinators – Pollinator walk	2021-2025

Meeting climate action verification criteria and monitoring of these criteria after the scheme has been completed is dependent on support from the Climate Action Fund or other sources of funding. Note that monitoring and verification of the overall scheme will be stratified – not all these criteria will be measured at each individual site. Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re-monitored in the future and compared against this baseline.

7.2. Critical success factors needed to achieve successful rehabilitation as outlined in the plan

The achievement of successful rehabilitation as outlined in the plan requires:

- **Funding to pay for resources required to deliver the planned rehabilitation (Bord na Móna and external).** Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. Bord na Móna is fully committed to meeting its obligations relating to

rehabilitation and decommissioning under the Integrated Pollution Control Licence. It is expected that additional costs of enhanced rehabilitation will be supported by Government through the Climate Action Fund.

- **Bord na Móna to have sufficient resources (staff and training) to deliver the planned rehabilitation with required associated skills and competencies.**
- **Bord na Móna to have sufficient resources (suitable machinery) and staff to maintain this machinery.**
- **Weather conditions to be within normal limits over the rehabilitation plan timeframe.** Long periods of wet weather have the capacity to significantly affect ground conditions and constrain the delivery of rehabilitation. The potential impact of wet weather on ground conditions can be reduced by appropriate planning and management. Bord na Móna have significant experience of managing these issues through 70 years of working in these peatland environments.
- **Rehabilitation measures to be effective.** The rehabilitation measures proposed in this plan are based on 40 years of Bord na Móna experience of peatland management and best practise applied internationally in peatland management. Measures proposed in this plan have already been shown to be effective at other sites. Bord na Móna will apply a flexible and adaptable approach to the more innovative rehabilitation measures proposed in this plan. If measures are not initially effective, Bord na Móna will review any requirement for additional practical rehabilitation.
- **Natural colonisation of vegetation to develop semi-natural habitats at a rate within the normal limits.** The development of naturally functioning semi-natural habitats on degraded bog takes time. It may take 30-50 years for active raised bog vegetation to re-develop on suitable cutaway that was previously bare peat. However, Bord na Móna experience has demonstrated the effectiveness of these type of measures for re-wetting bog and creating carbon sinks (Renou-Wilson et al. 2018).
- Rehabilitation measures have been designed to accelerate and work with natural colonisation and other natural processes. Bord na Móna experience of rehabilitation has shown that re-wetting improves conditions for natural colonisation and that natural colonisation is accelerated where the environmental conditions are most suitable. Rehabilitation measures have been designed to modify the conditions of areas within sites where conditions are less suitable for natural colonisation (modifying hydrology, topography, nutrient status or availability of potential seed sources).
- **Monitoring to be robust and effective.** Rehabilitation Monitoring will be established to validate the success of rehabilitation as required by Condition 10 of the IPC Licence and to verify the benefits of the proposed enhanced measures to optimise climate action. This will focus on collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services.

8. REHABILITATION ACTIONS AND TIME FRAME

Peatland rehabilitation requires detailed planning and the use of data from desktop surveys and field surveys. This data in association with topographical and hydrological modelling (Figure 8.3 & 8.4) will be important in planning the future peatland landscapes and planning the use of the most appropriate rehabilitation methodologies to maximise climate action benefits. Hydrological modelling (Figure 8.4) indicates those areas that are likely to re-wet when drains are blocked, based on the current topography, and areas where water levels may have to be modified, where needed. Enhanced rehabilitation measures will look to optimise hydrological conditions for re-wetting peat in other areas. This planning is also essential for matching the most sustainable rehabilitation methodology to the most suitable cutaway environment to maximise the benefits of the resource outlay (maximising cost/benefit).

The rehabilitation actions will be a combination of PCAS measures to re-wet peat. The distribution of these measures is provisionally outlined in Figure 8.5. (Note that the actual distribution of these measures may be subject to change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.)

These enhanced measures for Derrycashel bog will include (see Table 8.1 and Figure 8.1):

- Re-assessment of the pumping regime and removing pumps if this desired and has no significant external impact. Initial hydrological modelling indicates that a significant part of the site will develop a mosaic of wetland habitats with permanent deeper water. Hydrological management will look to optimise summer water levels to maximise the development of wetland vegetation (by looking to set water depths at < 0.5 m, where possible. It is inevitable that some sections will naturally have deeper water due to the topography at this site). Water-levels will be adjusted at outfalls and by adjusting piped drainage. More sustainable permanent gravity drainage solutions will be examined. Some targeted bunding may be required. It is expected that a natural seasonal regime of water fluctuation will develop, with water-levels fluctuating in association with levels in the adjacent River Shannon.
- Intensive drain blocking around existing wetlands or standing water to create/promote the spread of wetland habitats,
- Modifying outfalls, and management of water levels with overflow pipes and blocking of internal outfalls;
- Optimising water retention in wetland areas, including placement of berms where required;
- Regular drain blocking (3/100) on dry cutaway adjacent to wetland mosaics, along with the blocking of outfalls and management of water levels;
- Intensive blocking of drains in targeted marginal (degraded) raised bog remnant located at western side of the site and re-wetting, where possible, using an excavator to install peat blockages. Some other bog remnants are too small to benefit from this approach;
- Assessment of potential to remove invasive species Pitcher Plant from the site and implementation of any measures.
- Targeted fertiliser applications to accelerate vegetation establishment on areas of **bare peat** on headlands and high fields. Areas where vegetation has established do not need fertiliser application. (It is noted that the application of fertiliser may need additional assessment and approval as per the IPC Licence),
- It is not expected that inoculation of Reeds and rhizomes will be required at this site as there has already been significant natural colonisation.

Table 8.1: *Types of and areas for enhanced rehabilitation measures at Derrycashel Bog.* Note that the types of rehab and areas of rehab may change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.

Type		Enhanced Rehabilitation Measure	Extent (Ha)
Wetland	WLT1	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes	4.6
Wetland	WLT2	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes + Targeted blocking of outfalls within a site	188.6
Wetland	WLT3	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing overflows + targeted blocking of outfalls within a site +constructing larger berms to re-wet cutaway +	
Wetland	WLT4	More intensive drain blocking (max 7/100 m), + blocking outfalls and managing overflows + transplanting Reeds and other rhizomes	49.1
Marginal land	MLT1	No work required	25.1
Marginal land	MLT2	More intensive drain blocking (max 7/100 m)	39.2
Silt ponds	Silt pond	Silt ponds	0.3
Dry Cutaway 2	DCT2	Regular drain blocking (3/100m) +blocking outfalls and managing water levels with overflow pipes + targeted fertiliser treatment	73.8
Constraint	Constraint	Other Constraints (ROW)	6.1
Total			386.9

8.1 Short-term planning actions (0-1 years)

- Seek formal approval of the enhanced plan, noting the alternative standard plan should funding from the proposed Scheme not materialise, from the EPA.
- Agree an *ex ante* budget of eligible costs (based on the approved enhanced plan) with the Scheme regulator.
- Develop a detailed site plan with engineering drawings outlining how the various rehabilitation methodologies (The proposed Scheme PCAS) will be applied to Derrycashel Bog. This will take account of peat depths, topography, drainage and hydrological modelling. (See map for an indicative view of the application of different rehabilitation methodologies).
- A drainage management assessment of the proposed enhanced rehabilitation measures was carried out and any issues identified were resolved and the rehabilitation plan adapted. No specific issues that would change the overall objectives of the rehabilitation plan were identified.
- A review of known archaeology and an archaeological impact appraisal of the proposed rehabilitation was carried out. The results of this assessment was incorporated into the rehabilitation plan to minimise known archaeological disturbance, where possible.
- An assessment of pumping requirements to complete decommissioning was carried out.

- A review of issues that may constrain rehabilitation such as known rights of way, turbary and existing land agreements was carried out. Several rights of way exist on the site and are mapped as constraints.
- A review of remaining milled peat stocks was carried out. There are no peat stocks remaining on the bog.
- An ecological appraisal of the potential impacts of the planned rehabilitation on the presence of sensitive ground-nesting bird breeding species (e.g. breeding waders) was carried out. The scheduling of rehabilitation operations was adapted, where required.
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.
- Carry out Appropriate Assessment of the Rehabilitation Plan. (Note that an AA screening of Derrycashel has been carried out and the rehab plan has screened out at Stage 1).
- See Derrycashel Decommissioning and Rehabilitation Plan – Addendum 1 for more details of the AA screening conclusion.
- Track implementation and enforcement of the relevant IPC Licence conditions, the mitigation measures (AA) and other environmental control measures during the implantation of the rehabilitation plan.

8.2 Short-term practical actions (0-2 years)

- Carry out proposed measures as per the detailed site plan. This will include a combination of drain blocking, and fertiliser applications targeting bare peat areas of headlands, high fields and other areas (where required) in addition to wetland creation and management prescriptions. All rehabilitation will be carried out with regard to best practice environmental control measures (Appendix IV);
- Monitor the success of rehabilitation measures in relation to developing suitable hydrological conditions;
- Carry out the proposed monitoring, as outlined.
- While natural colonisation is expected to commence almost immediately once peat production ceases, Phase 2 actions will be carried out in targeted areas to accelerate re-vegetation and colonisation of target species. Phase 2 actions may include seeding of targeted vegetation and inoculation of *Sphagnum*;
- Silt ponds will be monitored during this period and there will be continued maintenance and cleaning to prevent potential silt run-off from the site during the rehabilitation phase; and
- Submit an *ex post* report to the Scheme regulator to verify the eligible measures to be carried out in year 1 of the Scheme, and an *ex ante* estimate for year 2 of the Scheme; and so on for each year of the proposed Scheme.

8.3 Long-term (>3 years)

- Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary;
- Delivery of a monitoring, aftercare and maintenance programme (See section 10.2 below);
- Decommissioning of silt-ponds will be assessed and carried out, where required; and
- Reporting to the EPA will continue until the IPC License is surrendered.

8.4 Timeframe

- **2020-2021:** Short-term planning actions.
- **2021:** Short-term practical actions.
- **2021-2024:** Long term practical actions. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- **2024:** Decommission silt-ponds, if necessary

8.5 Budget and costing

Bord na Móna (BnM) appreciates the Minister's intention to support, via the Climate Action Fund, Bord na Móna in developing a package of measures, 'the proposed Scheme', for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as, the Peatlands Climate Action Scheme'. *However, only the additional costs associated with the additional and enhanced rehabilitation, i.e, measures which go beyond the existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support.*

The enhanced decommissioning, rehabilitation and restoration of the peatlands funded by the proposed Scheme will deliver benefits across climate action (GHG mitigation through reduced carbon emissions and acceleration towards carbon sequestration), enrich the State's natural capital, increase eco-system services, strengthen biodiversity, improve water quality and storage attenuation as well as developing the amenity potential of the peatlands.

Bord na Móna maintains a provision on its balance sheet to pay for the future costs of **standard** rehabilitation and decommissioning when industrial peat extraction ceases. This is updated every year - for more information see the Bord na Móna Annual Report (Bord na Móna 2020). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

At this time, a 'standard' rehabilitation provision (sufficient to discharge the requirement of Condition 10 in the licence) has been allocated to the site based on the area of different cutaway types across the site (See Appendix I).

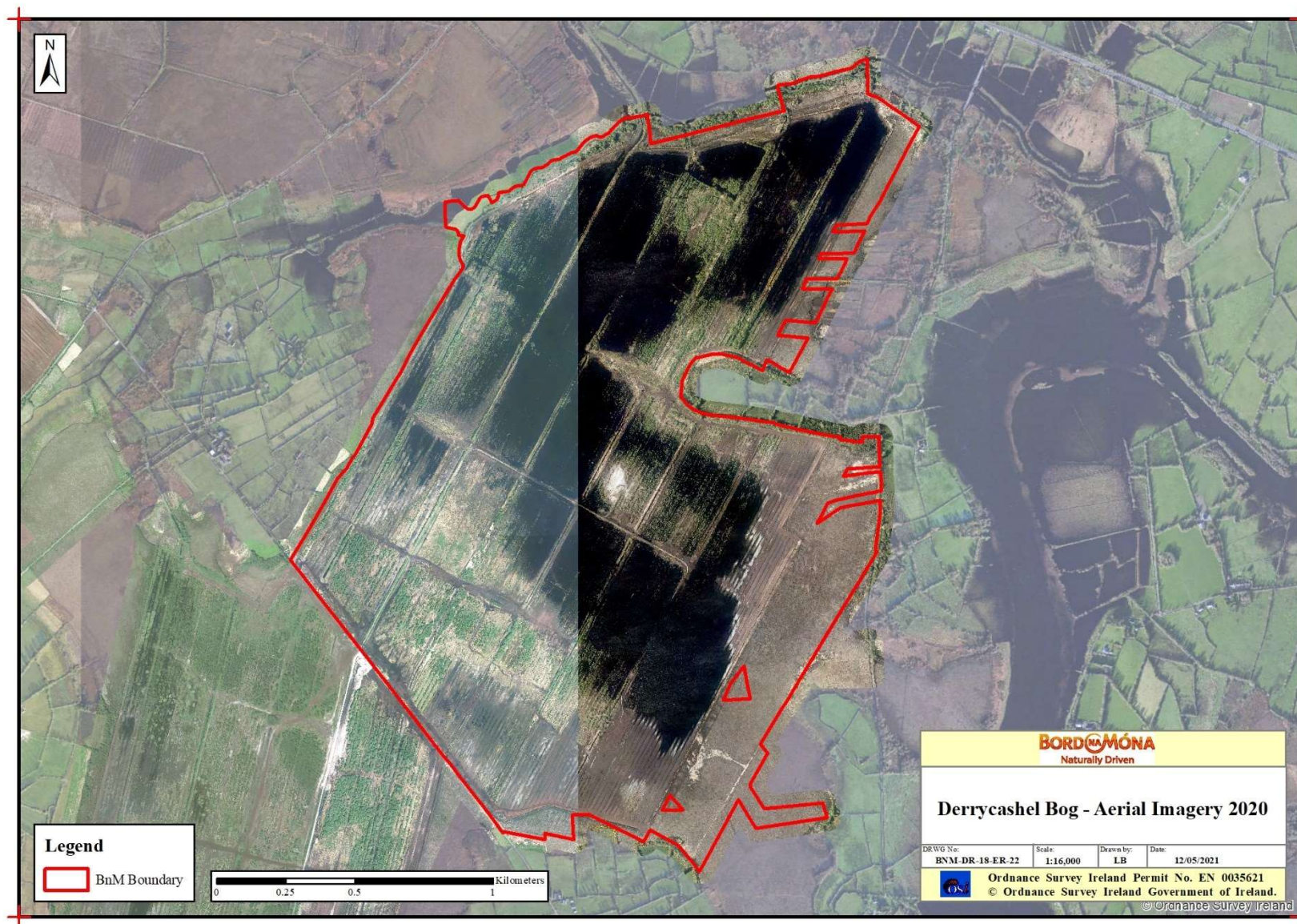


Figure 8.1 Aerial photo (2020) of Derrycashel Bog.

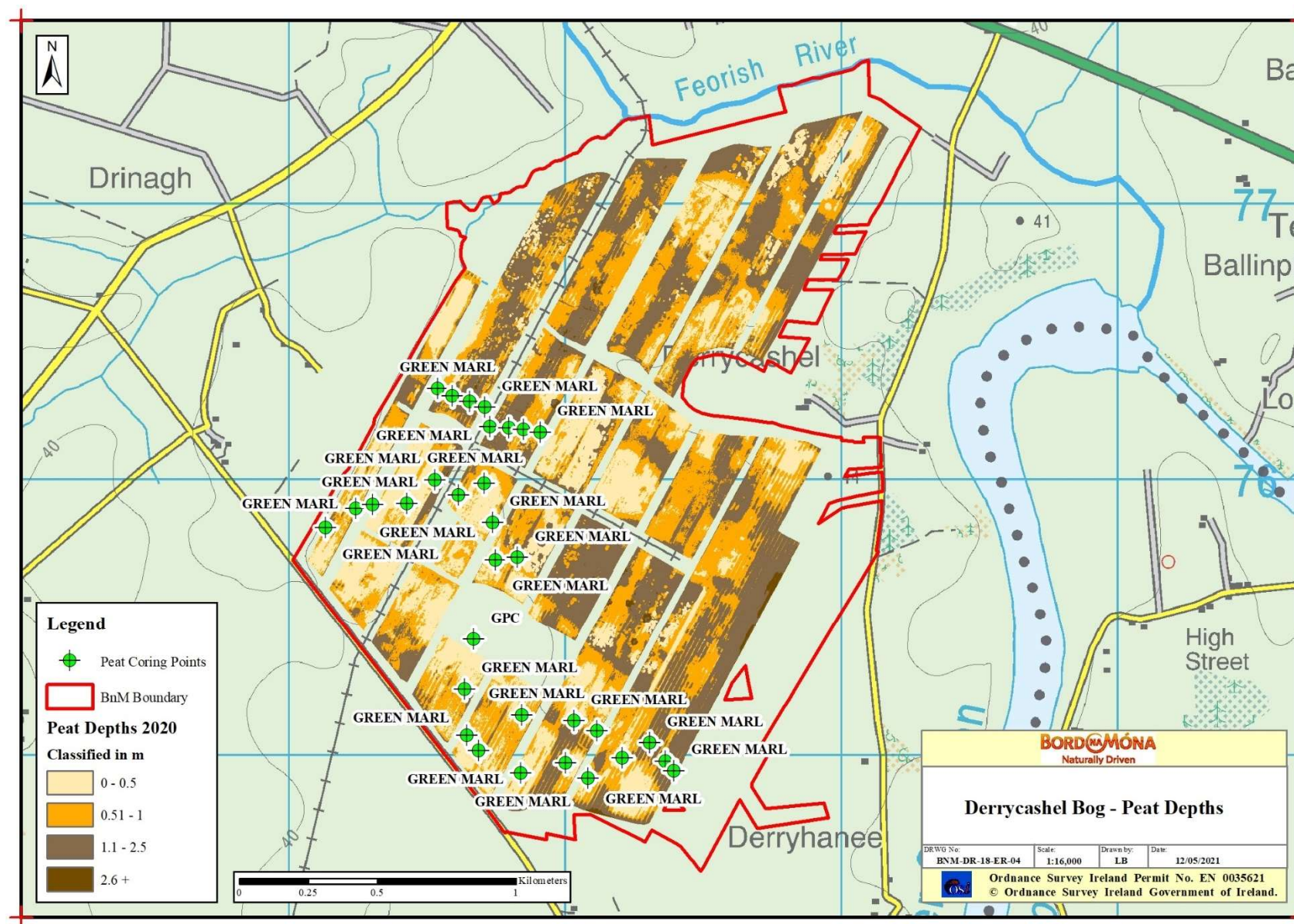


Figure 8.2 Derrycashel Bog Peat Depths map. The majority of the site has very shallow residual peat.

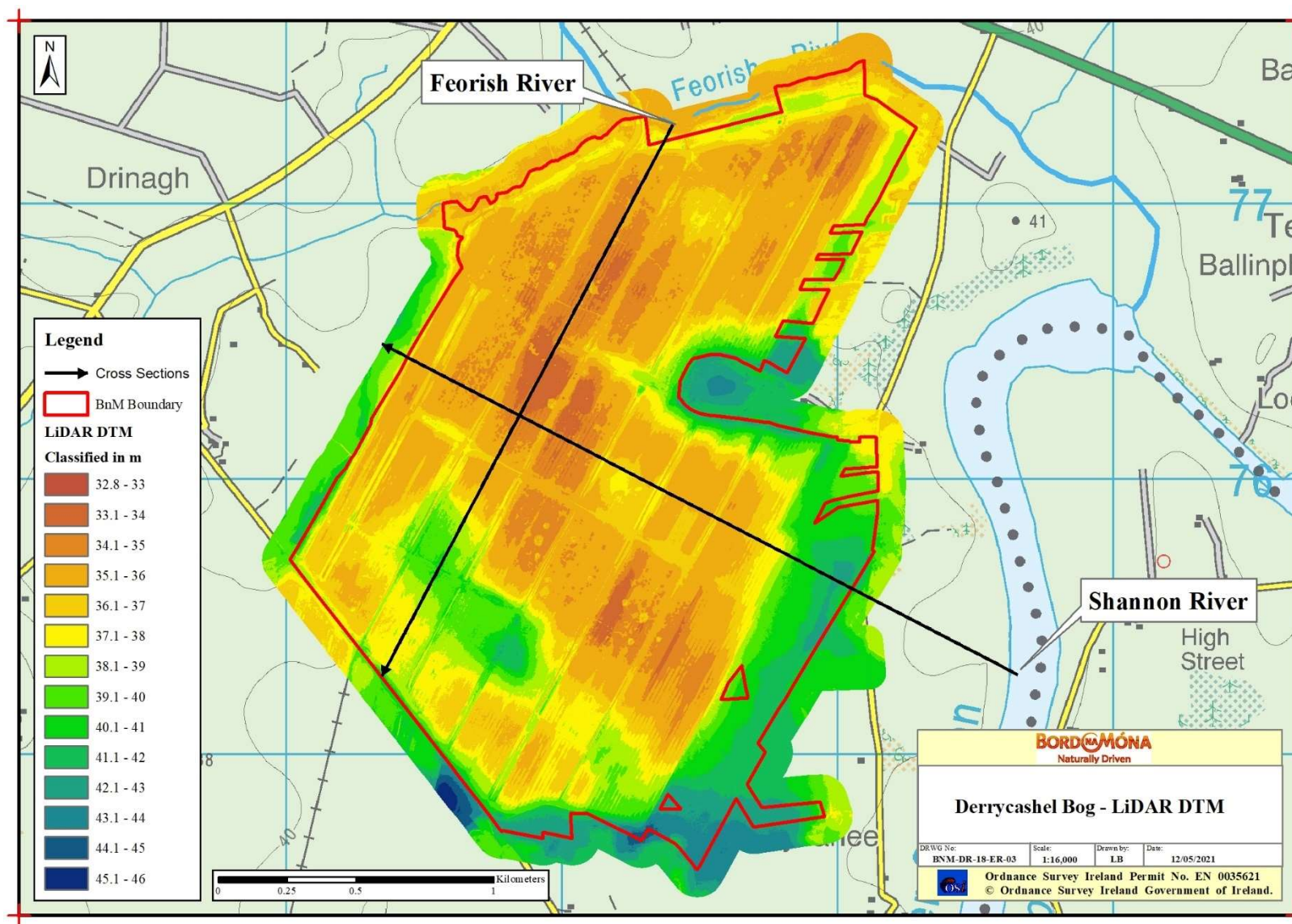


Figure 8.3. LIDAR surface map for Derrycashel bog. Basins indicated as orange and higher ground indicated as green/blue.

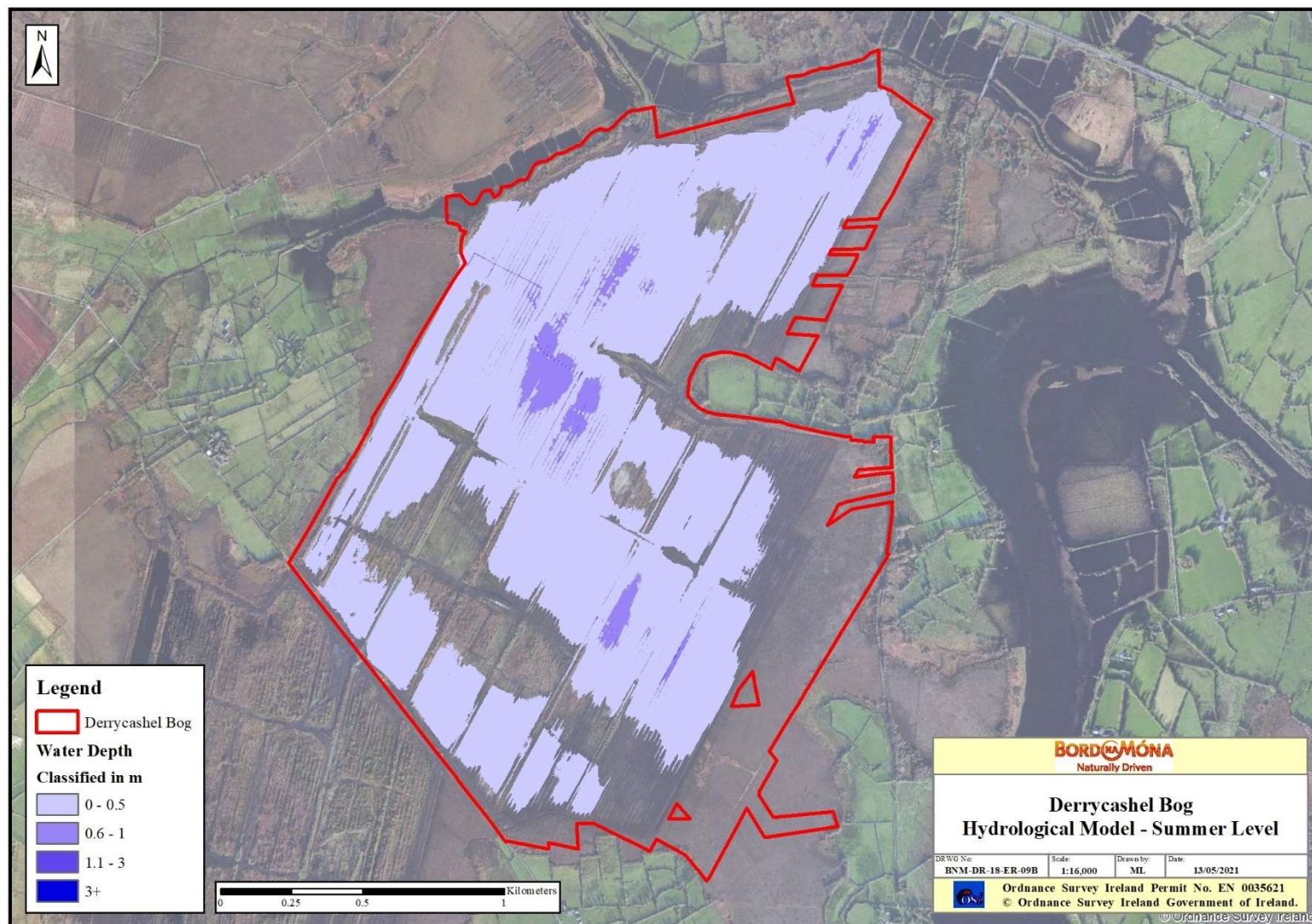


Figure 8.4. Hydrological model for Derrycashel Bog showing range of expected water depths based on current topography. Water levels expected to fluctuate seasonally.

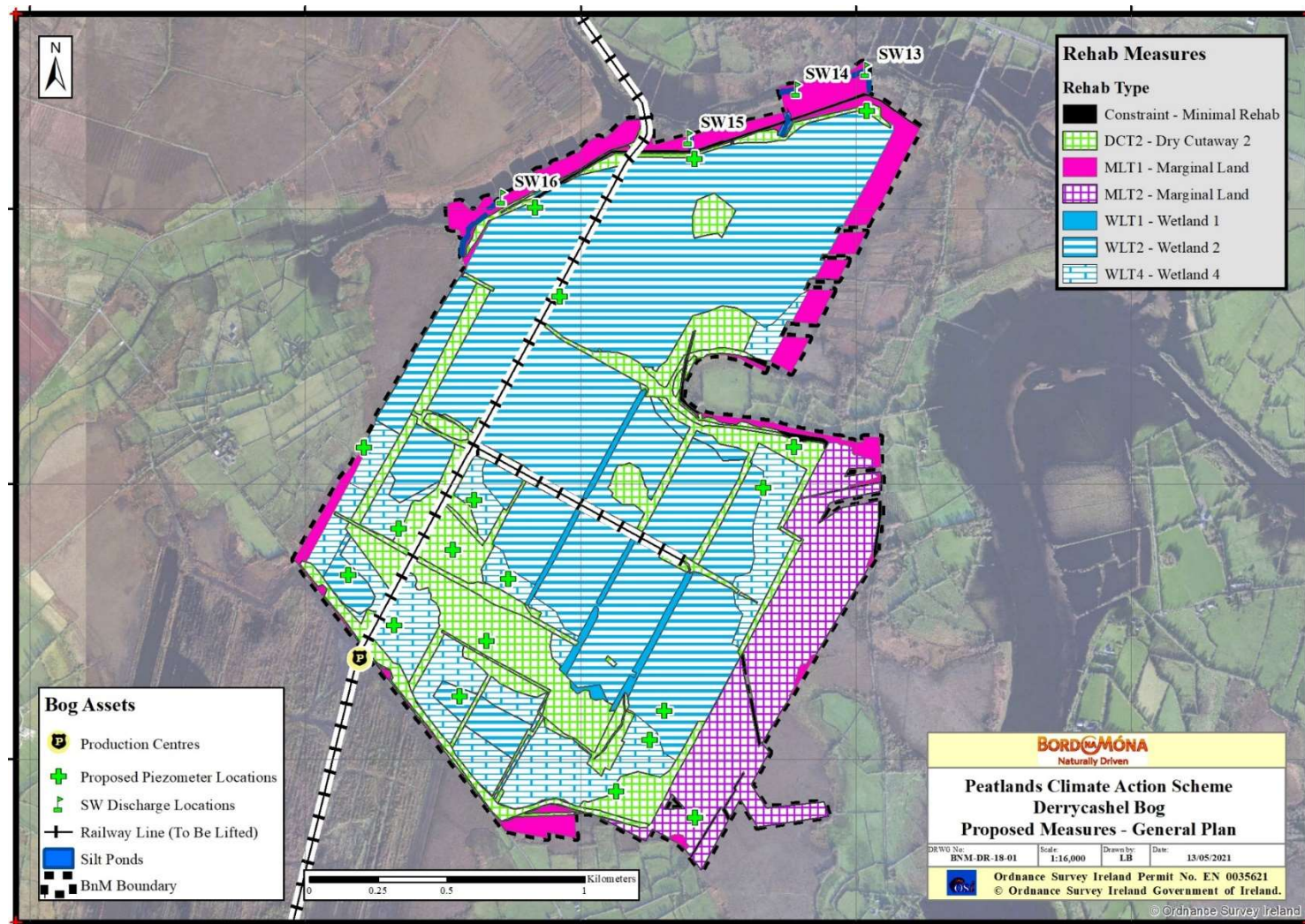


Figure 8.5. Indicative Enhanced Rehabilitation Plan for Derrycashel Bog. Note that the types of rehab and areas of rehab may change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.

9. AFTERCARE AND MAINTENANCE

9.1 Programme for monitoring, aftercare and maintenance

This programme for monitoring, aftercare and maintenance has been designed to meet the Conditions of the IPC Licence. This is defined as:

- There will be **initial quarterly monitoring assessments** of the site to determine the general status of the site, the condition of the silt ponds, assess the condition of the rehabilitation work, monitoring of any potential impacts on neighbours land, general land security, boundary management, dumping and littering.
- The number of these site visits will reduce after 2 years to bi-annually and then after 5 years to annual visits.
- These monitoring visits will also consider any requirements for further practical rehabilitation measures.
- The **baseline condition of the site will be established** post-rehabilitation implementation by using an aerial survey to take an up to date aerial photo, when rehabilitation is completed. This will be used to verify completion of rehabilitation measures. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated, if needed. It is proposed that sites can be monitored against this baseline in the future.
- **Water quality monitoring** at the bog will be established. The main objective of this water quality monitoring will be to establish a baseline and then monitor the impact of peatland rehabilitation on water quality from the bog.
- In order to assist in monitoring surface water quality from this bog, it is planned to increase the existing licence monitoring requirements to sampling for the same parameters to every month during the scheduled activities and for a period up to two years. post rehabilitation, depending on the period required to confirm that the main two parameters, suspended solids and ammonia are remaining compliant with the licence emission and trigger limit values and there is an improving trajectory in these two parameters i.e. reduction in concentration.
- Enhanced water quality monitoring will aim to include up to 70% of a bogs drainage catchments.
- Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.
- This monthly sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime but this has been increased to a monthly regime to appropriately track the changing water chemistry that will occur as part of this enhanced rehabilitation. In addition, DOC will be included as a parameter to try and identify any changes in carbon in the surface water.
- If, after two years, key criteria for successful rehabilitation are being achieved and key targets are being met, then the water quality monitoring will be reviewed, with consideration of potential ongoing research on site. The water quality data, the aerial surveys and the habitat mapping will be collated and will be submitted to the EPA as part of the final validation report.
- If, after two years, key criteria for successful rehabilitation have **not** been achieved and key targets have **not** been met, then the rehabilitation measures and status of the site will be evaluated and enhanced, where required. This evaluation may indicate no requirement for additional enhancement of

rehabilitation measures, but may demonstrate that more time is required before key criteria for rehabilitation has been achieved. Monitoring of water quality will then also continue for another period to be defined.

- Where other uses are proposed for the site that are compatible the provision of biodiversity and ecosystem services, 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 required assessment process and planning procedures.

Additional monitoring measures are also proposed to monitor ecosystem service benefits that have been derived by enhanced rehabilitation. These proposed monitoring measures will be funded by the proposed Climate Action Fund Scheme or additional other funding. Monitoring of climate action and other ecosystem service benefits will be designed to take account of the requirements of monitoring benefits of the overall Scheme and will be stratified; that is not all monitoring will be carried out in each site. These are defined as:

- Vegetation and habitat monitoring after rehabilitation is completed using a cutaway bog condition assessment (Similar to ecotope mapping). This assessment will include assessment of on environmental and ecological indicators such as vegetation cover, vegetation communities, presence of key species, *Sphagnum* cover, bare peat cover and water levels. It is proposed that sites can be monitored against this baseline in the future.
- The condition of the bog can be assessed using the condition assessment and suitable Greenhouse Gas (GHG) emission factors can be assigned to different habitats. GHG emission factors have been determined for various peatland habitats in Ireland (Wilson *et al.*, 2015) and are constantly being refined with more and more research. BnM is actively supporting research into GHG fluxes in different rehabilitated peatland habitats. This means that potential GHG emissions can be estimated from the site, as the site continues along its trajectory towards a naturally functioning peatland ecosystem.
- It is proposed to monitor the improvement of some biodiversity ecosystem services. A breeding bird and Pollinator monitoring programme will be established. Specific pollinator indicators will be monitored (bees and butterflies). This will be further defined in relation to monitoring of the overall proposed Scheme and after consultation with stakeholders.

9.2 Rehabilitation plan validation and licence surrender – report as required under condition 10.4

IPC License Condition 10.4. *A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment.*

Reporting to the EPA will continue until the IPC License is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites EPA, 2012, when:

- The planned rehabilitation has been completed;
- The key criteria for successful rehabilitation has been achieved and key targets have been met;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and

- The site has been environmentally stabilised.

10. REFERENCES

- Atherton, I, Bosanquet, SDS & Lawley, M (2010). Mosses and liverworts of Britain and Ireland - a field guide. British Bryological Society.
- Anderson, R., Farrell, C., Graf, M., Muller, F., Calvar, E., Frankard, P., Caporn, S., Anderson, P. (2017). An overview of the progress and challenges of peatland restoration in Western Europe. *Restoration Ecology*, Issue 2 Pages 271-282.
- Barry, T.A. et al (1973). A survey of cutover peats and underlying mineral soils. Soil Survey Bulletin No. 30. Dublin, Bord na Móna and An Foras Taluntais.
- Bord na Móna 2014. Blocking Drains in Irish raised bogs. The Bord na Móna Raised Bog Restoration Project. Cris, R. Buckmaster, S. Bain, C. Reed, M. (Eds) (2014) Global Peatland Restoration demonstrating SUCCESS. IUCN UK National Committee Peatland Programme, Edinburgh. <http://www.iucn-uk-peatlandprogramme.org/sites/www.iucn-uk-peatlandprogramme.org/files/IUCNGlobalSuccessApril2014.pdf>
- Bord na Móna. 2016. Bord na Móna Biodiversity Action Plan 2016-2021. Brosna Press, Ferbane. <http://www.bordnamona.ie/wp-content/uploads/2016/04/Biodiversity-Action-Plan-2016-2021.pdf>.
- Bord na Móna (2020). Bord na Móna Annual Report 2020. https://www.bordnamona.ie/wp-content/uploads/2020/07/M12822-BORD-NA-MONA_Annual-Report-2020_WEB2.pdf
- Bonn, A., Allott, T., Evans, M., Joosten, H. & Stoneman, R. (2017) Peatland restoration and ecosystem Services- science, policy and practice. Cambridge University Press.
- Carroll, J., Anderson, P., Caporn, S., Eades, P., O'Reilly C. & Bonn, A. 2009. Sphagnum in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16. Moors for the Future Partnership.
- Clark, D. and Rieley, J. 2010. Strategy for responsible peatland management. International Peat Society, Finland.
- Clark, D. (2010). Brown Gold. A history of Bord na Móna and the Irish peat industry. Gill Books.
- 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).
- Department of Communications, Climate Action and Environment 2019. National Climate Action Plan 2019. <https://www.dccae.gov.ie/en-ie/climate-action/publications/Pages/Climate-Action-Plan.aspx>
- Department of Housing, Planning, Community and Local Government 2017. Public consultation on the River Basin Management Plan for Ireland. Department of Housing, Planning, Community and Local Government. https://www.housing.gov.ie/sites/default/files/public-consultation/files/draft_river_basin_management_plan_1.pdf
- Department of Arts, Heritage and the Gaeltacht 2015. National Peatland Strategy. Department of Arts, Heritage and the Gaeltacht.
- <http://www.npws.ie/sites/default/files/general/Final%20National%20Peatlands%20Strategy.pdf>
- Eades, P., Bardsley, L., Giles, N. & Crofts, A. (2003). The Wetland Restoration Manual. The Wildlife Trusts, Newark.

- Environment Agency (2013). The Knotweed code of practise. Managing Japanese Knotweed on development sites. Environment Agency, Bristol, UK.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/536762/LIT_2695.pdf
- European Commission (2013). Interpretation manual of European Union Habitats. European Commission DG Environment Nature ENV B.3.
- EPA (2019). <http://gis.epa.ie/Envision>. EPA Envision Map Viewer. (Last Viewed: 31/12/2019).
- EPA (2020). Guidance on the process of preparing and implementing a bog rehabilitation plan.
<http://www.epa.ie/pubs/reports/enforcement/guidanceontheprocessofpreparingandimplementingabogr rehabilitationplan.html>.
- Farrell, C. A. and Doyle, G. J. 2003. Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland. *Wetlands Ecology and Management*, 11, 21-35.
- Fernandez, F., Connolly K., Crowley W., Denyer J., Duff K. & Smith G. (2014) Raised Bog Monitoring and Assessment Survey (2013). Irish Wildlife Manuals, No. 81. National Parks and Wildlife Service, Department of Arts, Heritage and Gaeltacht, Dublin, Ireland.
- Feehan, J. (2004). A long-lived wilderness. The future of the north midlands peatland network. Department of Environmental Resource Management, UCD.
- Foss, P.J. & O'Connell, C.A. (1984). Further observations of *Sarracenia purpurea* L. in County Kildare (H19). *Irish Nat. Journ.* 21:264-266
- Fossitt, J. (2000). A guide to habitats in Ireland. Kilkenny. The Heritage Council.
- Gann, G.D., McDonald, T., Walder, B., Aronson, J., Nelson, C.R., Jonson, J., Hallett, J.G., Eisenberg, C., Guariguata, M.R., Liu, J., Hua, F., Echeverría, C., Gonzales, E., Shaw, N., Decler, K. & Dixon, K.W. (2019). International Principles and Standards for the practice of Ecological Restoration. *Restoration Ecology* 27(S1): S1–S46.
- Grand-Clement, E., Anderson, K., Smith D., Angus, M., Luscombe D.J., Gatis, N., Bray L.S., Brazier R.E. (2015). New approaches to the restoration of shallow marginal peatlands *Journal of Environmental Management* 161.
- Hinde, S., Rosenburgh, A., Wright, N., Buckler, M. and Caporn, S. 2010. Sphagnum re-introduction project: A report on research into the re-introduction of Sphagnum mosses to degraded moorland. *Moors for the Future Research Report 18. Moors For The Future Partnership*.
- Holden, J., Walker, J., Evans, M.G., Worrall, F., Bonn, A., 2008. In: DEFRA (Ed.), *A Compendium of Peat Restoration and Management Projects*.
- Joosten, H. and Clarke, D. 2002. *Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making*. I.M.C.G. – I.P.S., Jyväskylä, Finland.
- Lindsay, R., 2010. *Peatbogs and Carbon: a Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change* (Report to RSPB Scotland, Edinburgh).
- Mackin, F., Barr, A., Rath, P., Eakin, M., Ryan, J., Jeffrey, R. & Fernandez Valverde, F. (2017) Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

- McBride, A., Diack, I., Droy, N., Hamill, B., Jones, P., Schutten, J., Skinner, A. and Street, M. 2011. The Fen Management Handbook, (2011), Scottish Natural Heritage, Perth.
- Minayeva, T. et al. (2017). Towards ecosystem-based restoration of peatland biodiversity. Mires and Peat, Volume 19 (2017), Article 01, 1–36, <http://www.mires-and-peat.net>
- McDonagh, E. (1996). Drain blocking by machines on Raised Bogs. Unpublished report for National Parks and Wildlife Service. https://www.npws.ie/sites/default/files/publications/pdf/McDonagh_1996_Drain_Blocking_Raised_Bogs.pdf.
- NPWS. (2014). Review of the raised bog Natural Heritage Area network. Department of Arts, Heritage and the Gaeltacht.
- NPWS. (2017a). National Raised bog Special Areas of Conservation management plan. Department of Arts, Heritage and the Gaeltacht.
[https://www.npws.ie/sites/default/files/files/FOR%20UPLOAD%20Plan\(WEB_English\)_05_02_18%20\(1\).pdf](https://www.npws.ie/sites/default/files/files/FOR%20UPLOAD%20Plan(WEB_English)_05_02_18%20(1).pdf)
- NPWS. (2017b). Actions for biodiversity 2017-2021. Ireland's 3rd national biodiversity plan. Department of Arts, Heritage and the Gaeltacht.
<https://www.npws.ie/sites/default/files/publications/pdf/National%20Biodiversity%20Action%20Plan%20English.pdf>
- NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill.
https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol2_Habitats_Article17.pdf
- NRA (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes (Revision 2). National Roads Authority.
- NRA (2010). Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads. National Roads Authority.
<https://www.tii.ie/technical-services/environment/construction/Management-of-Noxious-Weeds-and-Non-Native-Invasive-Plant-Species-on-National-Road-Schemes.pdf>.
- Quinty, F. and L. Rochefort, 2003. Peatland Restoration Guide, second edition. Canadian Sphagnum Peat Moss Association and New Brunswick Department of Natural Resources and Energy. Québec, Québec.
- Regan, S., Swenson, M., O'Connor, M. & Gill, L. (2020). Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. EPA RESEARCH PROGRAMME 2014–2020. Report No.342. (2014-NC-MS-2). EPA Research Report. Prepared for the Environmental Protection Agency by Trinity College Dublin. www.epa.ie.
- Renou-Wilson F., Bolger T., Bullock C., Convery F., Curry J. P., Ward S., Wilson D. & Müller C. (2011). BOGLAND - Sustainable Management of Peatlands in Ireland. STRIVE Report No 75 prepared for the Environmental Protection Agency. Johnstown Castle, Co. Wexford.
- Renou-Wilson, F., Wilson, D., Rigney, D., Byrne, K., Farrell, C. and Müller C. (2018). Network Monitoring Rewetted and Restored Peatlands/Organic Soils for Climate and Biodiversity Benefits (NEROS). Report No. 238. Report prepared for the Environmental Protection Agency. Johnstown Castle, Co. Wexford.
- Schouten, M.G.C. 2002. Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. Dúchas - The Heritage Service of the Department of the Environment and Local Government, Ireland; Staatsbosbeheer, the Netherlands; Geological Survey of Ireland; Dublin.

- Smith, G., O'Donoghue, P., O'Hara, K. & Delaney, E. (2011). Best Practice Guidance for Habitat Survey and Mapping. The Heritage Council.
- Stace, C. A. (1997). New Flora of the British Isles. Cambridge: Cambridge University Press.
- Thom, T., Hanlon, A., Lindsay, R., Richards, J., Stoneman R. & Brooks, S. (2019). Conserving Bogs – Management Handbook. <https://www.iucn-uk-peatlandprogramme.org/sites/default/files/header-images/Conserving%20Bogs%20the%20management%20handbook.pdf>
- Wilson, D., Renou-Wilson, F., Farrell, C., Bullock, C. and Muller, C. (2012). Carbon Restore – the potential of restored Irish peatlands for carbon uptake and storage; CCRP Report. EPA Wexford.
- Wilson, D., Dixon, S.D., Artz, R.R., Smith, T.E.L., Evans, C.D., Owen, H.J.F., Archer, E., & Renou-Wilson, F. (2015). Derivation of greenhouse gas emission factors for peatlands managed for extraction in the Republic of Ireland and the UK. Biogeosciences Discuss., 12, 7491–7535.
- Wheeler, B. D., & Shaw, S. C. (1995). Restoration of Damaged Peatlands – with Particular Reference to Lowland Raised Bogs Affected by Peat Extraction. London: HMSO.
- Wittram, B. W., Roberts, G., Buckler, M., King, L., & Walker, J. S. (2015). A Practitioners Guide to Sphagnum Reintroduction. Edale: Moors for the Future Partnership.

APPENDIX I: A STANDARD PEATLAND REHABILITATION PLAN TO MEET CONDITIONS OF THE IPC LICENCE

In the event that the proposed Scheme (PCAS) is not supported by additional funding, Bord na Móna is still obligated to carry out peatland rehabilitation to meet the conditions of the IPC Licence. Under its EPA licences and following cessation of peat extraction, BnM is mandated to ‘decommission’ its operations by removing materials ‘that may result in environmental pollution’ and establish that ‘rehabilitation’ measures have environmentally stabilised peat production areas.

This proposed standard peatland rehabilitation plan is outlined here to **estimate potential costs**. Bord na Móna will still be expected to cover the costs that would have accrued from standard decommissioning and rehabilitation activities, as part of its original obligations. The existing costs associated with both the removal of potentially polluting materials and the environmental stabilisation of the peatlands resides with Bord na Móna. However, the expenditure necessary to deliver the additional and enhanced decommissioning, rehabilitation and restoration and the benefits that flow from these measures and interventions/improvements will be eligible for funding by government through the Climate Action Fund.

The same process as outlined in Section 2 will be followed.

Scope of rehabilitation

The principal scope of this rehabilitation plan is to rehabilitate the bog. This is defined by:

- The area of Derrycashel Bog (Figure 3.1).
- EPA IPC Licence - Ref. P0504-01. 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. Derrycashel bog is part of the Mount Dillon Bog group.
- The current condition of Derrycashel Bog. This site has pumped drainage. Wetland habitats are already developing across a significant part of the site.
- The key objective of rehabilitation, as defined by this licence, is **environmental stabilisation** of the bog.
- To minimise potential impacts on neighbouring land. Some boundary drains around Derrycashel Bog will be left unblocked as blocking boundary drains could affect adjacent land.

Rehabilitation goals and outcomes

The key rehabilitation goal and outcome for Derrycashel Bog is environmental stabilisation of the site via wetland creation. This is defined as:

- Carrying out drain blocking to re-wet peat and slow runoff.
- Stabilising potential emissions from the site (e.g. suspended solids).
- Environmental stabilisation.

The outcome is setting the site on a trajectory towards establishment of natural habitats.

Criteria for successful rehabilitation:

- Rewetting of residual peat and shallow cutaway in the former area of industrial peat production to offset potential silt run off and to encourage development of vegetation cover via natural colonisation, and reducing the area of bare exposed peat.

- That there is a stabilising/improving concentration of suspended solids and ammonia associated with the measures undertaken to stabilise the peat surface by the blocking of the internal drainage system and the maximised rewetting of the peat surface. This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be measured via water quality monitoring (suspended solids and ammonia).
- That the main water body associated with surface water from this bog continues to be excluded in the EPA's list of peat pressure water bodies as reported in the River Basin Management Plans. Where the water body has been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body shows positive improvements in water quality impacts that were attributable to the original peat extraction activity.

Rehabilitation targets

- Demonstrating the delivery of the rehabilitation through site visits and through updated aerial photography (indicating presence of peat blockages and re-wetting). This will be demonstrated by a post rehab aerial survey.
- Stabilising potential emissions from the site (e.g. suspended solids). The key target will be developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be demonstrated by water quality monitoring results.

Rehabilitation measures: (see Figure Ap-1)

- Blocking field drains in drier sections of the former industrial production area using a dozer to create regular peat blockages (three blockages per 100 m) along each field drain.
- Re-alignment of piped drainage; and management of water levels to create/enhance existing wetlands.
- Pump management – reducing or ceasing pumping.
- No measures are planned for the other surrounding marginal peatland habitats.
- Silt ponds will continue to be maintained during the rehabilitation and decommissioning phase.
- Evaluate success of short-term rehabilitation measures and enhance where necessary.
- Decommissioning of silt-ponds will be assessed and carried out, where required.

Timeframe:

- 2021. 1st phase of rehabilitation. Field drain blocking.
- 2021. 2nd phase. Further realignment of piped drainage and other re-wetting measures dependent on success of 1st phase re-wetting, as determined by ongoing monitoring of water levels and re-vegetation.
- Other enhancement measures such as fertiliser treatment will be carried out, if needed. These will be determined by ongoing monitoring.
- 2023-2024. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- 2023-2024. Decommission silt-ponds, if necessary.

Table AP-1. Rehabilitation measures and target area.

Type	Code	Description	Area (Ha)
Dry cutaway	DCT2	Regular Drain Blocking, Blocking outfalls and managing water levels with overflow pipes	69.2
Wetland	WLT1	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes	245.5
Marginal Land	MLT1	No work required	68.0
Other	Other	Other lands (no work required inc. constrained areas and silt ponds *)	6.2
Total			388.9

Monitoring, after-care and maintenance

- There will be initial quarterly monitoring assessments of the site to determine the general status of the site, the condition of the silt-ponds, assess the condition of the rehabilitation work, assess the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to additional rehabilitation.
- Water quality monitoring will be established.
- Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.
- This sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime.
- 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 required assessment and planning procedures.

Validation and IPC Licence surrender

Reporting to the EPA will continue until the IPC License is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites (EPA, 2012) when:

- The planned rehabilitation has been completed;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

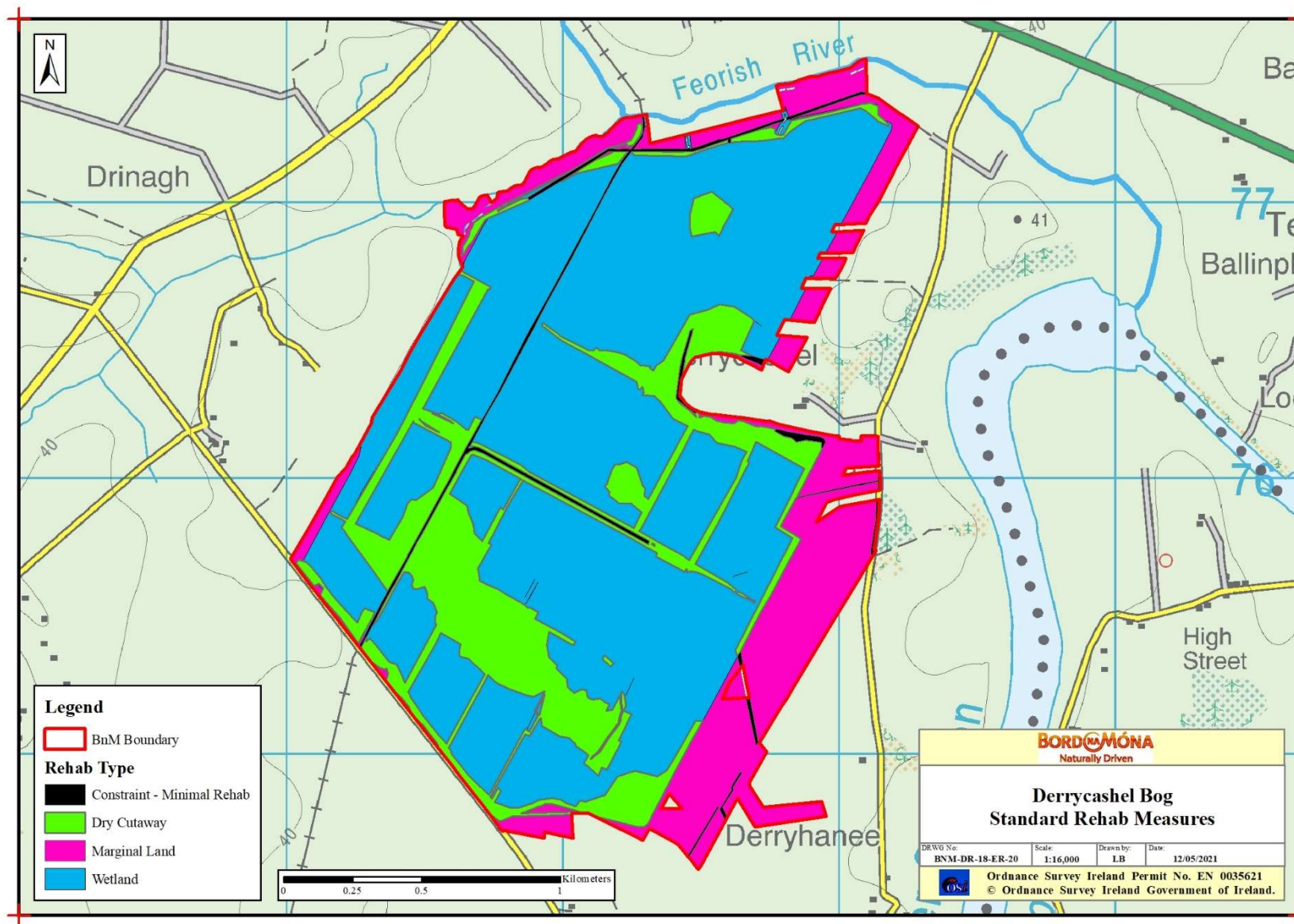


Figure Ap-1. Indicative standard rehabilitation plan for Derrycashel Bog.

APPENDIX II: BOG GROUP CONTEXT

The Mount Dillon Bog Group IPC Licensed area is made up of two sub-groups (Lough Ree (the Mount Dillon Energy Peat Group) and Mostrim) and have been in industrial peat production for several decades. There are 28 defined sites covering a total area of 11,322 ha. Of the 28 sites, 23 mainly straddle the River Shannon within counties Roscommon and Longford, with five sites partially in County Westmeath to the east. Each bog area further comprises a range of habitats from bare milled peat production areas to re-colonising cutaway to workshops areas and transport infrastructure. Industrial peat extraction from these sites mainly supplied ESB power stations at Lanesborough (LRP) or for horticultural peat products.

Industrial peat extraction in the Mount Dillon Bog Group ceased in 2019. It is planned to supply remaining milled peat stocks to Lanesborough (LRP) during 2020. Both power stations will cease using peat by the end of 2020. All remaining peat stocks will also be removed. Intensive decommissioning and rehabilitation for the Mount Dillon Bog Group is expected to start in 2020/2021.

One bog site, Cloonmore, was never used for industrial peat production and several bogs in the Mostrim group have been drained but never fully developed and still retain typical high bog characteristics. These include Clonwhelan, Glenlough and a section of Mostrim. These sites have been zoned for biodiversity and a high bog drain blocking will be used to re-wet the high bog and encourage restoration of the raised bog habitat. Several sites (Glenlough, Mostrim, Clonwhelan and Clynan) were assessed by consultants for NPWS as part of the review of the raised bog Natural Heritage Area network (NPWS 2014).

The rehabilitation plan for the Mount Dillon Bog Group encompasses all areas involved in industrial peat production including industrial production areas and associated facilities. It also includes rehabilitation measures for those bogs that were initially drained but not fully developed.

A breakdown of the component bog areas for the Mount Dillon Bog Group IPC License Ref. P0504-01 is outlined in Table Ap-2. These areas are also outlined on Figure Ap-2 (Map of the Mount Dillon Bog Group).

Industrial peat production history varies across the Mount Dillon bog group, so there is a wide range of peat depths at present. Bogs close to Lanesborough tend to have shallower peat depths or have been cutaway, while some bogs on the periphery of the group tend to have deeper peat reserves. Several sites such as Mount Dillon and Garryduff have been mostly cutaway to the fen peat layers or in some cases to expose the underlying gravel/sub-soil. Several bogs in the Mostrim group have only been partially developed or have had no industrial peat production, and have relatively deep peat depths

Table Ap-2a: Mount Dillon Bog Group names, area and indicative status (Mount Dillon Energy Peat sub-group).

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Begnagh	265	Cutover Bog Industrial peat production commenced at Begnagh Bog in 1977. Deep peat reserves remain on much of the former production area. Pumped bog drainage.	Begnagh Bog formerly supplied fuel peat for Lough Ree Power Some areas of cutaway on site are developing pioneer cutaway vegetation communities. LCC are proposing an amenity walkway for this bog	2020	Draft 2017
Clooneeny	358	Cutover Bog Industrial peat production commenced at Clooneeny Bog in 1985 and ceased in 2020. Deep	Clooneeny Bog formerly supplied including; horticultural peat and fuel peat for Lough Ree Power	2020	Draft 2017

		peat reserves remain on much of the former production area. Clooneeny is considered a deep peat cutover bog. Pumped bog drainage.	Most of the former production area on site is bare peat. Some areas of cutaway on site are developing pioneer cutaway vegetation communities. Bog restoration has been carried out in a bog remnant that was damaged by turf cutting trespass. LCC are proposing an amenity walkway for this bog		
Cloonmore	102	N/A	Never developed for industrial peat production; scattered plots.	N/A	N/A
Cloonshannagh	494	Cutover Bog Industrial peat production commenced at Cloonshannagh Bog in 1985. Deep peat reserves remain across the former production area. Cloonshannagh is considered a deep peat cutover bog.	Cloonshannagh Bog formerly supplied horticultural peat, and fuel peat for Lough Ree Power Restoration work has been carried out on a 38ha section of high bog within Cloonshannagh Bog. Some of the former production area on site is developing pioneer cutaway vegetation communities, the remainder of the site is bare peat	2020	Draft 2017
Cloonshannagh Rail Link	28	Cloonshannagh rail link is a link between sites.	N/A	N/A	N/A
Corlea	163	Cutaway Bog Industrial peat production commenced at Corlea Bog in 1960. Long-term peat extraction has created shallow cutaway. Corlea was a pumped bog. Pumped bog drainage – pumping has ceased.	The former production area at Corlea has already extensively colonised. Pioneer wetland and scrub development has occurred over much of the site. Large wetlands have developed with the cessation of pumping. Some wetland and rehabilitation management was undertaken between 2016-2019. Part of site leased to local community development group to develop amenity walkway in association with Longford County Council. LCC are proposing an amenity walkway for this bog	2018	Finalised 2019
Derraghan	289	Cutover Bog Industrial peat production commenced at Derraghan Bog in the 1940's. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derraghan is considered a shallow peat cutover bog. Pumped bog drainage.	Derraghan Bog formerly supplied fuel peat for Lough Ree Power. Part of the site developed into a licenced ash facility for Lough Ree Power. Much of the former production area at Derraghan has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities. A small area has been used for a BirchWater trail as part of the BnM Herbs Project.	2020	Draft 2017
Derryadd	653	Cutover Bog Industrial peat production commenced at Derryadd Bog in 1960. Long-term peat extraction has left shallow cutaway. Some pockets of deep peat remain. Pumped bog drainage.	Much of the former production area has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities Derryadd Bog is part of the footprint of Derryadd Windfarm for which planning permissions were granted in 2020. An amenity walkway is proposed.	2020	Draft 2019
Derryadd2	328	Cutover Bog Industrial peat production commenced at Derryadd 2 Bog in 1960. Long-term peat extraction has left shallow cutaway. Some pockets of deep peat remain. Pumped bog drainage.	Much of the former production area has been out of peat production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities Derryadd 2 Bog is part of the footprint of Derryadd Windfarm for which planning permissions were granted in 2020. An amenity walkway is proposed.	2020	Draft 2019
Derryarogue	895	Cutaway Bog Industrial peat production commenced at Derryarogue Bog in 1941. Long-term peat extraction	Much of the former production area has been out of production for some time. These areas have already extensively colonised with	2020	Draft 2019

		has left shallow cutaway. Some pockets of deep peat remain. Pumped bog drainage – pumping has been reduced.	pioneer wetland, cutaway and scrub vegetation communities. Derryarogue Bog is part of the footprint of Derrycashel Windfarm for which planning permissions were granted in 2020. An amenity walkway is proposed.		
Derrycashel	388	Cutaway Bog Industrial peat production commenced at Derrycashel Bog in 1951. Long-term peat extraction has left shallow cutaway. Some pockets of deep peat remain. Pumped bog drainage – pumping has been reduced.	Derrycashel Bog formerly supplied fuel peat for Lough Ree Power Much of the former production area at Derrycashel has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities. Some wetland and rehabilitation management was undertaken (c.60ha) between 2014-2015.	2018	Draft 2021
Derrycolumb	454	Cutaway & Cutover Bog Industrial peat production commenced at Derrycolumb Bog in the 1980's. Most of the former production area still has deep peat reserves. Pumped bog drainage.	Derrycolumb Bog formerly supplied fuel peat for Lough Ree Power Much of the former production area at Derrycolumb has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities. LCC are proposing an amenity walkway for this bog	2019	Draft 2021
Derrymoylin	356	Cutover Bog Industrial peat production commenced at Derrymoylin Bog in 1985 and ceased in 2020. This site still has residual deep peat.	Derrymoylin Bog formerly supplied fuel peat for Lough Ree Power. Most of the former production area on site is bare peat.	2020	Draft 2017
Derryshannoge	452	Cutover Bog Industrial peat production commenced at Derryshannoge Bog in 1985 and ceased in 2020. This site still has residual deep peat. Pumped bog drainage.	Derryshannoge Bog formerly supplied fuel peat for Lough Ree Power. Much of the former production area at Derryshannoge has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities.	2020	Draft 2017
Edera	281	Cutover Bog Development for industrial peat production commenced at Edera Bog in 1990's. Active extraction from Edera began in 2003 and ceased in 2018. This site still has residual deep peat.	Edera Bog formerly supplied fuel peat for Lough Ree Power. The majority of the former production area is bare peat. LCC are proposing an amenity walkway for this bog	2020	Draft 2021
Erenagh	93	Cutover Bog Development for industrial peat production commenced at Erenagh Bog in 1970's. This site still has residual deep peat. Pumped bog drainage.	Erenagh Bog formerly supplied; fuel peat for Lough Ree Power. Much of the former production area has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities.	2020	Draft 2017
Granaghan	212	Cutover Bog Development for industrial peat production commenced at Granaghan Bog in 1980's. This site still has residual deep peat. Pumped bog drainage.	Granaghan Bog formerly supplied horticultural peat, and fuel peat for Lough Ree Power. The majority of Granaghan Bog former production area is bare peat.	2020	Draft 2017
Killashee	110	Cutover Bog Development for industrial peat production commenced at Killashee Bog in 1985. This site still has residual deep peat.	Killashee Bog formerly supplied horticultural peat, and fuel peat for Lough Ree Power. The majority of Killashee Bog former production area is bare peat. Some areas have colonised with pioneer cutaway and scrub vegetation communities.	2020	Draft 2017
Knappoge	313	Cutaway Bog Peat Production at Knappoge bog commenced in 1963. Peat depths on the former production area are generally shallow. Pumped bog – pumping has now been stopped	Knappoge Bog formerly supplied fuel peat for Lough Ree Power. The majority of Knappoge Bog former production area is bare peat. Some areas have colonised with pioneer cutaway and scrub vegetation communities. Ceasing pumping has created large wetlands. An amenity trackway is under construction.	2018	Draft 2021

Lough Bannow	739	Cutaway Bog Peat Production at Lough Bannow bog commenced in the 1960's.. Peat depths on the former production area are generally shallow. Pumped bog	Much of the former production area at Lough Bannow has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities. A small (35ha) conifer plantation was established in 1980's by Coillte. Lough Bannow is part of the footprint of Derryadd Windfarm for which planning permissions were granted in 2020. An amenity walkway is proposed.	2020	Draft 2019
Moher	483	Cutover Bog Peat Production at Moher bog commenced in the 1960'S.. Peat depths on the former production area remain relatively deep. Pumped bog drainage.	Moher Bog formerly supplied fuel peat for Lough Ree Power. Much of the former production area is bare peat	2020	Draft 2017
Mount Dillon	592	Cutaway Bog Peat Production at Mount Dillon bog commenced in the 1940'S. Peat depths on the former production largely shallow. Pumped bog	Mount Dillon Bog formerly supplied fuel peat for Lough Ree Power. Much of the former production area at Mount Dillon has been out of production for some time. These areas have already extensively colonised with pioneer cutaway, wetland and scrub vegetation communities.	2020	Draft 2017

Table Ap-2b: Mount Dillon Bog Group names, area and indicative status (Mostrim sub-group).

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Clonwhelan	212	Development Bog. Clonwhelan Bog was drained in the 1980's but never brought into commercial peat production. Clonwhelan is a deep peat development bog.	Rehabilitation complete Raised bog restoration completed 2019	N/A	Finalised 2018
Clynan	402	Development Bog. Clynan Bog was drained in the 1980's. Sod peat production occurred around the margins and over a portion of the site.	Clynan Bog formerly supplied horticultural peat (sod moss) & fuel turf. Some rehabilitation work has been carried out on Clynan bog East already to buffer an undrained bog remnant. Raised bog restoration potential.	2020	Draft 2017
Coolcraff	412	Cutover Bog Industrial peat production commenced at Coolcraff Bog in the 1980's. The site was developed for milled peat production 2015-2018. Deep peat reserves remain over the majority of the former production area.	Coolcraff Bog formerly supplied a range of commercial functions including; horticultural peat. Much of the former production area at Coolcraff is bare peat. One section of high bog to the north of site was excluded from production and so never developed on the basis of high conservation value raised bog habitat.	2020	Draft 2017
Coolnagun	668	Cutaway Bog Industrial peat production commenced at Coolnagun Bog in 1941. Coolnagun is considered a deep peat cutover bog with areas of shallow cutaway.	Coolnagun Bog formerly supplied a range of commercial functions including; horticultural peat and fuel peat for Lough Ree Power. Much of the former production area at Coolnagun is bare peat. Some small patches of	2020	Draft 2017

			<p>pioneer cutaway vegetation communities are developing.</p> <p>Some bog restoration work was undertaken already along the eastern margin.</p>		
Glenlough	328	<p>Development bog</p> <p>Glenlough Bog was first developed in the 1980's. It was re-ditched in 2003-2005. Only a small part of the bog was fully brought into peat production for sod peat. Deep peat reserves remain over the majority of the former production area. Some of the bog has never been subject to commercial peat extraction.</p>	<p>Glenlough Bog formerly supplied a range of commercial functions including; horticultural peat.</p> <p>Degraded high bog vegetation remains over the majority of the bog. The former production area is a mosaic of vegetation.</p> <p>This site has raised bog restoration potential.</p>	2020	Draft 2020
Milkernagh	627	<p>Cutover Bog</p> <p>Industrial peat production commenced at Milkernagh Bog in 1950. Long-term peat extraction has created shallow cutaway in places. Deep peat reserves remain in parts on the former production area. Milkernagh is considered cutover bog with variable peat depths. Milkernagh has a pumped drainage regime.</p>	<p>Milkernagh Bog formerly supplied a range of commercial functions including; horticultural peat and fuel peat for Lough Ree Power.</p> <p>Much of the former production area at Milkernagh is bare peat. Pioneer cutaway vegetation communities are developing in places.</p>	2020	Draft 2017
Mostrim	442	<p>Development Bog/Cutover Bog</p> <p>The majority of Mostrim was drained but never developed. Industrial peat production commenced in parts of Mostrim Bog in the 1980's. Peat extraction has significantly affected parts of this bog but deep peat reserves remain on the former production area.</p>	<p>Mostrim Bog formerly supplied a range of commercial functions including; horticultural peat and fuel peat for Lough Ree Power.</p> <p>Raised bog restoration at Mostrim is ongoing with > 50% completed in Jan 2021.</p>	2020	Finalised 2020

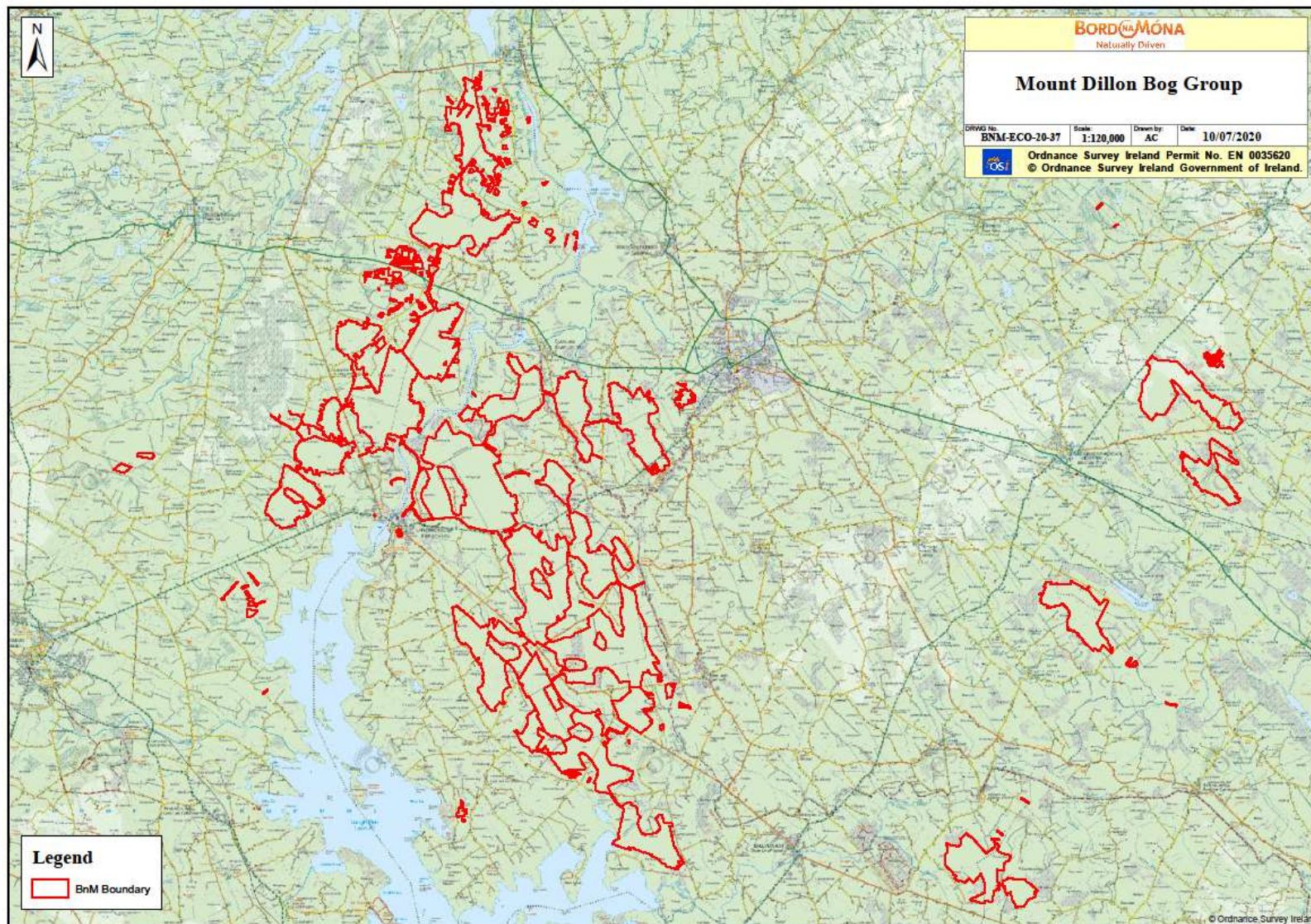


Figure Ap-2: Mount Dillon Bog Group

APPENDIX III: ECOLOGICAL SURVEY REPORT

Ecological Survey Report <i>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.</i>			
Bog Name:	<u>Derrycashel</u>	Area (ha):	389ha
Works Name:	Mount Dillon	County:	Roscommon
Recorder(s):	BnM Ecology Section	Survey/ monitoring Date(s):	8/04/2011 08/2013 Numerous site visits between September 2014 to February 2015 as part of rehabilitation work Field trip for members of the public during biodiversity weeks in May 2013 and 2014
Description of site <p>Derrycashel bog is located in Co. Roscommon along the River Shannon. It is situated 5 km north of Lanesborough and the N5 Dublin-Westport Road is situated within 1 km to the north of the site. It is part of the Mount Dillon bog group that supplies peat to Lough Ree Power. The Mount Dillon home bog is situated immediately to the south of Derrycashel while there are other bogs to the north and on the east side of the river Shannon in Co. Longford. A railway passes through the centre of Derrycashel and connects bogs to the north with the Mount Dillon network. The main landscape feature in this area is the River Shannon and its associated riparian zone and floodplain. Derrycashel Bog is situated below the level of the River Shannon and its drainage system is heavily dependant on pumps.</p> <p>Derrycashel bog has been the subject of several studies by John Feehan, Robert Rowlands and other researchers so there is more detailed information available about the history of the development of this bog, its ecology and its likely future development. Feehan (2004) presented several scenarios of the future landscape for Derrycashel based on the current water level in the River Shannon and different flooding scenarios.</p> <p>The site is bounded by a minor road along the southern boundary, which divides the site from the adjacent Mount Dillon bog. There is some intact high bog along its eastern boundary (some of which extends close to the Shannon channel) and midway along this boundary there is a mineral ridge that extends into the bog and has typical farmland. Further north along the eastern boundary there is more cutover bog. The Feorish River flows along the northern boundary and there is some development of callows-type grassland in the floodplain of this river within and adjacent to the BnM site boundary. Farmland, intact high bog and cutover bog is found along the western boundary.</p> <p>Derrycashel bog is a relatively old production bog, and has been in production since 1951. The majority of the production bog is now developing pioneer cutaway habitats. In the winter of 2014/15 a section (60ha) to the north east of the central rail line was rehabilitated. This work involved the creation of peat berms along with blocking drainage channels in order to re-wet this area of cutaway.</p> <p>Current milled industrial peat production is mainly confined to peripheral areas along the southern and eastern margins. Pioneer cutaway habitats are relatively extensive and a section of the site has already been rehabilitated however large areas of vegetated production bog have not been designated as cutaway yet and some of the more heavily vegetated areas are considered production-related cutaway. The fields are orientated north-east to south-west and arranged in blocks that are separated by major drainage channels. These drainage channels are mapped as riparian zones but frequently have some of the best developed vegetation along their banks with tall Birch-dominated woodland or dense scrub developing. There is also some dry heath in places along narrow bands of intact high bog along the edges of these deep drains where the peat has dried out and become dominated by Heather. Travel paths are also frequently found along these drainage zones. Large Haku piles of bare peat are found between several blocks of production fields. Bog timber has also been stored along some of the riparian zones and away from the production area.</p>			

The longest established cutaway vegetation is found along the south of the site over a glacial mound. This area is separated from the road by a long trough of lower ground. This relatively dry area is mostly developing a mosaic of open Birch scrub and poor fen dominated by Soft Rush. There are also some sections with less peat and more gravel that have a greater element of dry calcareous grassland species in combination with the Rushes such as Glaucous Sedge, Knapweed and Wild Strawberry. This area also has several patches where pioneer dry heath dominated by Heather has developed. This is mostly found in conjunction with Birch scrub, which is spread through this vegetation. Pioneer dry heath is found on the highest part of this mound, which may not have been harvested to any great extent or may even have been excluded as the peat was so thin in this area.

Further north there is some much lower ground where there is a significant contrast in the vegetation and habitat development. This lower ground has been affected by winter inundation and there was still open water present in several of the lower blocks. However, this open water is not likely to be permanent and will reduce in extent or disappear over the summer. The blocks with the longest established vegetation are dominated by Soft Rush and Willow. Rises in water levels seems to have a very significant effect on the recent development of habitats in these older low sections. The Soft Rush-dominated vegetation seems to have died off leaving standing-dead tussocks (see photos). Some of these areas were not wet at the time of the survey, although they may have been wet up to shortly before the survey. Some of this standing dead Soft Rush is being recolonised by other species such as Creeping Bent, Yorkshire Fog, Jointed Rush, and Willowherb spp. The other main feature of this vegetation is the layer of emergent Willow (mainly *S. cinerea*/*S. autia*) that has developed (see Photos). This layer only has a max height of 2-3 m high, and Birch and other woody species are virtually absent. This layer of Willow seems to have only emerged in recent years and its development in some blocks of production fields may be connected to recent prolonged winter inundation and difficulties in pumping out sections of production bog. There is a significant contrast between areas with prolonged inundation with dead Rush tussocks and frequent Willow and somewhat higher areas where the Rushes are still alive and there is more typical emergent Birch/Willow.

Other lower blocks have less established vegetation and Soft Rush and Willow appear in mosaic with bare peat. These younger areas also have some cover of Bog Cotton and Bottle Sedge. There are several blocks where the open water seems to be permanent and Bottle Sedge is much more extensive (see photos). These wetland areas are still in a pioneer phase and are relatively young in development compared to other sites. There is no significant establishment of any typical or mature wetland vegetation communities around the fringes although Bulrush and Common Reed are present. Scattered poor fen vegetation is typical with significant cover of bare peat in places. Other semi-aquatic and aquatic species are also present such as Mint, Marsh Pennywort, and Pondweed spp. There is also a significant portion of production bog with temporary open water. These wet areas contain associated pioneer poor fen vegetation (sections dominated by Soft Rush, Bog Cotton and Bottle Sedge). Some pairs of breeding waders were associated with these wetlands.

Several blocks of production fields have recently been cleared of vegetation. This includes area with poor fen and with open scrub. Production (of mini-sod peat) seems to be re-establishing within these areas.

A small area at the southern end of the site has been used as a trial area for establishment of crops to attract bird species such as Linnet. Oats, Linseed (and Canary Reedgrass) were originally planted. This area is still relatively dry. This area still has dense vegetation that is dominated by Reed Canarygrass (and other species that were originally planted – Oats?). Other typical poor fen species are colonising this section such as Rosebay Willowherb, Broad-leaved Willowherb, Spear Thistle, Sorrel, Clover sp., Dandelion, Coltsfoot, Soft Rush, Yorkshire Fog, Angelic, Chickweed, *Campylopus introflexus* and Cocksfoot. Willow and Birch saplings and Soft Rush tussocks are most common along the old drains.

The northern boundary has a strip of degraded high bog that has been invaded in places by Birch and Gorse. There are still some sections with Heather cover but this zone is quite disturbed. There is some development of a natural transitional zone from the edge of the high bog to the Feorish River channel. This has also been disturbed in the past by arterial drainage and the development of silt ponds. Wet grassland is present in the flood-plain of the Feorish River. This is dominated by tussocky grasses (Cocksfoot, Tufted Hairgrass) and Reed Canarygrass on the Bord na Móna area and it is not grazed.

Pitcher Plant was originally introduced to Derrycashel in 1906 (Foss and O'Connell 1985). It covered an area of 32 ha and was then transplanted to other bogs around Ireland before Bord na Móna began to harvest peat on this bog. Seemingly Bord na Móna put aside a small area of high bog to preserve this plant!

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

None – This part of the River Shannon is not part of any designation.

The nearest designated site is the Lough Forbes Complex (NPWS site code 001818), which is in Co. Longford, 3-4 km east of Derrycashel.

Adjacent habitats and land-use

Adjacent habitats include wet grassland (GS4), improved agricultural grassland (GA1), raised bog (PB1), scrub (WS1), Birch woodland (WD7) and, active and inactive cutover bog (PB4). There is some minor development of callows-type grassland along the northern boundary in the Feorish floodplain.

Watercourses (major water features on/off site)

- Some the drainage along the northern side of the site drains to the Feorish River. Several other drains connect directly to the River Shannon. Drainage in this site is pumped and there are at least 4 active pumps.
- Derrycashel is within the Shannon catchment.

Peat type and sub-soils

There is somewhat more detailed knowledge of peat types and sub-soils at Derrycashel due to older survey work carried out by Barry *et al.*, (1973) (see Feehan 2004 – A long-lived wilderness).

The exposed peat at this site is black fen peat, which is mostly reed fen peat, and minor cover of forest peat/woody fen peat (Barry *et al.*, 1973).

Gravel has also been exposed at several locations through the site where there are ridges and mounds. Sapropel, an organic-rich layer of mud that was deposited as a river sediment, underlies much of the basal peat in Derrycashel.

Fauna biodiversity

Birds

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

- 4 pairs of Ringed Plover and 1 pair of Lapwing were noted on the site with typical breeding behaviour. Several pairs were associated with the wetlands through the centre of the site while 2 pairs of Ring Plover were associated with the bare industrial peat production area to the east of the site.
- 1 Curlew was recorded calling around the northern boundary of the site. There is suitable nesting habitat adjacent to the site on some degraded high bog.
- A Merlin was recorded on the site.
- Willow Warbler was recorded throughout the site in maturing scrub.
- Blackcap was only recorded at one location in some of the oldest Birch woodland near to the crops.
- Lesser Black-backed Gull (4).
- Snipe (2)
- Mallard (7) probably breeding
- The wet areas attract wintering wildfowl and species such as Whooper Swan (25 – 18/01/2011)
- Other more common species recorded on the site included Pheasant, Coal Tit, Redpoll, Skylark, Magpie, Reed Bunting, Blackbird, Grey Crow, Rook, Raven, Heron, Chaffinch, Robin and Meadow Pipit.

Mammals

Several signs of mammals were recorded during the survey.

- Badger
- Rabbit
- Mink
- Pine Marten
- Fox
- Hare
- Otter (signs recorded along the north-east margin in a silt-pond complex).

Other Species

Several butterfly species were recorded during the survey

- Peacock
- Orange-tip
- Small Tortoiseshell
- Small White
- Brimstone (east side of site around mineral island that extends into bog)

Fish

- Stickleback in the drains
- Fish observed in the silt ponds included Pike and Brown Trout.
- Coarse fish were observed in the Feorish River (most likely bream and roach)

APPENDIX IV. ENVIRONMENTAL CONTROL MEASURES TO BE APPLIED TO BOG REHABILITATION

- Bog restoration/rehabilitation measures will be restricted to within the footprint of the proposed rehabilitation area.
- The proposed rehabilitation will have due regard to noise limits and hours of operation (i.e. dusk and dawn) to minimise any potential disturbance on resident and local fauna that utilise the site and immediate environs.
- All plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).
- The proposed activities will be restricted to daylight hours and there will be no requirement for artificial lighting.
- Silt ponds will be inspected and maintained as per the IPC Licence.
- During periods of heavy precipitation and run-off, activities will be halted.
- Measures will be carried out using a suitably sized machine and in all circumstances, excavation depths and volumes will be minimised where possible.
- All machines will be regularly checked and maintained prior to arrival at the site to prevent hydrocarbon leakage.
- Hoses and valves will be checked regularly for signs of wear and will be closed and securely locked when not in use.
- Fuelling and lubrication of equipment shall only be carried out in designated areas away from surface water drainage features and ecologically sensitive areas.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- Vehicles will never be left unattended during refuelling.
- No direct discharges to waters will be made. No washings from vehicles, plant or equipment will be carried out on site.
- All plant refuelling will take place using mobile fuel bowzers. Only dedicated trained and competent personnel will carry out refuelling operations.
- Mobile storage such as fuel bowzers will be bunded to 110% capacity to prevent spills. Tanks for bowzers and generators shall be double skinned. When not in use, all valves and fuel trigger guns from fuel storage containers will be locked. All pumps using fuel or containing oil will be locally and securely bunded where there is the possibility of discharge to waters.
- Potential impacts caused by spillages etc. during rehabilitation will be reduced by keeping spill kits and other appropriate equipment on-site.
- Site activities will be carried out in accordance with 'best practice'. In order to ensure compliance and implementation of 'best practice', these measures will be communicated to relevant Bord na Móna staff and updated as required.

APPENDIX V. BIOSECURITY

Pitcher plant (*Sarracenia purpurea*) is present on the eastern raised bog remnant at Derrycashel Bog. Where abundant *S. purpurea* has the potential to cause localised declines in the diversity of associated bryophyte, vascular plant and invertebrate assemblages but further research is deemed required to confirm the likely level of impact. The potential for dispersal of this species due to decommissioning and rehabilitation is evaluated as Low, as deliberate planting seems to be the main vector for its spread. Eradication is typically through hand-pulling or treatment with herbicides.

The potential for importation or introduction of non-native plant species (such as Japanese Knotweed, Himalayan Balsam, etc.) during future rehabilitation management, such as drain-blocking using excavators, has the potential to result in the establishment of invasive species within the site. Section 49 of the European Communities (Birds and Natural Habitats) Regulations 2011 prohibits the introduction and dispersal of invasive alien species (particularly plant species) listed on Part 1 (third column) of the 'Third Schedule'.

This section aims to reduce the risk from, and impacts of, invasive species and protecting biodiversity on lands under Bord na Moña ownership. Rehabilitation and decommissioning in the bog will have due regard to the relevant biosecurity measures outlined below:

- Any areas of high bog will be subject to a confirmatory survey to establish presence or absence, where relevant, of *Sarracenia* within close proximity to activity locations.
- Records of problematic invasive species within the various bog units will be marked out with signs to highlight areas of infestation to personnel.
- All plant machinery will be restricted from disturbing known colonies of invasive species.
- All plant machinery will avoid unnecessary crossings to adjoining lands.
- Good site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (i.e. Japanese Knotweed (*Fallopia japonica*), Himalayan Balsam (*Impatiens glandulifera*), Himalayan Knotweed (*Persicaria wallichii*), etc.) by thoroughly washing vehicles prior to entering the area.

The biosecurity measures outlined above are in line with best practice guidelines issued by the National Roads Authority (NRA, 2010) – The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads and broadly based on the Environment Agency's (2013) – The Knotweed Code of Practice: Managing Japanese Knotweed on Development Sites (Version 3, amended in 2013, accessed on the Environment Agency's website on the 11th of July 2016).

In addition to the above, Best Practise measures around the prevention and spread of Crayfish plague⁴ will be adhered with throughout all rehabilitation measures and activities.

⁴ <https://www.biodiversityireland.ie/projects/invasive-species/crayfish-plague/>

APPENDIX VI. POLICY AND REGULATORY FRAMEWORK

Bord na Móna Plc is a publicly owned company, originally established in 1934 to develop some of Ireland's extensive peat resources for the purposes of economic development and to support energy security. In the decades since its establishment the company has employed tens of thousands of people in its fuel, energy, and horticultural growing media businesses. For much of its history the company's support of important national policy aims has been enabled and encouraged in a variety of ways by Government.

Today, Bord na Móna is undertaking a number of highly significant actions in support of climate policy. These actions involve a radical transformation and decarbonisation of nearly the entire Bord na Móna business. This transformation will be driven by unlocking the full potential of our land and creating significant value for Ireland and the Midlands in particular. Bord na Móna have now announced the complete cessation of industrial peat production across its estate (January 2021).

Bord na Móna is an integral part of the economic, social, and environmental fabric of Ireland and Irish life. As a key employer in the Midlands, the company is conscious that its obligations go beyond purely commercial and environmental – there is also a social responsibility to employees and the communities served by Bord na Móna. It is the company's role and absolute priority to ensure that its long-term strategy delivers on all of these important areas in a robust and balanced way.

There are a wide range of policies, plans, legislation and land designations that inform the development of this Bord na Móna peatland rehabilitation plan. Bord na Móna have also developed and operate various policies and strategies that also inform the development of this rehabilitation plan.

1 EPA IPC Licence

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Mount Dillon bog group (Ref. P0504-01). 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. The bog is part of the Mount Dillon Bog group. This regulatory requirement is the main driver of the development of this rehabilitation plan.

2 The Peatlands Climate Action Scheme (PCAS)

Bord na Móna (BnM) appreciates the Minister's intention to support, via the Climate Action Fund, Bord na Móna in developing a package of measures, 'the proposed Scheme', for the enhanced decommissioning, rehabilitation and restoration of cutaway peatlands, referred to as the 'Peatlands Climate Action Scheme'. The enhanced decommissioning, rehabilitation and restoration of the peatlands funded by the proposed Scheme will deliver benefits across climate action (GHG mitigation through reduced carbon emissions and acceleration towards carbon sequestration), enrich the State's natural capital, increase eco-system services, strengthen biodiversity, improve water quality and storage attenuation as well as developing the amenity potential of the peatlands.

It is envisaged that Bord na Móna carry out an enhanced decommissioning, rehabilitation and restoration scheme, (PCAS), across a footprint of 33,000 ha. This proposed scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. Interventions and measures supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. However, only the costs associated with the additional and

enhanced measures, i.e., those which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10, will be eligible for support under the proposed Scheme.

3 National Climate Policy

The National Policy Position establishes the fundamental national objective of achieving a transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out:

- the context for the objective;
- clarifies the level of GHG mitigation ambition envisaged; and
- establishes the process to pursue and achieve the overall objective.

The evolution of climate policy in Ireland will be an iterative process based on the adoption by government of a series of national plans over the period to 2050. GHG mitigation and adaptation to the impacts of climate change are to be addressed in parallel national plans – respectively through the National Climate Action Plan. The plans will be continually updated, as well as being reviewed on a structured basis at appropriate intervals and, at a minimum, every five years. This will include early identification and ongoing updating of possible transition pathways to 2050 to inform sectoral strategic choices.

Bord na Móna is following a decarbonisation programme aimed at reducing the carbon emissions from its activities. The company aims to further develop renewable energy and resource recovery markets with a key objective of reducing the carbon intensity of all products. In addition, the carbon emission mitigation benefits associated with the post-peat extraction rehabilitated peatland following re-wetting, revegetation and colonisation of significant areas with native woodland will make a significant contribution to achieving the State's carbon emission reduction targets.

4 National Peatlands Strategy

The National Peatlands Strategy (2015) contains a comprehensive list of actions, necessary to ensure that Ireland's peatlands are preserved, nurtured and become living assets within the communities that live beside them. It sets out a cross-governmental approach to managing issues that relate to peatlands, including compliance with EU environmental law, climate change, forestry, flood control, energy, nature conservation, planning, and agriculture. The Strategy has been developed in partnership between relevant Government Departments/State bodies and key stakeholders through the Peatlands Council.

The strategy recognises that Ireland's peatlands will continue to contribute to a wide variety of human needs and to be put to many uses. It aims to ensure that Ireland's peatlands are sustainably managed so that their benefits can be enjoyed responsibly. It aims to inform appropriate regulatory systems to facilitate good decision making in support of responsible use. It also aims to inform the provision of appropriate incentives, financial supports and disincentives where required. The strategy attempts to strike an appropriate balance between different needs, including local stakeholders like turf-cutters and semi-state bodies such as Bord na Móna.

In line with a National Peatlands Strategy recommendation, a Peatlands Strategy Implementation Group (PSIG), was established, assisted in the finalisation of the Strategy, is overseeing subsequent implementation and will report to Government on an annual basis on the implementation of the actions and principles contained within the Strategy.

Bord na Móna is a key stakeholder in the National Peatlands Strategy and the Peatlands Strategy Implementation Group. The strategy recognises the potential for some Bord na Móna sites to be restored and to contribute to the national SAC and NHA network of protected raised bog sites. The strategy also recognises the various different values of cutaway bog and developed six key principles (with Bord na Móna) for the after-use of cutaway bog.

- Bord na Móna will continue to assess and evaluate the potential of the company's land bank, using a land use review system. The assessment will help prepare a set of evidence based management plans for the various areas of peatland. These plans will also inform its cutaway bog rehabilitation.
- The policy of Bord na Móna is not to open up any undrained new bogs for peat production.
- Lands identified by Bord na Móna as having high biodiversity value and/or priority habitats will be reserved for these purposes as the principal future land use.
- Generally, Bord na Móna cutaway bogs that flood naturally will be permitted to flood unless there is a clear environmental and/or economic case to maintain pumped drainage.
- In deciding on the most appropriate afteruse of cutaway peatlands, consideration shall be given to encouraging, where possible, the return to a natural functioning peatland ecosystem.
- This will require re-wetting of the cutaway peatlands which may lead in time to the restoration of the peatland ecosystem.
- Environmentally, socially and economically viable options should be analysed to plan the future use of industrial cutaway peatlands, in conjunction with limiting factors as outlined in Bord na Móna's Strategic Framework for the Future Use of Peatlands.

The National Peatlands Strategy highlights the importance and value of developing peatland rehabilitation plans for Bord na Móna cutaway sites and implementing this peatland rehabilitation.

5 National River Basin Management Plan 2018-2021 (Water Framework Directive)

The National River Basin Management Plan (2018-2021) (Department of Housing, Planning, Community and Local Government 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). In broad terms, the objectives of the WFD are (1) to prevent the deterioration of water bodies and to protect, enhance and restore them with the aim of achieving at least good status and (2) to achieve compliance with the requirements for designated protected areas.

The NRBMP outlines how peat extraction can be a potentially significant pressure on various water quality parameters. Peatland rehabilitation of Bord na Móna cutaway (in addition to other measures) is part of the WFD (2018-2021) programme of measures. The NRBMP takes account of the fact that Bord na Móna is in the process of phasing out the extraction of peat for energy production, that it set a target to rehabilitate 9,000 ha of cutaway bogs (covering 25 peatlands) by 2021 (in 2018) and will look to implement best-available mitigation measures to further reduce water quality impacts caused by peat extraction while the phasing-out process is taking place. This NRBMP rehabilitation target is set to be superseded by the acceleration of the Bord na Móna de-carbonisation programme and the proposed **Scheme (PCAS)**.

The development of site rehabilitation plans and the delivery of peatland rehabilitation by Bord na Móna is expected to have a positive impact on water quality and will help the NRBMP deliver its objectives in relation to the Water Framework Directive and is one of the five key principle actions.

6 National Biodiversity Action Plan 2016-2021

The National Biodiversity Action Plan 2016-2022 has a vision that biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally. Ireland's 2nd National Biodiversity Action Plan outlines the main policies, strategies, actions and targets in relation to biodiversity. This plan has several Bord na Móna specific objectives and actions including implementing the BnM Biodiversity Action Plan 2016-2021 and overlaps with both the National Peatlands Strategy and the National Raised Bog Special Areas of Conservation Management Plan 2017-2022.

7 National conservation designations

Bord na Móna operates in a wider landscape that also includes a network of European and National nature conservation sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), National Heritage Areas (NHAs, cNHAs) and National Nature Reserves). Bord na Móna will take account of this network of conservation objectives and their conservation objectives when developing these rehabilitation plans. It is expected that peatland rehabilitation will, in general, benefit the conservation objectives of this network of nature conservation sites.

8 National Raised Bog Special Area of Conservation Management Plan 2017-2022.

The National Raised Bog Special Area of Conservation Management Plan 2017-2022 sets out a roadmap for the long-term management, restoration and conservation of protected raised bogs in Ireland. The Plan strikes an appropriate balance between the need to conserve and restore Ireland's raised bog network as part of Ireland's commitments towards the EU Habitats Directive, and the needs of stakeholders and gives recognition to the important role that communities have to play in the conservation and restoration of raised bogs. The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 is part of the measures being implemented in response to the on-going infringement action against Ireland in relation to the implementation of the EU Habitats Directive, with regard to the regulation of turf cutting on the Special Areas of Conservation (SACs). The then Minister for Arts, Heritage and the Gaeltacht, also published a **Review of Raised Bog Natural Heritage Area Network** in 2014.

Bord na Móna has played a key role in the development of the National Raised Bog Special Area of Conservation Management Plan 2017-2022 and the Review of the Raised Bog Natural Heritage Area Network. Several Bord na Móna sites were assessed by the National Parks and Wildlife Service as part of the above Plan and Review and there is an expectation that several Bord na Móna sites will be designated as SACs and NHAs in the future. This will reinforce the network of protected raised bog sites and replace in part sites that will be de-designated as they have been deemed to be significantly damaged and are deemed to have no raised bog restoration prospects.

Bord na Móna has also responded to the needs of the NRBMP and provided several sites to the government for the relocation of turf-cutters from SACs. This is part of a suite of ongoing bog conservation measures in the NRBMP to manage turf-cutting in protected sites. Bord na Móna and the National Parks and Wildlife Service continues to engage regarding the ongoing relocation of turf-cutters from protected raised bog sites.

9 All-Ireland Pollinator Plan 2015-2020

The All-Ireland Pollinator Plan 2015-2020 outlines key objectives and actions to protect and support pollinating insects and the habitats they rely on. There are several Bord na Móna specific actions in this plan including the adoption of pollinator-friendly management within the Bord na Móna network of sites. One action to help achieve this objective is habitat rehabilitation and restoration, where possible, of pollinator-friendly habitats, including peatland habitats.

10 Land-use planning policies

As Bord na Móna operates in many counties across Ireland, it is important to note the respective development plans in these counties. Many of the existing development plans recognise the potential that exists in the after-use of cutover/cutaway peatlands. Bord na Móna seeks to work with all of the relevant local authorities to ensure that the most appropriate after-uses are reflected in local planning policy. The following areas of consistent importance are of both direct and indirect relevance to Bord na Móna: heritage, tourism, biodiversity/conservation, landscape, wind energy, and economy/enterprise.

No zoning information is available on the online resource myplan.ie in respect of the location of Derrycashel Bog.⁵

11 National Archaeology Code of Practise

Bord na Móna operates under an agreed Code of Practice regarding archaeology with the Department of Arts, Heritage and the Gaeltacht and the National Museum of Ireland which provides a framework to enable the Company to progress peat extraction whilst carrying out archaeological mitigation. (<https://www.archaeology.ie/sites/default/files/media/publications/cop-bord-na-mona-en.pdf>)

The Code replaced a set of Principles agreed with the Department of Arts, Heritage and the Gaeltacht in the 1990s. Under the Code Bord na Móna, the Minister and Director work together to ensure that appropriate archaeological mitigation is carried out in advance of peat extraction.

- BNM must ensure that any monuments or archaeological objects discovered during peat extraction are protected in an appropriate manner by following the Archaeological Protection Procedures.
- BNM must ensure that any newly discovered monuments on Bord na Móna lands are reported in a timely manner to the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht.
- BNM must ensure that any archaeological objects discovered on Bord na Móna lands are reported immediately to the Duty Officer of the National Museum of Ireland.
- Bord na Móna will endeavour to adhere to this code of practise during the peatland rehabilitation phase and appropriate archaeology mitigation is carried out before and during cutaway peatland rehabilitation. An Archaeological Impact Assessment is being carried out for the proposed rehabilitation at this site (Appendix XII). The recommendations of this assessment will be incorporated into the rehabilitation plan to minimise impacts on known archaeology. In addition, Bord na Móna will adhere to the Archaeology Code of Practise relating to management of stray archaeological finds that may arise during cutaway peatland rehabilitation and decommissioning.

⁵ <https://myplan.ie/zoning-map-viewer/>

12 Bord na Móna Biodiversity Action Plan 2016-2021

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. The Bord na Móna Biodiversity Action Plan also outlines key International and European policy in relation to biodiversity. This includes the **United Nations Convention on Biodiversity 2011-2020 (CBD)** and **European Biodiversity Strategy to 2020**. Further details of these policies and Bord na Mónas responses can be found in the Bord na Móna Biodiversity Action Plan (Bord na Móna 2016). Both policy documents highlight targets such as reducing pressure on biodiversity, promoting sustainability, habitat restoration and benefits of ecosystem services.

One example of a key CBD target is:

- *“Restore at least 15% of degraded areas through conservation and restoration activities.”*

The EUs headline target for progress by 2020 is to:

- *“halt the loss of biodiversity and the degradation of ecosystems in the EU by 2020, restore them as far as feasible, while stepping up the EU contribution to averting global biodiversity loss.”*

The Derrycashel Bog Rehabilitation Plan is aligned to the CBD target and the EU Biodiversity Strategy target and will help Ireland meet its commitment to these international Biodiversity policies.

13 Bord na Móna commitments

Bord na Móna made the commitment in 2009 not to develop any new peatland sites for industrial peat production. The company has continued to work with different stakeholders.

The company announced that peat production would be cut by over 50 percent in 2019 and would entirely cease over most of its lands by the mid-2020s. Rehabilitation measures will continue to be carried out with the focus on re-wetting and rehabilitation of cutover and cutaway areas in line with national policies (such as the National Peatland Strategy, the National Biodiversity Action Plan, the Climate Action Plan 2019, the Water Framework Directive, etc.) and rehabilitation guidelines set down by the Environmental Protection Agency. To date, 15,000 hectares of cutaway and cutover bog have been rehabilitated using this approach with 5,000 hectares in active rehabilitation.

In line with Bord na Móna’s accelerated decarbonisation programme, the company has also committed to a significantly larger rehabilitation target. This is reflected in our plans to rehabilitate a further 20,000 hectares of cutaway and cutover bog to wetland and woodland mosaics by 2025. In addition, we plan to restore a further 1,000 hectares of raised bog habitat by 2025. These targets are significant in both timing and scale and are indicative of Bord na Móna’s increased new ambition in this area.

These commitments outline the importance of peatland rehabilitation to Bord na Móna. The company will continue to demonstrate environmental responsibility and continue to deliver on these commitments in relation to peatland rehabilitation and in relation to the future management of these lands to maximise their benefits, particularly their ecosystem service benefits, along with the sustainable development of a portion of the land bank for other uses.

14 Bord na Móna Strategic Framework for the future use of cutaway peatlands 2020

The general after-use strategy of Bord na Móna is outlined in the Bord na Móna Strategic Framework for Future-Use of Cutaway Bogs 2020. This document outlines how Bord na Móna's cutover peatland estate is complex in nature with great variability in terms of peat depths, peat types, drainage, subsoil condition and environmental value. Thus, future options require consideration on a site-specific basis, also bearing in mind the considerable internal variation within bogs. The development of the land-bank will also take account of national needs, while also taking account of the various national legislation, policies and plans related to the management of peatlands. In general, Bord na Móna will seek to balance and optimise commercial, social, and environmental value of these sites, while taking account of the need for sustainability and their biodiversity value.

Any consideration of other future after-uses for Bord na Móna land such as development or other mixed uses will be conducted following the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this peatland rehabilitation plan.

APPENDIX VII. DECOMMISSIONING

1. Condition 10 Decommissioning

This is a requirement of the applicable Integrated Pollution Control Licence issued by the Environmental Protection Agency. This condition 10.1 requires the following:

10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:

10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

The main success criteria pertaining to successfully complying with this condition is ensuring that no environmental liability remains from this infrastructure and material and that the bog can be deemed suitable for surrender of the licence under section 95 of the EPA Acts. This is achieved by Bord na Móna identifying and quantifying any mechanical and infrastructural resources that were installed in the bog to enable the development and production operation at the site. This list is then refined to identify any items that would be deemed as possibly resulting in environmental pollution, should they not be removed.

Typically, these items/infrastructures would be any remaining, unconsolidated plant, equipment and attachments, waste materials, unused raw materials such as land drainage pipes, remaining peat stockpiles, stock pile covering, pumps, septic tanks and fuel tanks.

In relation to this bog, the list and tasks would be as follows:

Item	Description	Derrycashel Decommissioning Plan
1	Clean-up of remaining or unconsolidated waste or materials located in Bogs, Yards, Buildings and Offices	Clean-up of Bog
2	Cleaning Silt Ponds	Cleaning Silt Ponds
3	Decommissioning Peat Stockpiles	Peat Stockpile Management
4	Decommissioning or Removal of Buildings and Compounds	Not relevant
5	Decommissioning Fuel Tanks and associated facilities	Decommissioning and De-Gassing Mobile Fuel Tanks
6	Decommissioning and Removal of Bog Pump Sites	If feasible
7	Decommissioning or Removal of Septic Tanks	De-sludge Septic Tank

In addition, condition 7 of the licence requires these now defined waste items to be disposed of or recovered as follows:

7.1 Disposal or recovery of waste shall take place only as specified in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* of this licence and in accordance with the appropriate National and European legislation and protocols. No other waste shall be disposed of/recovered either on-site or off-site without prior notice to, and prior written agreement of, the Agency.

7.2 Waste sent off-site for recovery or disposal shall only be conveyed to a waste contractor, as agreed by the Agency, and only transported from the site of the activity to the site of recovery/disposal in a manner which will not adversely affect the environment.

7.3 A full record, which shall be open to inspection by authorized persons of the Agency at all times, shall be kept by the licensee on matters relating to the waste management operations and practices at this site. This record shall as a minimum contain details of the following:

7.3.1 The names of the agent and transporter of the waste.

7.3.2 The name of the persons responsible for the ultimate disposal/recovery of the waste.

7.3.3 The ultimate destination of the waste.

7.3.4 Written confirmation of the acceptance and disposal/recovery of any hazardous waste consignments sent off-site.

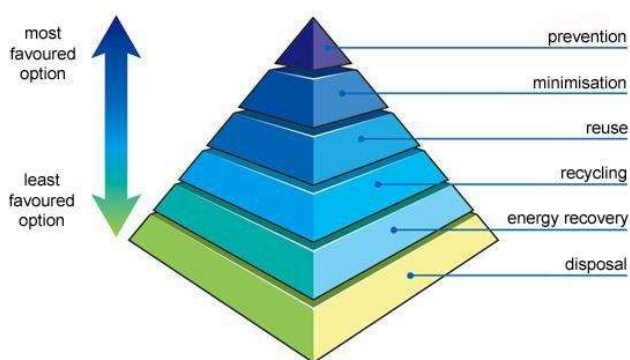
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

7.3.6 Details of any rejected consignments.

A copy of this Waste Management record shall be submitted to the Agency as part of the AER for the site.

As required by the licence, these waste items will be removed for recycling or disposal, using external contractors with the required waste collection permits, approved under 7.2, with waste records maintained as required under 7.3.

Where possible, Bord na Móna will utilize the appropriate waste hierarchy to identify waste that can reused or recycled ahead of disposal.



The validation of the success of condition 10.1 is carried out through an Independent Closure Audit (ICA), followed by and EPA Exit Audit (EA) and the eventual partial or full surrender of the licence.

2. Enhanced Decommissioning.

The remaining infrastructure does not constitute a risk to the environment and would not be a requirement of condition 10 of the licence. The removal of these are deemed as enhanced measures. These may enhance the future afteruse of the bog for amenity value, security against access for illegal and unsocial activities and general State and community benefit. In relation to this bog, this would include the infrastructure defined below:

Item	Enhanced Decommissioning Type	Derrycashel Decommissioning Plan
1	Removal of Railway Lines	Removal of Railway Lines
2	Decommissioning Bridges and Underpasses	If feasible
3	Decommissioning Railway Level Crossing	Decommissioning Railway Level Crossing
4	Restricting Access (bogs and silt ponds)	Restricting Access to Bog.
5	Removal of High Voltage Power Lines	If feasible

APPENDIX VIII. GLOSSARY

Cutaway Bog: A Bord na Móna site generally becomes cutaway when it is economically unviable to continue industrial peat extraction or when the majority of peat has been removed.

Deep peat cutover bog. Deep peat cutaway bog is defined as former raised bogs that have been in industrial peat production, where production has ceased but the residual peat depth is typically in excess of 2m. *Sphagnum* mosses are key species of raised bogs and the majority of the peat mass is formed from these mosses. *Sphagnum* species and other raised bog species are a key part of raised bog habitat function and prefer more acidic, nutrient poor, water-logged conditions. Typical raised bog *Sphagnum* mosses and other bog species do not thrive with the more typical alkaline water chemistry of cutaway bog but do grow well in these more acidic conditions where peat has been re-wetted. There is potential to re-develop *Sphagnum*-rich plant communities in these conditions if the peat can be re-wetted. This brings the opportunity of re-developing *Sphagnum*-rich vegetation communities that are considered Carbon sinks or peat-forming habitats and restoring the carbon sequestration function of these sites.

Dry cutaway bog: Cutaway bog is categorised as dry cutaway where it is not practical or feasible to re-wet these areas completely. It is inevitable that some areas of cutaway will remain relatively dry due to the heterogenous topography of the cutaway, as well as requirements for continued drainage on site for identified after-uses, or off site in relation to neighbouring lands or other infrastructure. Ridges and mounds of glacial deposits can become exposed during peat extraction and form a heterogenous topographical mosaic separated by basins. Dry cutaway may have very thin or no residual peat where ridges and mounds have been exposed. The exposed sub-soils are a mix of glacial gravels, muds and tills that can be quite free-draining. Dry cutaway may also have deeper residual peat but in a location (ie. at the margin) where the peat can not be re-wetted due to boundary constraints. Dry cutaway may also develop in situations where there a relatively steep slope that inhibits re-wetting. The majority of dry cutaway will develop towards grassland, heath, scrub and dry woodland habitats.

Enhanced decommissioning: This is defined as decommissioning carried out under proposed Scheme, which is proposed to externally funded.

Enhanced rehabilitation: This is defined as rehabilitation carried out under proposed Scheme, which is proposed to be externally funded. It is proposed by Government that Bord na Móna be obligated to carry out enhanced decommissioning, rehabilitation and restoration on peatlands. This proposed Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. Interventions and activities supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. However, only the costs associated with the additional, enhanced and accelerated measures, i.e., those interventions which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support under the proposed Scheme.

Marginal land. Marginal land is defined as land around the margin of the industrial peat production area. This margin generally contains a range of habitats including scrub, Birch woodland, cutover bog and raised bog remnants. It has a variety of land-uses including turf-cutting (private turbary). The Scheme will consider potential rehabilitation and restoration actions (e.g. drain blocking) within marginal land zones, where appropriate.

Rehabilitation: Rehabilitation is defined in general by Bord na Móna as environmental stabilisation of the former cutaway. This is generally achieved via re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention. It is not possible to restore raised bog habitats on BnM cutaway in general

in the short-term. In general, most of the peat mass has been removed from many BnM cutaway sites and the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status). This means there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland). Other after-use development may also serve to act as rehabilitation.

Restoration: Ecological restoration is defined as the process of re-establishing to the extent possible the structure, function and integrity of indigenous ecosystems and the sustaining habitats they provide” (SER 2004). Defined in this way, restoration encompasses the repair of ecosystems (Whisenant 1999) and the **improvement of ecological conditions in damaged wildlands** through the **reinstatement of ecological processes**. In general, Bord na Móna cutaway peatlands cannot be restored back to raised bog in a reasonable timeframe as their environmental conditions have changed so radically (with the removal of the acrotelem – the living layer and much of the peat mass). However, they can be returned to a **trajectory** towards a naturally functioning peatland system (Renou-Wilson 2012). **Raised bog restoration** is an objective of some BnM sites where there is residual natural raised bog vegetation and where the majority of the peat is still intact.

Standard rehabilitation: This is defined as rehabilitation that is designed to meet the conditions of the EPA IPC Licence. The key objective of rehabilitation is environmental stabilisation. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention. Other after-use development may also serve to act as rehabilitation.

Standard decommissioning: This is defined as decommissioning that is designed to meet the conditions of the EPA IPC Licence. This is defined as to render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

Wetland cutaway bog. Wetland cutaway bog is defined as former raised bogs that have been in industrial peat production, where production has ceased and the majority of peat has been cutaway, and where this cutaway has the potential to be re-wetted. A significant number of Bord na Móna sites have pumped drainage and these sites are likely to develop a mosaic of wetland habitats when pumping is reduced or stopped. The water chemistry of wetland cutaway frequently is strongly influenced by the more alkaline sub-soils that have been exposed during peat production. This means that pioneer vegetation is more typical of fen and wetland, rather than raised bog. Wetland cutaway will have a broad range of hydrological conditions depending on the local topography. In some cases, these wetlands may form deep water (> 0.5 m) whilst other areas may have the water table at or just below the surface of the ground.

APPENDIX IX. EXTRACTIVE WASTE MANAGEMENT PLAN

(Minimisation, treatment, recovery and disposal)

Objective:

The objective of this generic plan is to comply with the requirements of regulation 5 of the Waste Management (Management of Waste from Extractive Industries) Regulations, and to prevent or reduce waste production and its harmfulness.

Scope:

This plan covers IPPC Licence's Ref P0504-01, Mountdillion Group of Bogs in Counties Longford, Roscommon and Westmeath.

1.0 Extractive Waste:

Waste classified as extractive waste from peat extraction operations arise from three operations associated with this activity.

1.1 Silt Pond excavations and maintenance.

All peat extraction activities in Clonsast serviced by a silt lagoons/ponds. During the excavation of these silt ponds, pre IPPC Licensing in 1999 and since licensing, the excavated material is stored adjacent to the silt pond, where it either remains in situ or is levelled out. As required by condition 6.6, these silt lagoons are cleaned twice per annum or more often if inspections dictate. These silt cleanings are also deposited on the same location, adjacent to the silt pond, where they may be levelled periodically to allow room for subsequent cleanings. These mounds of silt pond excavation material and cleanings are generally no higher than 2-3 metres.

1.2 Power Station screenings:

Lough Ree Power Ltd screens the peat from the bogs prior to processing. This screening removes oversized peat, stones and bog timbers. Schedule 3 (ii) of the IPPC licence permits disposal of these peat screenings back to the bog, where it is levelled and graded into the surrounding peat landscape. These locations have been agreed with the Agency as per condition 7.4 of the IPPC Licence, and as per the attached locations.

1.3 Bog Timbers:

During peat extraction operations, bog timbers often arise in the bog surface and are required to be cleared. These timbers consist of bog pine, oak and some yew. Some of these timbers, such as the oak and yew are removed for use in the wood craft industry, with the remaining bog pine stockpiled in locations at the opposite end of each bog, where it generally becomes a habitat for flora and fauna. These piles of timber are generally no higher than 1-2 metres.

2.0 P0503-01 IPPC Licence Extractive Waste Conditions

2.1 Condition 7.5 Extractive Waste Management

The licensee shall draw up a Waste Management Plan (to be known as an Extractive Waste Management Plan) for the minimisation, treatment, recovery and disposal of extractive waste. This Plan shall meet the requirements of regulation 5 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009. The Plan shall be submitted for agreement by the Agency by the 31st December 2012. The Plan shall be reviewed at least once every five years thereafter in a manner agreeable to the Agency and amended in the event of substantial changes to the operation of a waste facility or to the waste deposited. Any amendments shall be notified to the Agency.

All extractive waste shall be managed in accordance with the Extractive Waste Management Plan. A report on the implementation of the Extractive Waste Management Plan shall be provided in the AER.

2.2 Condition 7.6 Waste Facility

- (i) No new waste facility may be developed or an existing waste facility modified unless agreed by the Agency.
- (ii) The licensee shall ensure that all existing waste facilities are managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
- (iii) The licensee shall ensure that all new waste facilities are constructed, managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
- (iv) Operational measures shall be continuously employed to prevent damage to waste facilities from personnel, plant or equipment.
- (v) The licensee shall establish and maintain a system for regular monitoring and inspection of waste facilities.
- (vi) All records of monitoring and inspection of waste facilities, as required under the licence, shall be maintained on-site in order to ensure the appropriate handover of information in the event of a change of operator or relevant personnel.

2.3 Condition 7.7 Excavation Voids

7.7.1 Unless otherwise agreed by the Agency, only extractive waste shall be placed in excavation voids.

7.7.2 When placing extractive waste into excavation voids for rehabilitation and construction purposes, the licensee shall, in accordance with regulation 10 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009, and the Extractive Waste Management Plan:

- Secure the stability of the waste
- Put in place measures to prevent pollution of soil, surface water and ground water.
- Carry out monitoring of the extractive waste and excavation void.

Condition 7.5. Extractive Waste Management Plan. 5 (1)

3.0 Minimisation.

3.1 Silt pond excavation material and cleanings.

IPPC Licence conditions require all production areas to be serviced by an appropriately designed silt pond based on storage volume and retention time. Condition 6.6 requires all ponds to be cleaned bi-annually and more often if inspections dictate, so the only opportunity for minimisation of same is through Standard Operating Procedures. These are required under condition 2.2.2 (i) regarding minimisation of suspended solids, and are in-place to minimise the generation of silt, which in-turn will minimise the generation of silt pond waste.

3.2 Power Station Screenings.

These screenings cannot be minimised as they are a consequence of peat production, stones, timbers and oversize peat materials are naturally occurring on the bog, and are required to be removed prior to processing.

3.3 Bog Timbers.

Bog timbers are also naturally occurring materials within a bog and are required to be removed prior for production. The volume of these bog timbers varies from bog to bog and as such their minimisation is not controllable or quantifiable.

4.0 Treatment**4.1 Silt pond excavation material and cleanings.**

The silt pond excavation material and silt cleanings do not require any treatment for its end use which will be either backfilling these silt pond voids as per condition 7.7.1 above as part of the Bog Rehabilitation Plan, or reincorporated into the surrounding peatlands.

4.2 Power Station Screenings.

The factory screenings are permitted to be returned to the bog as they were naturally occurring materials from the bog, and as such do not require any treatment to serve this purpose.

4.3 Bog Timbers

As per 1.3 above, these timbers are stockpiled at two locations in each bog, as per the attached list of sites and become habitats for various flora and fauna.

5.0 Recovery**5.1 Silt pond excavation material and cleanings.**

Condition 2.2.2 (vi) requires the reuse of silt pond waste to be examined. This was undertaken in 2006, the outcome of which was that this waste peat silt material, as a fuel, was contaminated with sub-soils, rendering it unsuitable for combustion. In addition, volumes are small compared to overall peat production volumes.

5.2 Power Station Screenings.

Given the nature of these screenings as outlined in 1.2 above, there is no further use identified and they are permitted to be disposed of back to the bog.

5.3 Bog Timbers

Investigations into processing these materials into smaller fractions for potential heating purposes did not yield any viable results. In addition, these older stockpiles are now classified as habitats and as such would not be considered for reuse as a fuel.

6.0 Disposal**6.1 Silt pond excavation material and cleanings.**

Schedule 3 (ii) permits the disposal of silt pond cleanings (Lagoon Sediments) to the bog and these locations, adjacent to the silt pond site, are presented in the attached spreadsheet, with associated grid coordinates.

6.2 Power Station Screenings.

Schedule 3 (ii) permits the disposal of screenings (Peat Screenings) to the bog at designated locations agreed under Condition 7.4, and these locations, are presented in the attached spreadsheet, with associated grid coordinates.

6.3 Bog Timbers

These naturally occurring bog timbers are stockpiled at locations in each bog, grid coordinates attached.

7.0 Extractive Waste Management Plan**5 (2a)(i)**

The vast majority of peat extraction bogs were all designed and drained for production prior to the 1960's and as such the production fields layout cannot be altered. Under our Cleaner Reduction Procedures, various design changes have been implemented to the production machines and process to reduce lost peat which eventually is captured in the silt ponds and requires removal as waste peat silt. This along with training and ongoing research and development will continuously reduce waste peat and subsequently waste silt pond cleanings. Bog timbers are present naturally in various volumes and quantities in different bogs and as peat production involves stripping peat in layers, the exposure, generation and removal of these timbers is unavoidable. Work has been undertaken recently into project looking at grinding of these bog timbers in situ using a timber miller, and if this project becomes viable it will contribute to the reduction of bog timbers.

5 (2a)(ii)

Given the nature and expanse of peat bogs, the stockpiling and storage of these waste materials do not present a visual, storage or stability problem. As required under Condition 10 of the IPPC Licence, the silt pond excavations and screenings will be utilised to backfill the silt pond voids once the bogs have finished and stabilised in accordance with our Bog Rehabilitation Plan. Storage of these wastes in the interim, open to the elements does not present a change on the nature of these wastes that will threaten the environment or prevent their reuse during the bog rehabilitation process.

5 (2a)(iii)

Under Condition 10 of the IPPC Licence, all silt ponds will be decommissioned once the bog surface has stabilised, in agreement with the Agency. This will involve the removal of weirs and flow controls, returning the silt pond back to its original drain or removing the silt pond from the drainage system. Both of these activities will involve placing the silt pond extraction and cleaning material back into the excavation void.

5 (2a)(iv)

The peat bogs do not contain any topsoil, so this is not required.

5 (2a)(v)

Peat mineral resources do not undergo any treatment.

5 (2b)

These three extractive waste are all being reused and recovered back to their original extraction points and have not undergone any physical, chemical, or biological change.

5 (2c)(i, ii & iii)

These three extractive wastes, stored on the bog for reuse or recovery during the bog rehabilitation phase, do not require any management or monitoring during the operation of these bogs. Silt pond excavations and cleanings are stored adjacent to the silt pond and quickly revegetated and stabilise, the screenings are graded back into the bog at the agreed locations upon disposal and the bog timbers do not prevent any water or airborne danger to the environment.

5 (3)

The three extractive wastes arising from peat extraction operations at this site are classified wastes from mineral non-metalliferous excavation, with an EWC code of 0101 02. The materials are not classified as hazardous under Directive 91/689/EEC20, and do not contain substances or preparations classified as dangerous under Directives 67/548/EEC5 or 1999/45/EC6 above a certain threshold.

The peat excavations and cleanings are stored in locations and in a manner that they could not collapse, and are remote in their nature. The stockpiles are located adjacent to silt ponds that are cleaned regularly and as such these stockpiles are managed and levelled to facilitate further cleanings.

Therefore the material stored at these waste facilities would not be considered to be a Category A waste facility.

Classification in accordance Annex II.

Waste Material	Description	Classification	Chemical Process treatment	Deposition description	Transport System
Silt Pond Excavations and cleanings	Peat and mineral soils associated with peatlands. Stored for reuse during bog rehabilitation, with no displacement of overburden	01 01 02	None	Excavated from silt ponds by excavator and deposited adjacent to the silt pond.	Excavator
Peat Screenings	Stones, timbers and oversized peat particles, reincorporated into low areas, agreed with the Agency, and stabilized under normal natural bog conditions	01 01 02	None	Removed by screen at the factory and transported by tractor and trailer to the designated and agreed locations	Tractor and trailer.
Bog Timbers	Pine, Oak and Yew species, stored at locations in each bog. Not subject to any stability issues due to exposure to atmospheric/meteorological conditions.	01 01 02	None	Removed from the bog surface by excavator and transported by tractor and trailer to the agreed locations	Tractor and Trailer

Description of operations.

Silt pond excavations arise from the requirement to have silt ponds treating all peat extraction sites. Silt pond cleanings arise from the removal of peat silt from silt ponds as required under IPPC Licence. Bog timbers arise from preparation of the bogs surface for peat production. Estimated quantities of materials are below:

Closure plan. (Bog Rehabilitation Plan).

Condition 10.1 – 10.3 of the IPPC Licence requires the following:

- 10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:
- 10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.
- 10.1.2 Implement the agreed cutaway bog rehabilitation plan (refer Condition 10.2).

10.2 Cutaway Bog Rehabilitation Plan:

- 10.2.1 The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area. This plan shall be submitted to the Agency for agreement within eighteen months of the date of grant of this licence.
- 10.2.2 The plan shall be reviewed every two years and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the written agreement of the Agency.

10.3 The Rehabilitation Plan shall include as a minimum, the following:

- 10.3.1 A scope statement for the plan; to include outcome of consultations with relevant Agencies, Authorities and affected parties (to be identified by the licensee).
- 10.3.2 The criteria which define the successful rehabilitation of the activity or part thereof, which ensures minimum impact to the environment.
- 10.3.3 A programme to achieve the stated criteria.
- 10.3.4 Where relevant, a test programme to demonstrate the successful implementation of the rehabilitation plan.
- 10.3.5 A programme for aftercare and maintenance.

10.4 A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment. This plan including maps and ecological classifications are available on file at the Mountdillon IPPC Licence Coordinators office.

The location in relation to the silt pond excavations and cleanings are adjacent to the silt ponds, which are considered under the Shannon River Basin Management Plan in accordance with the requirements of Directive 2000/60/EC.

Screenings and bog timbers are all naturally occurring elements of peatland and their placement back to the bog in smaller concentrated designated waste facilities does not constitute a risk to the prevention of water compliance.

The lands under where these materials are deposited are peatlands and are un-effected by the placing of this material.

Review.

This plan will be reviewed every five years, the first review to take place in September 2017. This review will entail an inspection of these waste facilities to ensure their placing, management, maintenance and stability comply with the requirements of the Extractive Waste Management requirements and condition 7.5, 7.6 and 7.7 of the Mountdillon IPPC Licence P0504-01.

APPENDIX X. MITIGATION MEASURES FOR THE APPLICATION OF FERTILISER

- Any fertiliser used will be Rock Phosphate and will not be applied in the following conditions:
 1. The land is waterlogged;
 2. The land is flooded, or it is likely to flood;
 3. The land is frozen, or covered with snow;
 4. Heavy rain is forecast within 48 hours (forecasts will be checked from Met Éireann).
 5. The ground slopes steeply and there is a risk of water pollution, when factors such as surface run-off pathways, the presence of land drains, the absence of hedgerows to mitigate surface flow, soil condition and ground cover are taken into account.
- No fertiliser will be spread on land within 2 metres of a surface watercourse.
- Buffer zones in respect of waterbodies, as specified on <https://www.epa.ie/about/faq/name,57156,en.html>, will be adhered with at all times with regard to fertiliser application. Reproduced as follows:

Water body / Feature	Buffer zone
Any water supply source providing 100m ³ or more of water per day, or serving 500 or more people	200 metres (or as little as 30 metres where a local authority allows)
Any water supply source providing 10m ³ or more of water per day, or serving 50 or more people	100 metres (or as little as 30 metres where a local authority allows)
Any other water supply for human consumption	25 metres (or as little as 30 metres where a local authority allows)
Lake shoreline	20 metres
Exposed cavernous or karstified limestone features (such as swallow holes or collapse features)	15 metres
Any surface watercourse where the slope towards the watercourse exceeds 10%	10 metres
Any other surface waters	5 metres*

APPENDIX XI. CONSULTATION SUMMARIES

Table APX -1 Consultees contacted

Bog Name	Contact Organisation	Contact Name	Date of Issue	Communication Format	Date Response Received	Response format
Derrycashel	Roscommon County Council - Director of Services (Planning, Environment and Emergency Services)	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Roscommon County Council - Heritage Officer	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Northern and Western Regional Assembly	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Chairperson of Roscommon County Council	General e-mail contact	08/01/2021	E-mail		
Derrycashel	<i>Roscommon County Councillors - Municipal District</i>	<i>Cllr. Kathleen Shanager</i>	08/01/2021	E-mail		
Derrycashel	<i>Roscommon County Councillors - Municipal District</i>	<i>Cllr. Orla Leyden</i>	08/01/2021	E-mail		
Derrycashel	<i>Roscommon County Councillors - Municipal District</i>	<i>Cllr Paschal Fitzmaurice</i>	08/01/2021	E-mail		
Derrycashel	<i>Roscommon County Councillors - Municipal District</i>	<i>Cllr Nigel Dineen</i>	08/01/2021	E-mail		
Derrycashel	<i>Roscommon County Councillors - Municipal District</i>	<i>Cllr. Anthony Waldron</i>	08/01/2021	E-mail		
Derrycashel	<i>Roscommon County Councillors - Municipal District</i>	<i>Cllr. Marty Mc Dermott</i>	08/01/2021	E-mail		
Derrycashel	TD Roscommon - Galway	Michael Fitzmaurice	08/01/2021	E-mail		
Derrycashel	TD Roscommon - Galway	Claire Kerrane	08/01/2021	E-mail		
Derrycashel	TD Roscommon - Galway	Denis Naughten	08/01/2021	E-mail		
Derrycashel	Senator Roscommon Mayo	Aisling Dolan	08/01/2021	E-mail		

Derrycashel	Environmental Protection Agency	General e-mail contact	08/01/2021	E-mail		
Derrycashel	National Parks and Wildlife Service	General e-mail contact	08/01/2021	E-mail		
Derrycashel	NPWS Regional Network	District Conservation Officer	12/01/2021	E-mail		
Derrycashel	Dept of the Housing Local Government and Heritage	Malcom Noonan (Minister of State at the Department of Housing, Local Government and Heritage)	12/01/2021	E-mail		
Derrycashel	National Monuments Service	General e-mail contact	08/01/2021	E-mail		
Derrycashel	National Museum of Ireland (Irish Antiquities Division)	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Minister for Environment, Climate and Communications	Minister - Eamon Ryan	12/01/2021	E-mail		
Derrycashel	Dept of Environment, Climate and Communications	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Office of Public Works	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Minister of state for Agriculture with responsibility for Land use and Biodiversity	Pippa Hackett Minister of State for Land Use and Biodiversity)	12/01/2021	E-mail		
Derrycashel	Inland Fisheries Ireland	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Waterways Ireland	General e-mail contact	08/01/2021	E-mail	24/01/2021	E-mail
Derrycashel	The Heritage Council	General e-mail contact	08/01/2021	E-mail	04/01/2021	E-mail
Derrycashel	Western Development Commission	General e-mail contact	08/01/2021	E-mail		
Derrycashel	An Forum Uisce (The Water Forum)	General e-mail contact	08/01/2021	E-mail		
Derrycashel	An Taisce	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Friends of the Earth	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Friends of the Irish Environment	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Birdwatch Ireland	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Irish Peatlands Conservation Council	General e-mail contact	08/01/2021	E-mail	25/01/2021	E-mail
Derrycashel	Irish Wildlife Trust	General e-mail contact	08/01/2021	E-mail	23/03/2021	E-mail

Derrycashel	Bat Conservation Ireland	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Woodlands of Ireland	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Butterfly Conservation Ireland	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Roscommon Public Participation Network (PPN)		08/01/2021	E-mail		
Derrycashel	Sustainable Water Action Network (SWAN)	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Irish Farmers Association (Leitrim, Logford, Roscommon, Sligo)	General e-mail contact	08/01/2021	E-mail	29/01/2021	E-mail
Derrycashel	Irish Farmers Association (Head Office)	General e-mail contact	08/01/2021	E-mail		
Derrycashel	National Association of Regional Game Councils	General e-mail contact	08/01/2021	E-mail		
Derrycashel	ICMSA (Irish Creamery Milk Suppliers Association)	General e-mail contact	08/01/2021	E-mail		
Derrycashel	ICSA (Irish Cattle and Sheep Farmers Association)	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Midlands & East Regional WFD Operational Committee	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Shannon Flood Risk State Agency Co-ordination Working Group	General e-mail contact	08/01/2021	E-mail		
Derrycashel	CARO (Climate Action Regional Office) Atlantic and Seaboard North	General e-mail contact	08/01/2021	E-mail		
Derrycashel	Irish Raptor Study Group	General e-mail contact	12/01/2021	E-mail		
Derrycashel	Trinity College	Contact Initiated by Stakeholder		E-mail	22/01/2021	E-mail

Table APX -2 Response summary from Consultees contacted

Organisation	Summary of Response by Stakeholder	BnM Response
Senator Aisling Dolan	Senator Dolan replied via e-mail 18/01/2021 and suggested a number of amenity developments that could be incorporated into the PCAS scheme and request clarification on a number of issues such as hydrological risk assessments and protection for existing rights of way.	BnM acknowledged and responded via e-mail to assure that all points raised within the submission will be considered.
TD Roscommon - Galway. Denis Naughten	E-mail response on 09/12/2020 to request a full hydrological assessment on PCAS bogs and advise of future amenity projects within his represented constituency.	BnM acknowledged and responded via e-mail to assure that all points raised within the submission will be considered.
TD Roscommon - Galway. Michael Fitzmaurice	Responded via e-mail on 05/12/2020. Outlined concerns for turfcutters at particular and the potential flooding of adjacent farmer's landholdings.	BnM acknowledged and responded via e-mail to assure that all points raised within the submission will be considered.
Irish Peatlands Conservation Council	Responded to consultation regarding Derrycashel Bog and the PCAS project at large to express support for the project and list a number of comments on how the project might be improved; 1) Potential for inclusion of local environmental groups in species specific conservation plans 2) Requested that a map of potentially suitable areas for such projects should be included in rehab plans 3) Promoted the idea of creating a biodiversity action plan that considers the use of site by all relevant stakeholders 4) Recommended following the NPWS community engagement strategy as it was largely successful in bring local communities along with restoration projects	BnM responded 25/01/2021, all issues raised will be taken into account in future drafts of plan. Also advised that; 1) BnM have included DOC as an additional parameter on our suite of water monitoring analysis. 2) BnM are working with Lawco and WFD to align the BNM monitoring programme with the EPA's 2021 Monitoring programme 3) BnM have an extensive community consultation process ongoing with a dedicated Community Liaison Officer communicating to affected and interested parties
NPWS Regional Network	NPWS responded through e-mail thread on the 02, 03,07,09/12/2020 in relation to all PCAS bogs. The main points discussed were to advise of the requirement to investigate if assessment under the SEA and Birds directives for each site.	BnM acknowledged via e-mail to address queries on 09/12/2021. Also, a phone conversation with local NPWS Conservation Ranger on 11/01/2021 discussed biodiversity and rehabilitation measures on PCAS bogs including Derrycashel
National Museum of Ireland (Irish Antiquities Division)	Responded through e-mail 28/12/2020 in relation to all PCAS bogs. Issues raised were; 1) The request that due diligence be taken during works to protect any	BnM acknowledged and responded via e-mail on 28/12/2020 to assure BnM will give due cognisance to all points within all rehabilitation

	<p>archaeologically significant findings or areas</p> <p>2) The NMI reiterated the importance of peatlands for the preservation of archaeology and requested they be consulted as part of any EIA undertaken</p>	<p>plans for Derrycashel Bog.</p> <p>A virtual meeting on PCAS between BnM and NMI was held on 18/01/2021</p>
Irish Farmers Association	<p>Responded to consultation regarding Derrycashel and the PCAS project at large on multiple dates throughout ongoing discourse. Concerns raised were:</p> <p>1) Potential for flooding on adjacent lands.</p> <p>2) Health and Safety</p> <p>3) Perceived potentially detrimental impact of PCAS on property value</p> <p>4) Reiterated the desire of the IFA that people who have been cutting turf on bogs should retain this right.</p>	<p>A working group has been established at a high level between BnM and IFA on various issues including PCAS. A meeting was held between BnM and IFA representatives on 18/02/2021 to present details on PCAS. Dialogue is ongoing.</p>
The Heritage Council	<p>Responded to consultation via e-mail on 04/01/2021 asking for more information on PCAS in general and looking to be involved in any seminar or information events.</p>	<p>BnM responded via phone conversation on 11/01/2021. Dialogue is ongoing.</p>
Dept. of Agriculture, Food & the Marine (DAFM)	<p>Submission by e-mail to express support for PCAS in general. Submission recommended;</p> <p>1) That local landowners and stakeholders be considered as part of the consultation process.</p> <p>2) EIA assessment be carried out prior to PCAS works.</p> <p>3) Hydrological assessments are carried out with a view to protecting adjoining lands from adverse impacts.</p>	<p>BnM acknowledged and responded via e-mail on 02/03/2021 to assure that all points raised within the submission will be considered. A virtual meeting/PCAS presentation was held for DAFM on 11/12/2020.</p>
The Irish Wildlife Trust	<p>Responded to consultation via e-mail on 01/02/2021 to acknowledge receipt of PCAS plans and indicate desire to make a submission. Submission received on 23/03/2021 supporting the PCAS scheme and specifically requesting:</p> <p>1. Consideration of statutory protection for rehabilitated bogs;</p> <p>2. Consideration for re-wilding in determining future habitats and species presence, including reintroductions;</p> <p>3. Appropriate monitoring is established.</p>	<p>BnM responded via email and phone throughout February and March. A virtual meeting/PCAS presentation was held for IWT on 17/02/2021. Dialogue is ongoing.</p>

Trinity College	<p>A researcher at Trinity College, Dublin, made a submission by e-mail 24/01/2021.</p> <p>The following points were raised;</p> <ol style="list-style-type: none"> 1) Advised that the consultation phase of the project should be given more time 2) Advised that there is little evidence of pre-project and post-project measurement 3) Advised that further community engagement with local stakeholders and research based stakeholders would benefit the project 	BnM acknowledged and will give due cognisance to all points raised in the submission by Trinity College Researcher in the rehabilitation plan for Derrycashel Bog. BnM raised responded via e-mail.
Butterfly Conservation Ireland	<p>Responded to consultation via e-mail with submission on Derrycashel. Concerns raised were:</p> <ol style="list-style-type: none"> 1) Alterations to the text of the rehab plan. 2) Request for all turf cutting on BnM land to end. 4) Suggest monitoring for Large Heath Butterfly or food plant Hare's-tail Cottongrass. 5) Suggested alterations to habitat design in rehab plan to further connect regional high bog habitats and create further raised bog habitat on site. 6) Advised BnM to ensure that quality habitats already found on site are not damaged by PCAs activities. 	BnM acknowledged via e-mail; Phone conversation with BCI on 19/01/2021.
ICMSA (Irish Creamery Milk Suppliers Association)	Virtual meeting/PCAS presentation organised for 03/03/2021.	<p>A meeting was held by BnM on 03/03/2021 to present details on PCAS to the ICMSA and members.</p> <p>Dialogue is ongoing.</p>

APPENDIX XII. ARCHAEOLOGY

Role of the Archaeological Liaison Officer

1. To communicate this Code of Practice and the *Archaeological Protection Procedures* (Appendix IV) to all personnel operating on the bog.
2. To ensure that all notices relating to the *Archaeological Protection Procedures* are posted and maintained at appropriate locations on the bog.
3. To report any stray finds, presented to the Liaison Officer from his/her group of bogs, to the Duty Officer of the National Museum of Ireland.
4. To provide for the appropriate protection of the stray find, whether in-situ or removed from the bog, as directed by the Duty Officer of the National Museum of Ireland.



Code of Practice

22

Code of Practice

5. To arrange for the delivery or collection of the stray find, as directed by the Duty Officer of the National Museum of Ireland.
6. To complete the Report of Discovery of Archaeological Object(s) in Bogs (Appendix V), as directed by the Duty Officer of the National Museum of Ireland.
7. To maintain a file of all stray finds and associated documentation and provide copies to the Project Archaeologist.
8. To provide assistance, where required, to the Department during archaeological surveys.
9. To provide assistance, where required, to Bord na Móna's Consultant Archaeologists, during investigation and mitigation of monuments.
10. To report to the Bord na Móna members on the Archaeology Management Liaison Committee any planned developments or new activities on cutaway peatland areas within his/her group of bogs.



	Procedure: ENV017	Rev: 1
Title: Archaeological Findings	Approved: EM	Date: 13/10/2020

1) Purpose

The purpose of this procedure is to describe the arrangements in Bord na Móna for findings of Archaeological material (Stray Finds).

All objects, sites or monuments, no matter how fragmentary, are important elements of our heritage.

2) Procedure

1. Check whether there are any known archaeological monuments in your area.
2. Be vigilant at all times - objects or traces of structures can be found on the field surfaces, in the drain faces, on the bog margins or caught within the mechanics of machinery.
3. If an object is found leave it in place, if it is safe to do so, note its position and immediately contact your Archaeological Liaison Officer who will assess the situation and contact the Duty Officer of the National Museum of Ireland.
4. Resist the temptation to investigate the find spot as this may disturb fragile archaeological deposits.
5. If the object is already dislodged or is in imminent danger, remove it carefully, mark its find spot and report it immediately to your Archaeological Liaison Officer.
6. Objects made of wood, leather or textile, which are removed from peat should be kept in conditions similar to those in which they are found. This can be done by packing them in peat or, if waterlogged, placing them in a clean basin of water and sealing the container. Resist the temptation to clean or remove peat from the object.
7. If timbers or other materials, such as gravel or stones, which could be part of a man-made structure are noted on the bog, mark the location and report it immediately to your Archaeological Liaison Officer. If you suspect the find is of archaeological importance, resist the temptation to expose it any further as this could result in damage to the structure.
8. Report anything that looks unnatural in the bog – your Archaeological Liaison Officer will decide whether it should be referred to the appropriate authorities.

NOTE: Our archaeological heritage is a finite, non-renewable resource. Once a site is destroyed its information is lost forever and we have lost the chance to understand a little more about our past, where we have come from and perhaps the opportunity to learn for the future.

Your Archaeological Liaison Officer is

3) Records

Revision Index			
Revision	Date	Description of change	Approved
1	13/09/2020	First release	EMcD
2			

Archaeological Impact Assessment of Proposed Bog Rehabilitation at Derrycashel Bog, Co. Roscommon. Dr. Charles Mount. March 2021.



**Archaeological Impact Assessment of Proposed Bog
Decommissioning and Rehabilitation at Derrycashel Bog, Co.
Roscommon**

Report For

Bord Na Móna Energy Ltd.

Author

Dr. Charles Mount

Bord Na Móna Project Archaeologist



Introduction

The EPA (2002) *Guidance on the process of preparing and implementing a bog rehabilitation plan* notes that the licensee should characterise the bog prior to embarking on detailed planning and implementation. This characterisation should detail how the land is classified in terms of statutory protections, e.g. as European sites, world heritage sites, RAMSAR sites, National Heritage Areas, national monuments, archaeological heritage, etc. This archaeological impact assessment report was prepared by Dr. Charles Mount for Bord na Móna Energy Ltd to fulfil this characterisation in relation to archaeological heritage. It represents the results of a desk-based assessment of the impact of proposed bog rehabilitation on c.389 hectares at Derrycashel, Co. Roscommon on the known archaeological heritage of the bog. The proposed rehabilitation actions will be a combination of measures to create wetlands and re-wet deep peat as outlined in the draft Methodology Paper for the proposed Bord na Móna Decommissioning, Rehabilitation and Restoration Scheme. These enhanced measures for Derrycashel Bog will include:

- Blocking field drains in drier sections of the former industrial production area using a dozer to create regular peat blockages (three blockages per 100 m) along each field drain.
- Re-alignment of piped drainage; and management of water levels to create/enhance existing wetlands.
- Pump management – reducing or ceasing pumping.
- No measures are planned for the other surrounding marginal peatland habitats.
- Silt ponds will continue to be maintained during the rehabilitation and decommissioning phase.
- Evaluate success of short-term rehabilitation measures and enhance where necessary.
- Decommissioning of silt-ponds will be assessed and carried out, where required.

Derrycashel Bog is located c.1.4km west of Termonbarry and south of the N5 road. The bog occupies the townlands of Cloonmore, Derrycashel, Derryhanee, Drinagh, Erra and Mountdillon, OS 6 inch sheet Roscommon 30.

Methodology

This is a desk-based archaeological assessment that includes a collation of existing written and graphic information to identify the likely archaeological potential of Derrycashel Bog. The extent of the rehabilitation area is indicated in Fig. 1. This area was examined using information from:

- The IAWU Peatland Survey
- The Re-assessment Peatland Survey 2009
- The Bord na Móna excavation programme
- The Sites and Monuments Record that is maintained by the Dept of Housing, Local Government and Heritage
- The Excavations Database
- Previous assessments

An impact assessment has been prepared and recommendations have been made.



Desktop assessment

Recorded Monuments

The Record of Monuments and Places (RMP) for Co. Roscommon which was established under Section 12 of the National Monuments (Amendment) Act, 1994 was examined as part of the assessment (DAHGI 1998). This record was published by the Minister in 1998 and includes sites and monuments that were known in Derrycashel Bog before that date. This review established that there are no Recorded Monuments located in the proposed rehabilitation area (see Fig. 1).

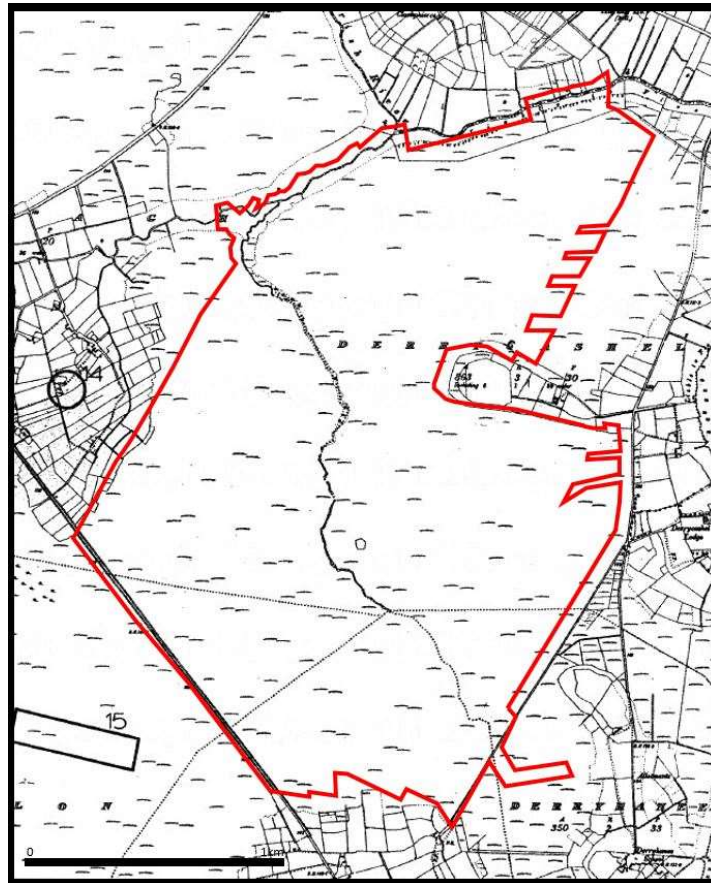


Fig. 1. Derrycashel Bog, Co. Roscommon, detail of the Record of Monuments and Places map sheet Nos. 54, 55 and 56. The proposed rehabilitation area is outlined with the red line. There are no Recorded Monuments in the rehabilitation area.

Peatland survey

Derrycashel Bog was not surveyed by the Irish Archaeological Wetland Unit.

Sites and Monuments Record

The Sites and Monuments Record (SMR) which is maintained by the Department of Housing, Local Government and Heritage was examined as part of the assessment on the 16th of March 2021. The SMR consists of records included in the RMP and sites and monuments notified to the Dept. since the publication of the RMP. This review established that there are no monuments entered in the SMR in the proposed rehabilitation area (see Fig. 2). There is an SMR site in the bog area located outside the



rehabilitation area in Derrycashel townland SMR RO030-013----, a D-shaped field that is included as a Redundant record.

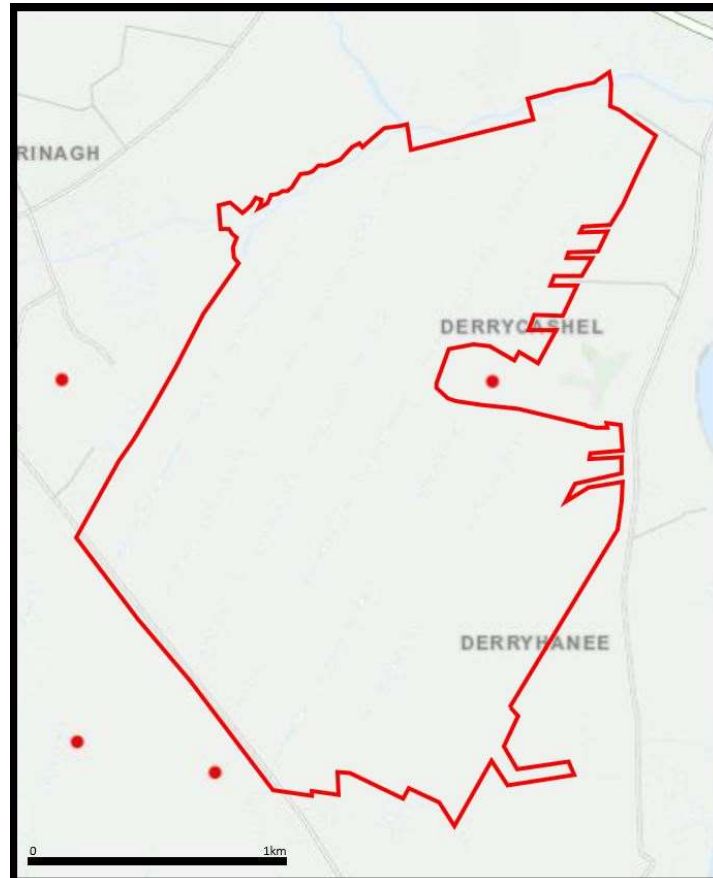


Fig. 2. Derrycashel Bog, Co. Roscommon, detail of the Sites and Monuments Record. The proposed rehabilitation area is outlined with the red line. There are no SMRs in the rehabilitation area.

Peatland Survey 2007 & 2008

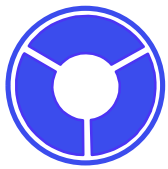
The Peatland Survey of Derrycashel Bog was carried out in 2008 under licence No. 08E0644 (Rohan 2009). Nothing of archaeological significance was identified during the field walking survey of the bog.

Archaeological investigations

Reports of archaeological excavations and licensed monitoring in the study area listed in the excavations database at excavations.ie were examined as part of the assessment. There have been no licensed archaeological excavations carried out in Derrycashel Bog. The database records the unlicensed investigation of a Bog Body. In 2005 fragments of a Bronze Age Bog Body were identified in a harvesting machine in a Bord na Móna depot near Ballyleague, Co. Roscommon. The machine had been harvesting in Derrycashel Bog but subsequent examination of the bog by staff of the national Museum of Ireland identified no further remains (Mulhall 2005).

Reported finds

The topographical files of the National Museum of Ireland were searched for records of finds from the bog in April 2021 (thanks to Isabella Mulhall). There are a number reported find recorded in the Topographical



Files of the National Museum that can be attributed to Derrycashel Bog (see Table 1). Finds include human remains (2005:3), the upper (1967:193) and lower (1967:221) stones of a beehive rotary quern were found in proximity to one another in Derrycashel Bog. In the neighbouring Mountdillon Bog human remains and wool fragments (1945:146) were found in 1945. A wooden trough (1908:21) is also recorded as found in a bog in Erra townland in Derrycashel Bog.

Townland	Museum No.	Description
Derrycashel	1967:193	Upper stone from beehive quern. Derrycashel Townland. Sheet 30.
Derrycashel	1967:221	Lower stone of rotary quern. Derrycashel Townland. Sheet 30. Ex situ
Derrycashel	2005:3	Human remains (bog body). Derrycashel Townland
Drinagh	1945:146.1	Woollen garment. Drinagh Townland.
Drinagh	1945:146.2	Mummified human remains (bog body). Drinagh Townland.
Erra	SA 1908:21.	Dug out vessel (cradle?). Erra townland. Exact find spot not recorded.

Table 1. List of archaeological finds from Derrycolumb Bog reported to the National Museum of Ireland.

Previous assessments

Derrycashel Bog has been the subject of an Environmental Impact Assessment Report carried out by Irish Archaeological Consultancy LTD in 2018 for Bord na Móna Energy Limited in relation to IPC Licence P0500-01. The assessment noted that there was a moderate potential for archaeological features to be uncovered during the course of any future development works in Derrycashel Bog.

Impact assessment

Known archaeology in the rehabilitation area includes a Bog Body and other archaeological artefacts but no sightings of monuments.

Recommendations

There is no known extant archaeological material in Derrycashel Bog which should be avoided by the rehabilitation works. Known archaeological finds in the rehabilitation area includes a Bog Body and other archaeological artefacts. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should also be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

Conclusion

This is a desk-based archaeological assessment and includes a collation of existing written and graphic information to identify the likely archaeological potential of the proposed rehabilitation area. There are no known archaeological sites in Derrycashel Bog which should be avoided by the rehabilitation works. Known archaeology in the rehabilitation area includes a Bog Body and other archaeological artefacts. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.



References

DAHGI 1998. Recorded Monuments Protected under Section 12 of the National Monuments (Amendment) Act, 1994. County Roscommon.

EPA 2020. Guidance on the process of preparing and implementing a bog rehabilitation plan.

Mulhall, I. 2005. Bronze Age bog body 2005:1329 - DERRYCASHEL, Roscommon.
<https://excavations.ie/report/2005/Roscommon/0014353/>

Rohan, N. 2009. Peatland Survey 2007 & 2008. Unpublished report prepared for DOEHLG and Bord na Móna.

Dr. Charles Mount
18 May 2021