Bord na Móna

Bunahinly-Kilgarvan Bog

Cutaway Bog Decommissioning and Rehabilitation Plan

2022

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0502-01:

> "*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 Bunahinly-Kilgarvan 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 Bunahinly-Kilgarvan Bog.

In addition, to preparing this document to comply with Condition 10 of IPC Licence Ref. P0502-01, due regard was also given to the Peatlands Climate Action Scheme (PCAS) announced by the Minster. This Scheme will see the Minister support, via the Climate Action Fund and Ireland's National Recovery and Resilience Plan, Bord na Móna in developing a package of measures, 'the 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 Scheme will be supported by Government, 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 Bunahinly-Kilgarvan 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 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 Scheme.

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

Any consideration of any other future after-uses for Bunahinly-Kilgarvan Bog, such as amenity, will be conducted in adherence to the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.

Document Control Sheet	
Document Name:	Bunahinly-Kilgarvan Bog Cutaway Bog Decommissioning and Rehabilitation Plan 2022
Document File Path:	
Document Status:	Final

This document comprises:	DCS	TOC	Text (Body)	References	Maps	No. of Appendices
	1	1	0	0	1	12

Rev. 0.1	Author(s):	Checked By:	Approved By:
Name(s):	CC	MMC	MMC
Date:	03/09/2021	14/09/2021	14/09/2021

Rev. 1	Author(s):	Checked By:	Approved By:
Name(s):	DMN	MMC	MMC
Date:	08/03/2022	10/03/2022	10/03/2022
Rev. 1.1	Author(s):	Checked By:	Approved By:
Name(s):	CC	MMC	MMC
Date:	24.05.22	24.05.22	24.05.22

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 Bunihinly-Kilgarvan Decommissioning and Rehabilitation Plan – Addendum 1 for more details.

Table of Contents

NON-TECHNICAL SUMMARY

- Bord na Móna is planning to rehabilitate Bunahinly-Kilgarvan Bog, south of Athlone town, in Co. Westmeath.
- Bunahinly-Kilgarvan comprises two separate bogs that are connected via a narrow strip of peatland with Bunahinly to the north and Kilgarvan to the south.
- Peat harvesting is now finished at Bunahinly-Kilgarvan Bog.
- This is happening as Bord na Móna are obliged to carry out peatland rehabilitation via an IPC License issued by the Environmental protection Agency. In addition, the Government has agreed to support peatland rehabilitation via the establishment of the Peatland Climate Action Scheme (PCAS). This is funded via the government and by Bord na Móna.
- The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat, and minimising effects to downstream waterbodies. Bunahinly-Kilgarvan was drained in the past to allow peat extraction. Better results for water quality improvements, climate action, the reduction of carbon emissions and biodiversity are achieved when the remaining peat is re-wetted. This means drain-blocking and other measures to raise water levels to the surface of the bog and to encourage the natural colonisation of vegetation.
- Bunahinly-Kilgarvan Bog was utilised for industrial peat production from the 1990's until 2018 and much of the former production area currently comprises of bare peat. There are some already established pioneer peatland habitats. It is a relatively young production bog and it still has relatively deep residual acidic peat remaining.
- In general soggy ground conditions are preferred. This means the remaining peat is wet and that plants that prefer wetter conditions, like Bog Cotton and *Sphagnum* moss, will thrive.
- Many Bord na Móna bogs cannot be restored back to raised bog immediately, as so much peat has been removed and the environmental conditions have been modified. However other peatland habitats with Heather, Bog Cotton, Rushes, Purple Moor-grass, Bog-mosses and scattered trees will develop, and in time a naturalised peatland can be restored.
- The development of a range of habitats in Bunahinly-Kilgarvan Bog will support biodiversity including plants, insects, birds and mammals. This includes some species that are rare and protected in the wider landscape. It will increase the national area of native woodland. Many wetland habitats in the wider landscape have been reclaimed for agriculture and other uses and peatland rehabilitation is an opportunity to create new wetland and peatland habitats.
- Measures proposed for Bunahinly-Kilgarvan Bog include drain blocking, cell bunding and other measures required to raise water levels to the surface of the peat (changing levels of pipes for example). Only internal drains will be blocked. Some fertiliser will be spread on headlands and other areas (a small part of the overall area) to encourage vegetation growth.
- Bord na Mona plan to carry out this work in 2022 and 2023.
- These rehabilitation measures will be planned by a team consisting of expert ecologists, hydrologists and engineers. It is a guiding principle of Bord na Móna rehabilitation planning that no actions or activities will be undertaken that would negatively impact on adjacent land. No boundary drains will be blocked, in general. Water will still leave the bog via the existing outlets.
- It will take some time for vegetation and habitats to fully develop at Bunahinly-Kilgarvan, and a peatland ecosystem to be restored. However, it is expected that most of the bog will be developing pioneer habitats after 5-10 years.

- This is a peatland rehabilitation plan. This plan does not consider future after-use or development. Bord na Móna continually reviews its land-bank to consider future commercial or industrial developments, such as renewable energy. Any other proposed development will planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the bog.
- Peatland rehabilitation of these bogs will bring a range of benefits to the local community via improvements to the local landscape and is also important for supporting national policies and strategies in relation to reduction of carbon emissions from these peatlands, supporting biodiversity and improvements to water quality.

SUMMARY

Name of bog: Bunahinly-Kilgarvan Bog **Area:** 394 ha

Site description:

- Industrial Peat extraction at Bunahinly-Kilgarvan commenced in the 1990's and ceased in 2018. The peat was formerly used as fuel peat in West Offaly Power Station Power in Shannonbridge.
- Bunahinly-Kilgarvan has a gravity drainage regime.
- The majority of the former peat production footprint is bare peat, or pioneering bare peat. Active drainage channels are still present.
- Residual peat depths at Bunahinly are deep (>2m) for the most part but reach depths of >4.5m in places.

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 embryonic *Sphagnum*-rich peat forming communities, wetland, Reed swamp, wet woodland and fen habitats on cutaway peats, along with management of existing pioneer habitats.
- 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 peatland habitats and will have some potential to develop carbon sink function in part. 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 any exposed archaeological structures, their retention in situ and preservation into the future, where possible.

Scope of rehabilitation

The principal scope of this rehabilitation plan is defined by:

- The area of Bunahinly-Kilgarvan.
- EPA IPC Licence - Ref. P0502-01. 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 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 Bunahinly-Kilgarvan, 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 Bunahinly-Kilgarvan will be left unblocked, as blocking boundary drains could affect adjacent land.
- Other constraints include Turbary rights and Archaeology.

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, and the creation of embryonic *Sphagnum*-rich peat forming communities along with 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 embryonic *Sphagnum*-rich peat forming communities, heath, wetland, fen, Reed swamp, wet woodland, scrub and Birch woodland communities, where conditions are suitable, and eventually towards a reduced Carbon source/partial carbon sink (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 Bunahinly-Kilgarvan 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 and Ireland's National Recovery and Resilience Plan 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:

- 2021-2022: Short-term planning actions.
- 2022: Short-term practical actions.
- 2022-2025: Any Long term practical actions; Evaluate success of short-term rehabilitation measures outlined above and remediate, where necessary.
- 2025: Decommission silt-ponds, if necessary.

Monitoring, after-care and maintenance

The monitoring, after-care and maintenance programme for Bunahinly-Kilgarvan, 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, asses 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 Blackwater bog group (Ref. P0502-01). 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. Bunahinly-Kilgarvan bog is part of the Blackwater bog group (see Appendix II for details of the bog areas within the Blackwater Bog Group). Bunahinly-Kilgarvan Bog is located in Co. Westmeath.

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.

Note: This plan should be read in conjunction with the accompanying Map book.

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 Scheme will be supported by Government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan, 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 previously identified a footprint of 33,000 ha as peatlands suitable for this scheme. This 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. The Scheme commenced in 2021.

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 Scheme. Bord na Móna have now announced the complete cessation of industrial peat production across its estate (January 2021).

It is expected that the 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 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.

Bunahinly-Kilgarvan Bog is proposed to be part of this Scheme (PCAS), which commenced in 2021 and this rehabilitation plan outlines the approach to be taken.

1.1 Constraints and Limitations

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0502-01:

> "*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 **Bunahinly-Kilgarvan Bog**.

Bord na Móna will continue to review the future after-use of its land-bank. Any consideration of any other future after-uses for Bunahinly-Kilgarvan, 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 Bunahinly-Kilgarvan permanently ceased in 2018 , although some remaining stock is still being removed. Currently the former peat production areas comprise a mosaic of largely bare peat along

with pioneering cutaway habitats, in addition to marginal[1] habitats. At the northern extreme of Bunahinly a section of previously drained production bog has been subject to some rehabilitation and re-wetting.

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 peatland ecosystems to fully re-establish.

Parts of Bunahinly-Kilgarvan Bog (within and outside the areas owned and under the control of Bord na Móna) are currently being 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 Bunahinly-Kilgarvan 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. Several Rights of Way exist at Bunahinly-Kilgarvan. There is at least one archaeological feature present in the Kilgarvan portion of Bunahinly-Kilgarvan which may constrain PCAS activities.

Parts of Bunahinly-Kilgarvan may be subject to surface water flooding during the winter months dependant on rainfall levels and levels of flooding along the adjacent River Shannon . Both Bunahinly and Kilgarvan are subject to gravity drainage only, and have never been pumped.

The BnM industrial rail line on site at Bunahinly-Kilgarvan connects to Shannonbridge Power Station which ceased operation in 2020. Some extant peat stock is present at Kilgarvan.

Part of Bunahinly (which was previously subject to rehabilitation) is currently being considered by Bord na Mona for future potential industrial/commercial use, due to its proximity to Athlone.

Note: Two Mapbooks accompany this Rehab Plan and are referenced where applicable.

[1] 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.

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 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 2012 to 2021 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 research studies on site;
- Hydrological modelling; and
- The development of a Methodology Paper (draft) outlining the 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 Bunahinly-Kilgarvan 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.

- 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.
- Pschenyckyj et al., 2021, Optimising Water Quality Returns from Peatland Management while Delivering Co-Benefits for Climate and Biodiversity. An Fóram Uisce.
- 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:

- Blackwater Integrated Pollution Control Licence;
- Blackwater 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, Bunahinly-Kilgarvan Bog was surveyed in November of 2010. Additional ecological walk-over surveys and visits have taken place between 2010-2021 (visited during Autumn of 2011 and 2012 and winter of 2013), but also a final confirmatory survey took place in June (Bunahinly) and July (Kilgarvan) of 2021. 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 site visit was used to categorise any changes in habitat extent at Bunahinly-Kilgarvan in June 2021.

A detailed ecological survey report for Bunahinly-Kilgarvan is contained in Appendix II.

3. SITE DESCRIPTION

Bunahinly-Kilgarvan Bog is located 1km south of Athlone in Co. Westmeath. It is also adjacent to the River Shannon, which is located 50-150m away from the western boundary of the site. Bunahinly-Kilgarvan comprises two separate bogs that are connected via a narrow strip of peatland with Bunahinly to the north and Kilgarvan to the south. This site is located in a low-lying area and the adjoining grassland to the west is prone to flooding during winter months.

The main landscape feature in this area is the River Shannon and its associated riparian zone and floodplain.

See Drawing number BNM-DR-23-09-01 titled **Bunahinly Bog: Bog Site Location** and BNM-DR-23-10-01 titled **Kilgarvan Bog: Bog Site Location** , included in the accompanying Mapbooks[2] , which illustrate the location of Bunahinly-Kilgarvan Bog in context to the surrounding area.

3.1 Status and Situation

3.1.1 Site history

Both Bunahinly and Kilgarvan bog came into production relatively recently (1990's) , and ceased in 2018. The peat was formerly used as fuel peat in West Offaly Power Station Power in Shannonbridge.

A deep peat cutaway re-wetting rehabilitation trial was previously established in the north of Bunahinly. The aim was to determine the effect of blocking drains and raising the water level in deep peat areas out of production where there was potential to regenerate Sphagnum-rich peat-forming vegetation communities. The drain-blocking was completed in September 2011. Additional drain-blocking and re-wetting work was completed in 2016 in this area comprising an additional bog remnant. Monitoring of this re-wetting indicates that it has been relatively successful. A small area that is subject to water flow from the wider area is now developing *Sphagnum*-rich peat-forming vegetation.

A Sphagnum inoculation trial using Beadamoss was previously established at Bunahinly in 2017, which covers 1 ha. Initial monitoring indicates that Sphagnum colonisation on the inoculated plot has been relatively poor. It is through that this was due to drier ground conditions.

3.1.2 Current land-use

Industrial peat production has now permanently ceased at Bunahinly-Kilgarvan. Some extant stock is still present at Kilgarvan (July 2021). It is expected that this peat stock will be removed during 2022 and 2023.

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

[2] Cutaway Bog Decommissioning and Rehabilitation Plan – Bunahinly-Kilgarvan Bog Map Book

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 Bunahinly-Kilgarvan 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 Scheme (PCAS) will provide some employment for a team of workers at this site for a period of time (> 1 year).

3.2 Geology and Peat Depths

3.2.1 Sub-soil geology

At Bunahinly, the underlying geology is categorised as 'Waulsortian limestones' comprising massive, unbedded limestone; whilst the underlying geology at Kilgarvan is the 'Ballysteen formation' which comprises dark muddy limestone, shale.

Published bedrock and Quaternary geological maps only present the shallowest deposits encountered, and fail to present in information on the buried peat substrate. Coring carried out by RPS in 2021 across Bunahinly-Kilgarvan provided further insight into the deposits underlying the site, particularly when combined with GPR data concerning the elevation of the peat substrate.

Combining the two datasets reveals the lowest lying areas of the site to be underlain by marl (below c. 36mOD), while a ridge of more elevated material (rising to c.39mOD) occurs below the northern section of the bog. Coring data at BUN_004 indicates that the area is underlain by clayey material, therefore this material has been interpreted as glacial till (based on comparable features present immediately to the north-west); however, as outlined previously there is a gravel aquifer to the north-east of this site and it is possible that these elevated ridges below the base of peat are gravel comprised of gravel. Coring also suggests that the marl is underlain by lacustrine clay which would be expected to limit vertical losses to depth in areas where this occurs.

Basal peat in Bunahinly is largely underlain with shell marl/green clay, and Green Gritty plastic Clay. Basal peat in Kilgarvan is largely underlain with shell marl/green clay, and Green Gritty plastic Clay. These sub-soils are lacustrine (lake-forming) deposits. There is a small mound in Kilgarvan that is likely to be underlain with glacial material (mixed sub-soils with gravel).

The underlying geology and subsoil of Bunahinly-Kilgarvan bog is calcareous.

3.2.2 Peat type and depths

Large sections of Bunahinly-Kilgarvan still contain significant areas of “Sphagnum” peat and are considered deep peat bogs. Peat depths at Bunahinly are ca.5m on average, whilst those at Kilgarvan range in depth from <0.5m to ca.5m.

See Drawing number BNM-DR-23-09-04 titled **Bunahinly Bog: Bog Peat Depths** and BNM-DR-23-10-04 titled **Kilgarvan Bog: Bog Peat depths** , included in the accompanying Mapbooks.

3.3 Key Biodiversity Features of Interest

Habitats at Bunahinly-Kilgarvan are dominated by bare peat, with little or no increase in vegetative cover in the interim period since the recent cessation of peat production (2018). At Bunahinly pioneering open cutaway habitats are developing in the northwest ‘arm’ of the former peat production area, dominated primarily by Rush and Heather. In addition an area in the north of the bog which was subject to some rehabilitation comprises a mosaic of pioneering heath with wetter Bog cotton dominated areas, along with *Sphagnum* mosses (predominantly within blocked drains). Some areas of drier heath are also present, and marginal habitats around the boundary include bog remnants, grassland and further pioneering cutaway habitats.

Bare peat dominates at Kilgarvan, although the margins of the property include some remnant habitats including raised bog, Gorse-dominated scrub along with Birch dominated woodland that acts as a refuge for local wildlife. The majority of the bog whilst not currently in active industrial peat production still has extant stock which is being removed.

The River Shannon and its associated corridor forms the main ecological feature proximal to Bunahinly-Kilgarvan. Part of Bunahinly-Kilgarvan overlaps designated European Sites associated with the Shannon, and the habitat corridor which connects Bunahinly and Kilgarvan is subject to periodic flooding from the Shannon during the winter months. A number of tributary watercourses including the Cloonbonny River and the Boor River (along the southern margin) drain Bunahinly-Kilgarvan.

3.3.1 Current habitats

The most common habitats present include:

- Bare Peat
- Bare peat and dry heath mosaic (establishing on older production bog)
- Bare peat, dry heath and Bog Cotton-dominated vegetation establishing at north of site
- Gorse scrub
- Dry grassland (along bog margin)
- Silt ponds (including ridges of spoil and adjacent land)
- Riparian zones (with scrub along verges)
- Works area

The most common habitats present around the margins at this site include:

- Raised bog (PB1) (several fragments) (Codes refer to Heritage Council habitat classification, Fossitt 2000).
- Scrub (WS1) (Gorse scrub and Birch scrub developing of dry high bog around margins)
- Bog woodland (WN7)
- Conifer plantation (WD4) (minor screen of Pine planted around margin at northern end of site).
- Cutover bog (PB4) (several small fragments)
- Improved grassland (GA1) (several small patches where BnM boundary extends over adjacent fields)
- Wet grassland (GS4) (several small patches where BnM boundary extends over adjacent fields)
- Depositing river (Boor River)
- See Drawing number BNM-DR-23-09-17 titled **Bunahinly Bog: Bog Habitat Map** and BNM-DR-23-10-17 titled **Kilgarvan Bog: Bog Habitat Map** , included in the accompanying Mapbooks.

Pioneering vegetation on Cutover Bog at Bunahinly

Rehabilitated cutover Bog at Bunahinly

	
Pioneering Heath along margin of former production area at Kilgarvan	*Bare Peat and extant stock at Kilgarvan*

Table 1: Photos of Habitats at Bunahinly-Kilgarvan Bog

3.3.2 Species of conservation interest

Bird species previously recorded at Bunahinly Kilgarvan include the Red listed [3]Lapwing (*Vanellus vanellus*), which has been recorded onsite during the winter period , when birds from the adjacent SPA may utilise the bog to roost and/or feeding. Lapwing also during the summer months and may breed at Kilgarvan.

Other wintering species of bird include the also Red listed Common Snipe (*Gallinago gallinago*) which likely uses the marginal habitats present to feed and/or roost.

The general assemblage of birds utilising the bog reflects the current extent of largely bare peat with species such as Meadow pipit (*Anthus pratensis*), Pied Wagtail (*Motacilla alba*) and Raven (*Corvus corax*) recorded on recent visits in 2021 to inform Rehab Planning.

Mammal species known to occur include Irish Hare (*Lepus timidus hibernicus*), Badger (*Meles meles*) and Otter (*Lutra lutra*).

In July of 2021, Meadow brown (*Maniola jurtina*) and Red admiral (*Vanessa atalanta*) butterflies were recorded.

Marsh Fritillary (*Euphydryas aurinia*) have been recorded to the north east of Bunahinly at Crosswood Bog but there are no on-site records.

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. 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

Crosswood Bog SAC (Site Code 002337) and NHA is located 1.4km to the north east of Bunahinly-Kilgarvan and is designated for Active raised Bogs [7110] and Degraded Raised Bogs still capable of natural regeneration [7210].

The River Shannon Callows SAC (Site Code 000216) and NHA is located due west of Bunahinly-Kilgarvan and overlaps the boundary of Kilgarvan at the southern extreme of the bog. This SAC has a number of Qualifying Interests including Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410]; Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) [6510]; Alkaline fens [7230]; Limestone pavements [8240]; Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0] and Lutra (Otter) [1355].

The River Shannon Callows SPA (Site Code 004096) SPA is also located due west of Bunahinly-Kilgarvan and overlaps the boundary of Kilgarvan at the southern extreme of the bog. The Special Conservation Interests (SCI's) for this European Site are Whooper Swan (*Cygnus cygnus*) [A038]; Wigeon (*Anas penelope*) [A050]; Corncrake (*Crex crex*) [A122]; Golden Plover (*Pluvialis apricaria*) [A140]; Lapwing (*Vanellus vanellus*) [A142]; Black-tailed Godwit (*Limosa limosa*) [A156]; Black-headed Gull (*Chroicocephalus ridibundus*) [A179] and Wetland and Waterbirds [A999].

[3] Gilbert G, Stanbury A and Lewis L (2021), "Birds of Conservation Concern in Ireland 2020 –2026". Irish Birds 9: 523—544

Other NHA's in proximity include Carrickynaghtan Bog NHA (Site Code 001623), located to the west of the River Shannon ca. 2km from Bunahinly and Pilgrims Road Esker NHA (Site Code 001776) located ca.5km south of Kilgarvan. Mongan Bog Nature Reserve is ca.5km south west of Kilgarvan.

See drawings BNM-DR-23-09-23 **Bunahinly Bog: Proximity to Designated Sites** and BNM-DR-23-10-23 **Kilgarvan Bog: Proximity to Designated Sites** for further information.

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 Bunahinly-Kilgarvan Bog (i.e. within 3km) The closest Ramsar Site is Mongan Bog which is ca.5km south.

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

3.5 Hydrology and Hydrogeology

Bunahinly-Kilgarvan forms part of the Upper Shannon Catchment (Catchment ID : 26G) as defined by the EPA under the Water Framework Directive (WFD) and is situated within the Shannon[Lower]_SC_010 Sub-Catchments. The bog is located along the floodplain of the river Shannon just south of the town of Athlone. Both bogs contain several drainage pathways which primarily drain in a south-westerly direction towards the River Shannon.

Regional hydrological data suggest that Bunahinly-Kilgarvan receives average precipitation of 900mm/yr (1981-2010), with an estimated evapotranspiration rate of c. 500mm/yr. A , leaving an average effective precipitation of 400mm/yr. Assuming no recharge to groundwater and no groundwater contribution to discharge from the bog, the available precipitation that may become runoff (assuming no change in storage) is 400mm/yr, which equates to an annual runoff rate of c. 4,000m^3/ha.

Bunahinly-Kilgarvan currently has a gravity drainage regime. Initial hydrological modelling (depression analysis) indicates the bog has a number of basins that will develop a mosaic of peatland and wetland habitats.

GSI data indicates that Waulsortian Limestones underlie Bunahinly, while the Ballysteen Formation underlies Kilgarvan. Both of these units are classified as Locally Important Aquifers (Bedrock which is Moderately Productive only in Local Zones). However, a locally important gravel aquifer is also located along the Eastern/North-eastern margin of Bunahinly Bog. Several bedrock faults can be observed in the surrounding areas including one which crosses through Kilgarvan, trending SE-NW. The locally important aquifer which underlies both bogs is mostly within the Ballysteen Formation. No data exists concerning depth to bedrock, whilst no bedrock outcrop could be identified in close proximity to the bogs.

Quaternary Sediment maps show Bunahinly-Kilgarvan underlain by peat, yet surrounded by inorganic deposits, including Till derived chiefly from Limestone to the east and alluvium to the west, with some glaciofluvial sands and gravels and lacustrine clay to the north of Bunahinly. GSI groundwater vulnerability mapping indicates that there is generally moderate vulnerability in the surrounding areas with higher vulnerability to the north-east of Bunahinly, corresponding to the locally important gravel aquifer. While Groundwater Vulnerability is typically used to indicate the susceptibility to groundwater pollution, it can provide a useful proxy indication of likely groundwater flow rates in the surrounding area.

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.

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 Bunahinly-Kilgarvan 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.

Bunahinly bog has three treated surface water outlets, two to the Shannon Upper tributary IE_SH_26S021800, and one direct to the Shannon (Upper)_ 120. Kilgarvan Bog also has three treated surface water outlets, two to the same Shannon Upper tributary as Bunahinly Bog and the remaining one to the IE_SH_26B071200 BOOR_020 (Boor River).

Both the Shannon Upper tributary and the Boor River body are currently classified as At Risk and listed as being under pressure from peat extraction in the third cycle of the river basin management plan, 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 accompanying structures maps along with water quality maps . See Drawing numbers BNM-DR-23-09-02 titled **Bunahinly Bog: Structures and Sampling** and Drawing number BNM-DR-23-10-02 titled **Kilgarvan Bog: Structures and Sampling**, along with Drawing number BNM-DR-23-09-WQ01 titled **Bunahinly Bog: Water Quality Map** and Drawing number BNM-DR-23-10-WQ01 titled **Kilgarvan Bog: Water Quality Map** within the accompanying Mapbooks, which illustrate the various drainage and water quality infrastructure present at Bunahinly-Kilgarvan.

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 3.7 mg/l and COD 100mg/l.

Initial monthly results are included in Appendix XIII. These results cover the period from November 2020 to Dec 2021. During this period, sampling regime was changed at three locations, SW 89A, 91 and 96 as these sampling locations did not represent the final treated outlet. These results indicate the baseline water quality from a minimum of 70% of the bog's catchments. Peat extraction ceased in both bogs in 2018 and as expected some of the key water quality parameters, that can impact water quality from peat extraction activities, such as suspended solids, remained relatively static. During this period, ammonia indicating a mixed trend across the two bogs, with Bunahinly indicating a lower Ammonia concentration overall possibly due to less of an area in active production up to 2018. All other parameters fluctuated slightly, most likely influenced by normal weather patterns, especially rainfall.

Monthly ammonia concentrations from November 2020 to December 2021 had a range of 0.017 to 0.83 mg/l with an average of 0.417 mg/l at Bunahinly.

During the same period at Kilgarvan, Ammonia had a higher Ammonia with a range of 0.009 to 2.18 mg/l and an average of 0.825mg/l.

Results for suspended solids for the same period in Bunahinly indicate a range of 2 to 19mg/l with an average of 5.6 mg/l, while Kilgarvan was slightly less with range of 2 to 9mg/l and an average of 5.0 mg/l.

From an analysis of any monitoring over the previous 5 yrs., during such time where peat extraction was undertaken each Summer the IPC licence environmental monitoring of some of the discharges from this bog, indicate that results were under the ELV for SS and broadly under the trigger levels for ammonia and COD (see Table 3.1).

Table 3.1. Water quality data

Bog	SW	Monitoring	pH	SS mg/l	TS mg/l	Ammonia mg/l	TP mg/l	COD mg/l	Colour
Kilgarvin	SW-88	Q2 19	7.1	17	150	1.3	<0.05	80	240
Kilgarvin	SW-89	Q2 19	7.4	<5	196	3.4	<0.05	80	200
Kilgarvin	SW-89A	Q2 19	7.5	12	180	2.5	<0.05	62	146
Kilgarvin	SW-90	Q2 19	7.2	<5	119	1	<0.05	85	262
Kilgarvin	SW-91	Q2 19	7.7	<5	242	2.2	<0.05	59	132
Bunahinly	SW-92	Q2 19	6.6	<5	116	0.42	<0.05	126	248
Bunahinly	SW-93	Q2 19	6.2	<5	88	0.17	<0.05	108	269
Bunahinly	SW-94	Q2 19	7.1	<5	128	0.71	<0.05	129	236
Kilgarvin	SW-95	Q2 19	7.4	<5	130	0.15	<0.05	52	187
Kilgarvin	SW-96	Q2 19	7.4	6	192	0.09	<0.05	102	196
Bunahinly	SW-97	Q2 19	7	<5	134	0.1	<0.05	117	272
Kilgarvin	SW-88	Q1 18	7.2	5	62	1.3	0.05	47	293
Kilgarvin	SW-89	Q1 18	7.7	5	146	4	0.05	43	142
Kilgarvin	SW-89A	Q1 18	7.7	5	182	3.8	0.05	46	132
Kilgarvin	SW-90	Q1 18	7.3	5	108	1.6	0.05	55	189
Kilgarvin	SW-91	Q1 18	7.8	5	396	4.4	0.05	36	211
Bunahinly	SW-92	Q1 18	6.7	5	88	0.17	0.05	52	183
Bunahinly	SW-93	Q1 18	6.2	5	70	0.23	0.05	70	215
Bunahinly	SW-94	Q1 18	7.2	5	106	0.9	0.05	41	167
Kilgarvin	SW-95	Q1 18	7.5	5	132	0.37	0.05	35	64
Kilgarvin	SW-96	Q1 18	7.4	5	153	0.02	0.05	75	220
Bunahinly	SW-97	Q1 18	7.5	5	192	0.15	0.05	69	153
Bunahinly	SW-92	Q1 17	6.5	5	92	0.57	0.05	66	218
Bunahinly	SW-93	Q1 17	6.2	5	196	0.4	0.05	73	262
Kilgarvin	SW-88	Q3 15	7.4	5	152	1.9	0.05	77	207
Kilgarvin	SW-89	Q4 15	7.1	19	94	1.1	0.05	69	238
Kilgarvin	SW-89A	Q4 15	6	5	153	0.18	0.16	91	339
Kilgarvin	SW-90	Q4 15	6	5	92	0.38	0.05	62	466
Kilgarvin	SW-91	Q4 15	7.6	5	300	0.1	0.05	39	114
Bunahinly	SW-94	Q4 15	5.6	13	114	0.73	75	75	133

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 Bunahinly-Kilgarvan 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 [Lower]__SC_10, 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 Mona 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.

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).

3.8 Carbon emissions

The bog is likely to be a carbon source as it is a drained (degraded) peatland with 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 CO_2 and a source for Methane) 6 years after bog restoration was carried out (Renou-Wilson et al. 2018).

It is expected that Bunahinly-Kilgarvan Bog will become a reduced **Carbon source/partial carbon sink** 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. Some *Sphagnum*-rich vegetation has already developed on Bunahinly Bog in suitable hydrological conditions and the key objective will be to expand the footprint of these suitable hydrological conditions. Much of this site is expected to develop *Sphagnum*-rich habitats eventually, in combination with drier heath and Birch woodland. There will also be smaller amounts of 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 majority of the terrestrial habitats in isolation are deemed to be of **Local Importance (Lower value)** (dominated by bare peat). A small section of the site partially overlaps with the River Shannon Callows SAC and Middle Shannon Callows SPA (south-western section). Both designated sites are recognised as **Internationally Important**. Some of the small remnant areas of high bog (PB1) are deemed to be of **Local Importance (Higher value)** as this is a habitat of significant ecological importance and they have intact carbon stores, even though the remnant areas are quite small in extent.

4. CONSULTATION

4.1 Consultation to date

Consultation will seek 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. Stakeholders were notified when the draft plan was finalised internally by Bord na Móna, and invited to make submissions on the objectives and content of this plan in relation to Bunihinly-Kilgarvan Bog. The draft plans and final versions of the rehab plans are available on the Bord an Mona website (www.pcasinfo.ie).

There has been ongoing consultation about rehabilitation and other general issues over the years about Bunahinly-Kilgarvan Bog with various stakeholders in relation to:

- General consultation with range of stakeholders at annual Bord na Mona Biodiversity Action Plan review days 2010-2018.
- 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).
- Feasibility and development of greenway trails on BnM land to create cycling and walking loops, to connect different areas and to support local amenity and tourism (Offaly Leader, Offaly County Council, ORNI and Failte Ireland);
- Route selection and development of the Galway-Athlone Greenway (RPS – lead consultants);
- Consultation with Green Offaly regarding a proposed Peatland Biosphere Reserve in Offaly.

To inform the current Plan, both national and local stakeholders, including neighbours whose land adjoins Bunahinly-Kilgarvan 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 were sought and informed of the opportunity to engage with this rehabilitation plan, and when identified were invited to submit their comments or observations in relation to the proposed rehabilitation at Bunahinly-Kilgarvan Bog (see Appendix XI).

Phone correspondence was undertaken as either follow up to submissions received, or to instigate consultation. All correspondence received has been acknowledged and evaluated against the rehabilitation work proposed here; these are also summarised in Appendix XI.

Further to the above, as a means of further notification for those based near to any proposed PCAS activities, a leaflet detailing PCAS plans for Bunahinly-Kilgarvan Bog, contact details and the PCAS website address was delivered to each house within a 1 Km radius of the bog.

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 Bunahinly-Kilgarvan Bog – these are summarised below.

4.2.1 Assessments of rehabilitation

To date a number of consultees including the Irish Farmer's Association (IFA), the Irish Milk and Suppliers and Creamery Association (IMSCA) and Trinity College Dublin have raised concerns during consultation regarding the duration and scope of PCAS consultation period. Stakeholders suggested that the consultation period should be extended to allow all potential stakeholders to make submissions where required.

4.2.2 Assessments of rehabilitation

Queries on pre-rehabilitation assessments were raised by NPWS and the National Museum of Ireland relating to the finalisation of several bog rehab plans in 2021 in relation to Appropriate Assessment, Environmental Impact Assessment and Strategic Environmental Assessment.

4.2.3 Restoration scope

Restoration/rehabilitation of marginal habitats was raised by IPCC and BCI relating to the finalisation of several bog rehab plans in 2021 as worthy of consideration within the rehabilitation measures to support carbon sequestration and biodiversity objectives.

4.2.4 Monitoring

Further details on monitoring of ecological metrics, and how and where reporting on this monitoring would take place, was raised by the IPCC, University College Dublin and Trinity College researchers in their respective submissions relating to the finalisation of several bog rehab plans in 2021. Butterfly Conservation Ireland also suggested that monitoring of Large Heath butterfly be considered to assess the success of the proposed rehabilitation actions. Irish Water reiterated the requirement of a strong monitoring program with respect to water quality during and post rehabilitation.

4.2.5 Flooding and drainage

The IFA, The Department of Agriculture Food and the Marine, individual local residents and ICMSA queried likely impacts relating to the finalisation of several bog rehab plans in 2021 and the finalisation for this Bunahinly-Kilgarvan Rehabilitation Plan arising from the proposed re-wetting associated with the rehabilitation in relation to flooding on adjoining lands and, specifically, with regards to the maintenance of drains. The IFA also raised the issue of Health and Safety in relation to raising water levels as well as possible impacts on land and property prices.

4.2.6 Future management

The IFA expressed concerns regarding the future ownership of the BnM bogs subject to rehabilitation. They expressed a desire for contingency planning for potential future ownership of designated bogs so as to ensure no negative impacts arise on adjacent properties from any new ownership.

4.2.7 Other issues

Other issues (raised by IPCC) during the finalisation of several bog rehab plans in 2021 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.

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. Consultation

BnM have carried out ongoing consultation as part of the process of developing the rehabilitation plan for Bunahinly-Kilgarvan Bog. This is ongoing with a dedicated Community Liaison Officer communicating to affected and interested parties. A website has been developed to make information available. This will be continually updated. It is expected that some PCAS Bogs will become demonstration sites so that interested stakeholders can come to visit and observe the measures on the ground.

4.3.2 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 Bunahinly-Kilgarvan 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 (Appendix XII). 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. 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.

4.3.3 Restoration scope

As part of the PCAS, all restoration/rehabilitation options have been developed to support climate action and biodiversity objectives. Other issues such as existing amenity, social impacts, industrial history, archaeology were not part of the direct scope of PCAS but were considered when developing the rehabilitation plan. After use of the bog is outside the scope of PCAS. Rehabilitation will lead to the development of a stable diverse re-wetted cutaway landscape that will have added benefits for amenity in the future.

4.3.4 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 biodiversity monitoring is proposed as part of the monitoring and verification at Bunahinly-Kilgarvan 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 Bunahinly-Kilgarvan Bog. Significant changes in vegetation colonisation are unlikely to be observed over a short time period.

4.3.5 Flooding, drainage or other impacts on 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. Where it is deemed that blocking of a shared drain would cause any adjoining lands to be adversely affected, this will be avoided and alterations made to the rehabilitation plan. In general, drains around the margins of the bog will not be blocked.

External consultants have been appointed to carry a hydrological assessment to identify any potential impacts to neighbouring lands and to mitigate against any such impacts. No issues were identified. There is no potential for direct impacts on arterial drainage downstream.

The rehabilitation measures proposed at Bunahinly-Kilgarvan Bog 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, those which the upstream catchments drain through, 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.

4.3.6 Amenity

Creating amenity such as walking tracks is not part of the direct scope of PCAS. There is no current amenity planned for Bunahinly-Kilgarvan by BnM. Currently there are several feasibility studies considering potential greenway routes in Offaly and one such potential route would be along the BnM railway from Bunihinly, through Bloomhill and linking to Blackwater. PCAS will enable and support any future amenity development. There can be further opportunities to develop amenity at this site, for example on the decommissioned railways. Any future amenity can be positively aligned and integrated to after-use plans following the completion of the proposed rehabilitation at Bunahinly-Kilgarvan Bog. Rehabilitation measures proposed for Bunahinly-Kilgarvan Bog do not need to be amended to integrate any future amenity projects positioned along the margin of the former production bog or along the former bog railways.

4.3.7 Water quality

In general, peatland restoration and rehabilitation has been shown to demonstrate positive impacts on down-stream water quality (Minayeva *et al.*, 2017). BnM expect that rehabilitation measures will positively impact the water quality in receiving water bodies through enhancing the water attenuation across rehabilitated sites. The robust water monitoring programme implemented as part of PCAS will be used to assess water quality leaving rehabilitated sites at designated points.

4.3.8 Future management

Bord na Móna will continue to manage their land bank into the future. As industrial 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.

Bord na Móna considers issues regarding estate security, fire risk, invasive species and water pollution of utmost importance. BnM intends to maintain security and manage fire risk over the entirety of the estate. In this regard, PCAS activities, should have no detrimental impact on these issues. Regarding water pollution, BnM is regulated by the EPA and as such adheres to the strict water pollution measures laid out by the same.

4.3.9 Other issues

Other issues, including after-use and management issues outside the boundary of Bunahinly-Kilgarvan Bog, are acknowledged but are specifically outside the scope of this rehabilitation plan.

Security: It is the intention of Bord na Móna to keep secure the estate and ensure that any anti-social behaviour that occurs within the estate is reported and dealt with by the appropriate authorities.

4.3.10 Concluding statement.

- Some parts of Bunahinly-Kilgarvan bog have largely stabilised and are developing a mosaic of habitats already. This will not be radically changed.
- 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 and assessment, and corresponding adaptations to incorporate Drainage Management Plan mitigation measures.
- Several marginal drains will not be blocked to avoid impacts on adjacent lands, rights of way or turf-banks. This does not change the overall rehabilitation goals and outcomes and can be integrated with the other rehabilitation measures to allow cutaway re-wetting.
- No changes were required to the rehabilitation plan to enable any future potential 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 embryonic *Sphagnum*-rich vegetation communities on deep peat, or reed swamp and fen on shallow more alkaline peat and other subsoils, where present.
- Optimising hydrological conditions on extant high bog.
- Optimising hydrological conditions for the protection of any exposed archaeological structures, their retention in situ and preservation into the future, where possible.
- Supporting any future land-use.
- The main goal and outcome of this plan is the successful rehabilitation (environmental stabilisation) of peatlands used for industrial peat extraction 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 Bunahinly-Kilgarvan. 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 such 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 contributary sources of impacts

(private peat extraction and Bord na Mona). Reducing pressures due to former peat extraction activities at Bunahinly-Kilgarvan 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. Bloomhill) 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. An Archaeological Impact Assessment (AIA) has been carried out under the PCAS scheme (Appendix XII).

6. SCOPE OF REHABILITATION

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

- The area of Bunahinly-Kilgarvan.
- EPA IPC Licence - Ref. P0502-01. 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. Bunahinly-Kilgarvan is part of the Blackwater Bog group.
- The Scheme is designed to exceed the stabilisation requirements as defined by the IPC Licence. This scheme is designed to enhance the ecosystem services of Bunahinly-Kilgarvan, 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 Bunahinly-Kilgarvan mean that deep peat measures along with some wetland creation is the most suitable rehabilitation approach for this site. Bunahinly-Kilgarvan Bog had a gravity drainage regime but does have residual deep peat along with shallower areas.
- 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 Bunahinly-Kilgarvan as **environmental stabilisation**, **optimising residual peat re-wetting, and the development of embryonic raised bog on deep peat along with 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 Bunahinly-Kilgarvan will support multiple national strategies of climate action, biodiversity action and other key environmental strategies such was 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 some extant raised bog remnants around the margins of Bunahinly-Kilgarvan.
- It is not proposed to carry out any rehabilitation in the other marginal or peripheral cutover bog zones. Generally, these 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 Bunahinly-Kilgarvan commenced in the 1990's, and finished in 2018. Remaining peat depths are therefore up to 5m deep for the most part apart from an area in the east of Kilgarvan where depths are less.
- **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) has been carried out to mitigate against any impact on found archaeology at Bunahinly-Kilgarvan. 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:

- Constraints such as the gas pipeline and drainage associated with the railway at the NE corner of Bunihinly.
- The longer-term development of stable naturally functioning habitats at Bunahinly-Kilgarvan.
- 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 Bunahinly-Kilgarvan.
- 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 run-off of suspended solids).

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 run-off of suspended solids 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. This will be measured by the EPA Water Framework Directive monitoring programme.

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.

Following commencement, and as the monthly monitoring program at Bunahinly-Kilgarvan continues in 2022 during the rehabilitation works, and data from the 2020 monitoring program is compiled, further trending will be produced to verify any ongoing trends.

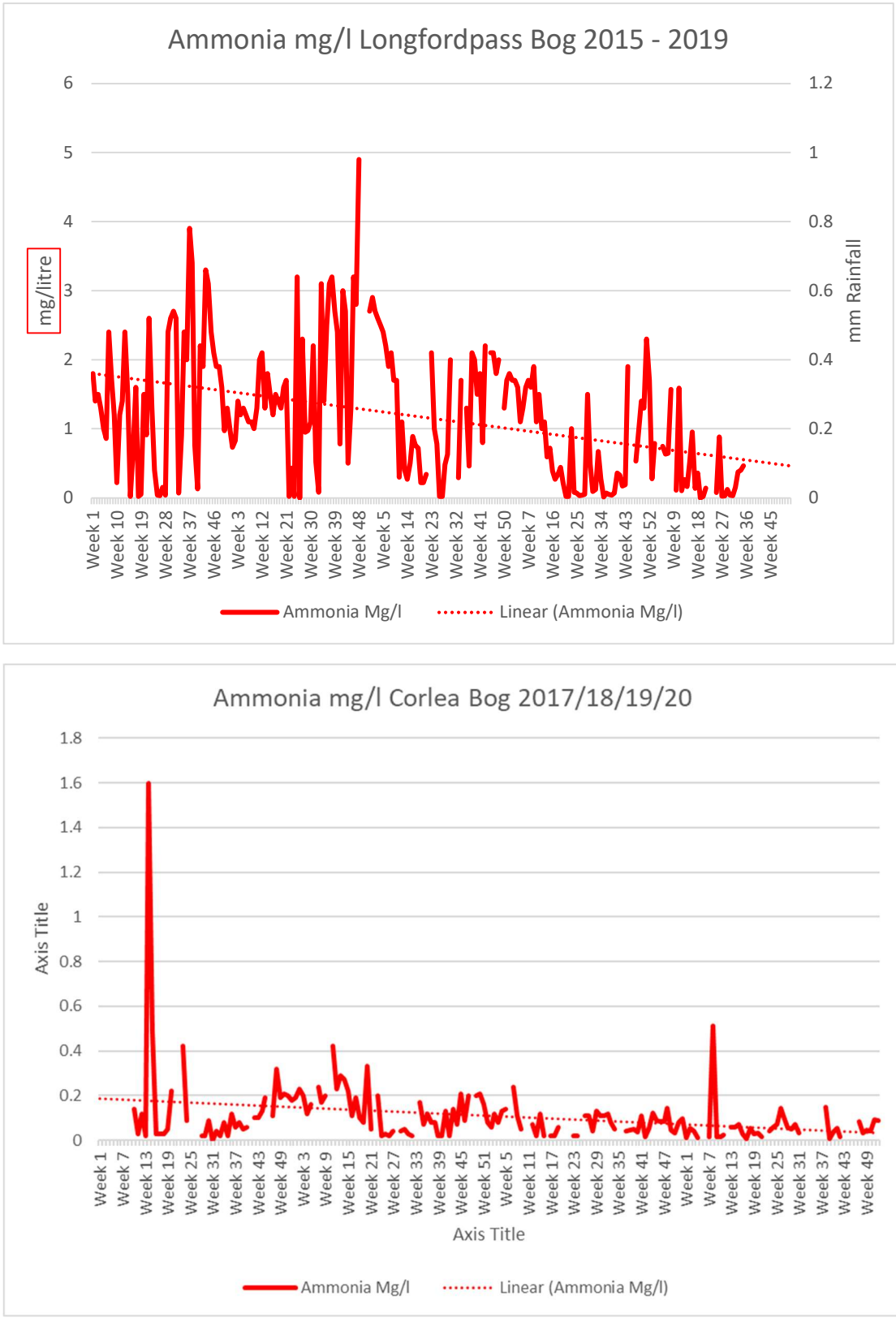


Figure 7.1. Ammonia levels over the period 2015-2020 at Longfordpass and Corlea.

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. It will take some time for stable naturally functioning habitats to fully develop at Bunahinly-Kilgarvan. 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 industrial peat production	Delivery of rehabilitation measures Reduction in bare peat.	Aerial photography after rehabilitation has been completed – to demonstrate measures (drain-blocking) Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition.	2022-2025
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	2021-2024
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 compared against this baseline.	2022-2025
Climate action verification	Reduction in carbon emissions.	Reduction in carbon emissions	Carbon emissions – estimated using a bog condition assessment and appropriate carbon emission factors.	2022-2025
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.	2022-2025
Climate action verification	Biodiversity and ecosystem services. Habitat establishment Presence of key species – Sphagnum	Improvement in biodiversity and ecosystem services.	Metrics that relate to selected biodiversity and ecosystem services Presence of key species – Sphagnum – Walkover survey	2022-2025

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 and Ireland's National Recovery and Resilience Plan 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.
- **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 affective 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 a 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 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 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).

A number of illustrative figures have been produced to inform Rehab Planning and Design, including Aerial Photography, Peat Depths, LiDar Surface Maps, and Depression Analysis modelling; these are included in the accompanying Mapbook(s) as the drawings referenced below:

BNM-DR-23-09-22 titled **Bunahinly Bog: Aerial Imagery2020**

BNM-DR-23-10-22 titled **Kilgarvan Bog: Aerial Imagery2020**

BNM-DR-23-09-04 titled **Bunahinly Bog: Peat Depths**

BNM-DR-23-10-04 titled **Kilgarvan Bog: Peat Depths**

BNM-DR-23-09-03 titled **Bunahinly Bog: LiDAR Map**

BNM-DR-23-10-03 titled **Kilgarvan Bog: LiDAR Map**

BNM-DR-23-09-09 titled **Bunahinly Bog: Depression Analysis**

BNM-DR-23-10-09 titled **Kilgarvan Bog: Depression Analysis**

The rehabilitation actions themselves will be a combination of PCAS measures to re-wet peat. The distribution of these measures is provisionally outlined in drawing titled **BNM-DR-23-09-05 Bunahinly Bog: Rehabilitation Measures** and **BNM-DR-23-10-05 Kilgarvan Bog: Rehabilitation Measures** in the accompanying Mapbook(s) (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 Bunahinly-Kilgarvan bog will include (see Table 8.1):

- Deep Peat measures including field re-profiling, resulting in bunded areas suitable for Sphagnum inoculation, on deeper peat;
- Intensive drain blocking around shallow peat areas / modelled depressions on little or no peat to create/promote the spread of fen and Reedbed habitats,
- Modifying outfalls, and management of water levels with overflow pipes and blocking of internal outfalls;
- Regular drain blocking (3/100) on dry cutaway along with the blocking of outfalls and management of water levels, along with organic fertiliser application;
- Intensive drain blocking (up to 7/100m) on targeted Marginal land drains;
- Intensive blocking of drains in targeted marginal (degraded) raised bog remnants around the margins of Bunahinly-Kilgarvan and re-wetting, where possible, using an excavator to install peat blockages.
- Outfall management and/or further drain blocking in one area at least which was formerly subject to rehabilitation, as additional works;

- Targeted fertiliser applications to accelerate vegetation establishment on areas of **bare peat** on headlands and high fields, and within certain areas of dry cutaway. Areas where vegetation has established do not need fertiliser application.
- Seeding of vegetation and inoculation of *Sphagnum* will be undertaken where required.
- Initial hydrological modelling indicates that a part of the site will develop a mosaic of wetland habitats with the potential for some 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 small 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.

Table 8.1: Types of and areas for enhanced rehabilitation measures at Bunahinly-Kilgarvan 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)
Deep Peat	DPT 2	More intensive drain blocking (max 7/100), modifying outfalls and Sphagnum inoculation	4.54
Deep Peat	DPT 4	Berms and field re-profiling (45x60m cell), modifying outfalls and managing overflows & drainage channels for excess water & Sphagnum Inoculation	264.97
Wetland	WLT4	More intensive drain blocking (max 7/100 m), + modifying outfalls and managing overflows + transplanting Reeds and other rhizomes	2.93
Marginal land	MLT1	No work required	38.09
Marginal land	MLT2	More intensive drain blocking (max 7/100 m)	0
Dry Cutaway 2	DCT1	Drain blocking with dozer (3 per 100m), modifying outfalls and applying fertiliser.	1.44
Dry Cutaway 2	DCT2	Regular drain blocking (3/100m) +modifying outfalls and managing water levels with overflow pipes + targeted fertiliser treatment	41.97
Additional Works	AW1	More intensive drain blocking and outfall management	24.97
Silt ponds	Silt pond	Silt ponds	2.33
Constraint	Constraint	Other Constraints	11.89
Total			393.12

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 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 Scheme PCAS) will be applied to Bunahinly-Kilgarvan. 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 has been carried out and any issues identified resolved and the rehabilitation plan adapted.
- A review of known archaeology and an archaeological impact appraisal of the proposed rehabilitation has been carried out. The results of this assessment has been incorporated into the rehabilitation plan to minimise known archaeological disturbance, where needed.
- A review of issues that may constrain rehabilitation such as known rights of way, turbary and existing land agreements has been carried out.
- A review of remaining milled peat stocks has been carried out. There are peat stocks remaining on Kilgarvan bog that will be removed before rehabilitation commences.
- 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) is to be carried out. The scheduling of rehabilitation operations will be adapted, where required.
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.
- An Appropriate Assessment of the Rehabilitation Plan has been carried out. (Note that an NIS was prepared for this rehabilitation plan.)
- See Bunihinly-Kilgaran Decommissioning and Rehabilitation Plan – Addendum 1 for more details.
- Track implementation and enforcement of the relevant IPC Licence conditions, the mitigation measures (AA) (where required), and other environmental control measures during the implantation of the rehabilitation plan.

8.2 Short-term practical actions (0-3 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 other management prescriptions. All rehabilitation will be carried out with regard to best practice environmental control measures (Appendix IV).
- Some proposed measures will be carried out on a phased basis as stock is removed from the site. It is not expected that the site will be completely cleared of peat stock before rehabilitation begins.
- 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 run-off of suspended solids from the site during the rehabilitation phase.
- 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 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

- **2021-2022**: Short-term planning actions.
- **2022-2023**: Short-term practical actions.
- **2023-2025**: Long term practical actions. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- **2025**: 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 and Ireland's National Recovery and Resilience Plan, Bord na Móna in developing a package of measures, 'the 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 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 be allocated to the site based on the area of different cutaway types across the site (See Appendix I).

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, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, COD and DOC.
- 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 and Ireland's National Recovery and Resilience Plan 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.

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.
- 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 Gaeltaght 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/guidanceontheprocessofpreparingandimplementingabogrehabilitationplan.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., Decleer, 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

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.

Pschenyckyj, C., Riondata, E., Wilson, D., Flood, K., O'Driscoll, C., Renou-Wilson, F. (2021). Optimising Water Quality Returns from Peatland Management while Delivering Co-Benefits for Climate and Biodiversity, Report produced for An Fóram Uisce, Online, Available at: https://thewaterforum.ie/app/uploads/2021/04/Peatlands_Full_Report_Final_March2021b.pdf, Accessed 17.08.2021

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'Hora, 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.

BUNAHINLY KILGARVAN DECOMMISSIONING AND REHABILITATION PLAN - ADDENDUM 1

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Blackwater bog group (Ref. P0502-01). 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. Bunahinly-Kilgarvan bog is part of the Blackwater bog group. Bunahinly-Kilgarvan Bog is located in Co. Westmeath.

This addendum outlines the findings of the Appropriate Assessment reporting carried out in respect of proposed PCAS activities at Bunahinly Kilgarvan Bog.

APPROPRIATE ASSESSMENT REPORTING FINDINGS

An Appropriate Assessment Stage 1 Screening Report[4] was commissioned by Bord na Móna to inform whether the proposed PCAS activities at Bunahinly Kilgarvan Bog had the potential to result in Likely Significant Effects on European Sites.

Following screening, an Appropriate Assessment was deemed to be required:

'Following screening it can reasonably be concluded that there is no likelihood of significant effects to eleven of the above European Sites because of the proposed project, either alone or in-combination with other plans or projects. Therefore, the potential for significant effects on eleven European Sites has been excluded, the Project has been 'Screened Out' from the Appropriate Assessment process, no Appropriate Assessment is required.

Following screening it can reasonably be concluded that there is likelihood of significant effects to five of the above European Sites as a result of the proposed project, either alone or in-combination with other plans or projects. Therefore, the potential for significant effects on any European Sites has not been excluded, and Appropriate Assessment is required in respect of the following European Sites:

- *River Shannon Callows SAC (Site Code: 000216)*
- *Middle Shannon Callows SPA (Site Code: 004096)*
- *Mongan Bog SPA (Site Code: 004017)*
- *Lough Ree SPA (004064)*
- *River Suck Callows SPA (Site Code: 004097)'*

The above European Sites were subject to a Stage 2 Evaluation which concluded as follows:

'This Natura Impact Statement has been prepared to provide sufficient objective scientific information in support of the proposed development, in order to allow an Appropriate Assessment determination in the context of Article 6(3) of the Habitats Directive. The report has been prepared in order to evaluate the significance of potential effects on European sites from the proposed decommissioning and rehabilitation of Bunakinly-Kilgarvan Bog, as described in ***Appendix B****, alone and in-combination with other developments.*

Appropriate Assessment Stage One Screening of all European sites identified within a 15km radius of the proposed development evaluated that the potential for significant effects on the Special Conservation Interests

[4] Delichon Ecology (2022), Cutaway Bog Decommissioning and Rehabilitation Plan, Screening for Appropriate Assessment & Natura Impact Statement. Bunahinly-Kilgarvan Bogs, Co. Westmeath

or Qualifying Interests of three no. European Sites could not be excluded. In particular, the potential for indirect effects via a deterioration in water quality, and from disturbance to /displacement to fauna.

Thus, the respective elements were brought forward for further critical examination in the Natura Impact Statement Report to inform the Appropriate Assessment process.

Following examination and analysis, and taking account of the protective measures proposed, the potential for

- *Disturbance and displacement of SCI waterbird species occurring within the Middle Shannon Callows SPA and River Suck Callows SPA were found not to result in adverse effects due to the protective measures around timing and scheduling of works, such as the implementation of an exclusion zone during the period when SCI's may present (**Section 3.4.1.13**). This exclusion zone (150m) is selected based on the largest Minimum Approach Distance or MAD for the SCI species under consideration and constitutes Best Available Scientific knowledge.*
- *Impacts to water dependent and nutrient sensitive Annex I habitats and species of River Shannon Callows SAC as a result of deterioration in water quality. These habitats and species are as follows: Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) (6410), Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis) (6510), Alkaline fens (7230), Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)* (91E0), Otter (Lutra lutra) (1355).*
- *Disturbance and / or displacement of the otter population associated with the River Shannon Callows SAC.*

*The key protective measure being retention of silt laden water and potentially deleterious materials associated with the decommissioning and rehabilitation works to the project footprint. The attenuation of silt and particulate matter generated as a result of the proposed works is a key mitigation measure for the proposed rehabilitation and decommissioning works. The main source of potential impact to influence significant adverse effects to the downstream areas of the Middle Shannon Callows SPA and River Shannon Callows SAC relate to particulate matter run-off from the site, during the rehabilitation works. A key consideration in this regard will be drain blocking as described in **Section 3.4.1.5**. This methodology relies on the placement of terminal dams at the extremity of the drain; i.e. that closest to watercourse within the receiving environment. The securing of strategic peat dams will allow the hydraulic separation between the proposed rehabilitation works and the receiving and downstream aquatic environment, and in so doing isolating these works from sensitive ecological and environmental receptors within the project zone of influence and in the case of Bunakinly-Kilgarvan Bog and the Middle Shannon Callows SPA / River Shannon Callows SAC. Other key mitigation measures include the standard best practice environmental control measures, measures to avoid berm failure, the utilisation of existing surface water management infrastructure and the provision of further bespoke surface water management and mitigation measures. Once operational, the rehabilitated bog will provide further attenuation contributing to positive quality trends to the receiving environment, including the downstream areas of the Middle Shannon Callows SPA and River Shannon Callows SAC.*

There are no significant effects identified which would adversely affect the Special Conservation Interests or conservation objectives of the various SPA's under consideration with regard to the densities, range or conservation status of the waterbird species and their supporting wetland habitats.

There are no significant effects identified which would adversely affect the Qualifying Interests or conservation objectives of the various SAC's under consideration with regard to the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected.

The provisions of Article 6 of the 'Habitats' Directive 92/43/EC (2000) defines integrity as the 'coherence of the sites ecological structure and function, across its whole area, or the habitats, complex of habitats and/or population of species for which the site is classified'. It is clear that, given the application of prescribed protective measures for the avoidance of impacts and the implementation of the required mitigation measures, the proposed development will not give rise to adverse effects on the integrity of any of the identified European sites evaluated herein.'

APPROPRIATE ASSESSMENT REPORTING RECOMMENDED MITIGATION

Mitigation Measures

Description of the measure

The below best practice and bespoke mitigation measures have been designed and are prescribed in cognisance of those water dependent and nutrient sensitive features of Qualifying Interest for which the River Shannon Callows SAC and Middle Shannon Callows SPA have been designated.

These measures have been designed and have been prescribed to ensure that all targets and attributes set out for these features of qualifying interest are not compromised or effected by the proposed rehabilitation works at Bunahinly-Kilgarvan Bog.

Best Practice Environmental Control Measures to be applied to Decommissioning and Rehabilitation Works

The following Best Practice Environmental Control measures are to be applied as standard to ensure compliance with IPC license Conditions:

- Bog restoration/rehabilitation works will be restricted to within the footprint of the proposed rehabilitation works area.
- The proposed rehabilitation works 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.
- A standard operating procedure overseen by the Project Ecologist will be in place for all PCAS activities to avoid any significant effects on breeding birds. This will include ground nesting birds and will apply to silt pond cleaning, and cutaway activities. Restriction zones will be in place to avoid effects on any identified ground nesting birds/waterfowl as appropriate.
- There are only sealed/locked and in use portacabins in place at Kilgarvan and Bunahinly bogs. These portacabins don't support optimal bird nesting or bat roosting potential. Should bird nesting activity occur along the portacabin roof edges, the portacabin won't be removed until all works are completed at Bunahinly - Kilgarvan, which will be outside the closed nesting season; i.e. after September 2022.
- Confirmatory surveys will be undertaken by a suitably qualified ecologist to identify the presence of any bird species of conservation concern which may potentially be disturbed. The survey will typically include habitats suitable for ground nesting birds, in particular sensitive species (e.g. Lapwing/Ringed Plover/Curlew/Red Grouse) but also buildings scheduled for decommissioning, potential winter period feeding or roosting areas for Wildfowl, roosting areas for Hen Harrier etc.
- All plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).
- The proposed works 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, works will be halted.
- Works 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.
- All waste will be sorted by the works crews, managed within the site in designated waste disposal facilities, and removed to a licenced waste facility, in line with BnM Standard operating practice.
- 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 bowsers. Only dedicated trained and competent personnel will carry out refuelling operations.
- All fuels required for machinery and equipment will be stored in a designated location, away from main traffic activity, at the nearest BnM Compound. All fuel will be stored in bunded, locked storage containers. Diesel or petrol fuel and mechanical oils will also be used by site vehicles.
- Mobile storage such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers 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 works will be reduced by keeping spill kits and other appropriate equipment on-site.
- Site works 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.
- All waste water will be removed by a licenced waste contractor to a licenced waste water treatment facility.
- 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.

- Fertiliser will not be spread within 25m of a hydraulic break (where slope indicates runoff potential); 25m of an area subject to annual winter inundation, 25m of a natural watercourse, or 25m of any drains where conveyance is to be retained through the proposed rehabilitation extent.
- Fertiliser will be applied to headlands and bare fields where the surface slope indicates runoff is directed away from the above areas, and to within 2m of internal drainage channels within the cutover high field areas. These drainage channels will be blocked in advance of fertiliser application, restricting potential run-off to downstream drainage channels
- Buffer zones in respect of waterbodies, as specified on https://gis.epa.ie/EPAMaps/, will be adhered with at all times with regard to fertiliser application.

The below image / flow chart (**Figure 19**) provides Bord na Móna's proposed clean up procedures for fuel/oil and peat.

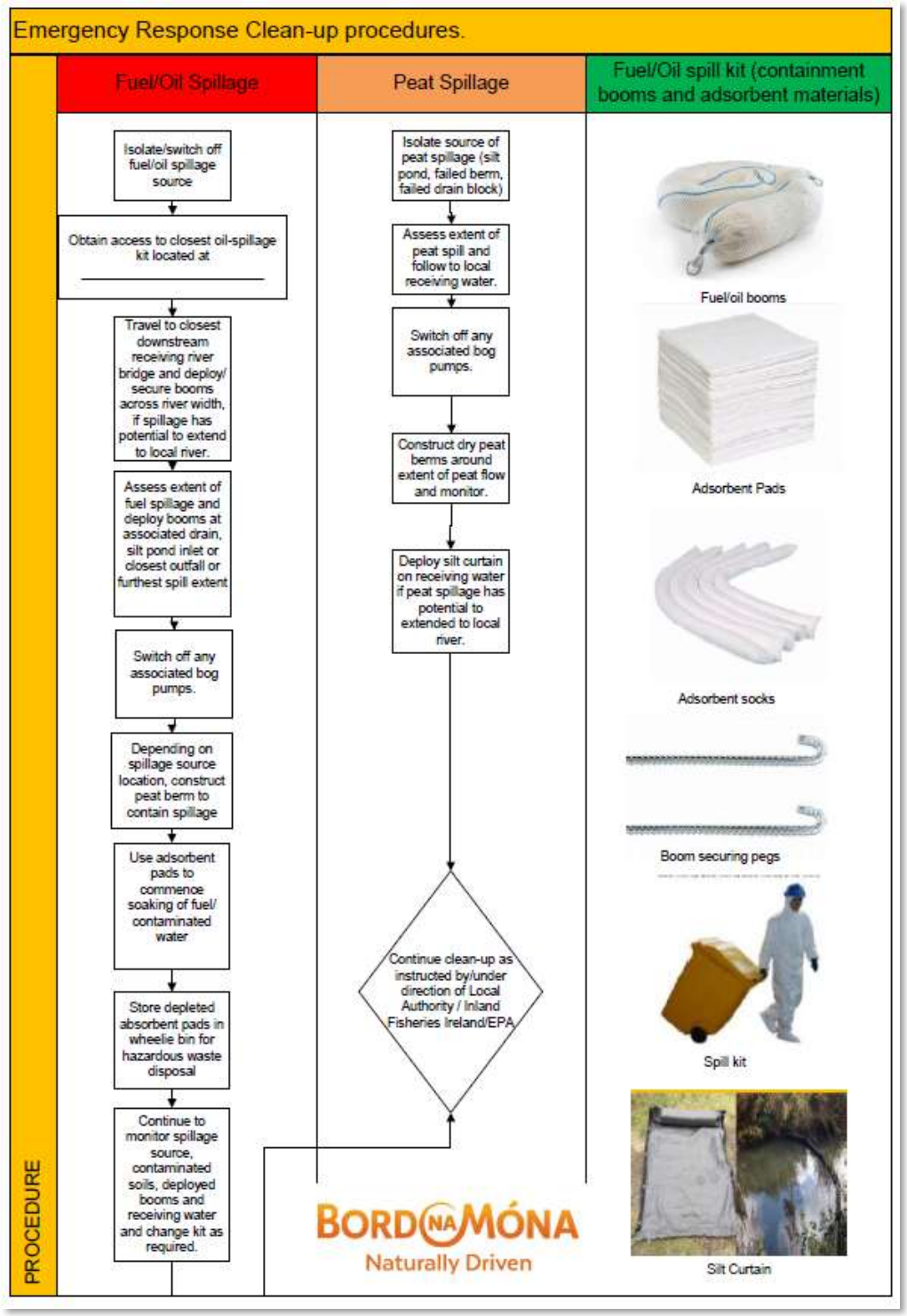
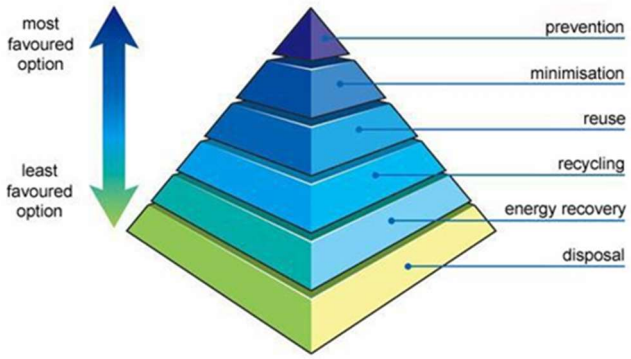


Figure 19: BnM Emergency Response Clean Up Procedures

Best Practice Measures around the treatment of Waste

Condition 7 of the IPC licence for Peat Extraction at Bunahinly-Kilgarvan Bog requires waste items to be disposed of or recovered as follows:

- 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.
- 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.
- 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:
    - The names of the agent and transporter of the waste.
    - The name of the persons responsible for the ultimate disposal/recovery of the
    - waste.
    - The ultimate destination of the waste.
    - Written confirmation of the acceptance and disposal/recovery of any hazardous waste consignments sent off-site.
    - 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.
    - 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, as agreed by the EPA, with waste records maintained as required for inspection by authorized persons of the EPA at all times.
- 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.

These best practice measures have been included for the protection of watercourses in the receiving environment, downstream connected European Sites (River Shannon Callows SAC / Middle Shannon Callows SPA) and their nutrient sensitive and water dependent habitats and species of Qualifying Interest.

Best Practice & Biosecurity

Invasive alien plant species were not identified on the Bunahinly-Kilgarvan sites during the 2022 site walkover survey. Nonetheless, 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. 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.

The potential for importation or introduction of non-native plant species (such as Japanese Knotweed, Himalayan Balsam, etc.) has been identified. 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 Móna ownership. Rehabilitation and decommissioning in the bog will have due regard to the relevant biosecurity measures outlined below:

- 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.
- For any material entering the site, the supplier must provide an assurance that it is free of invasive species.
- All plant and equipment employed on the proposed works (e.g. diggers, tracked machines, footwear etc.) must be thoroughly cleaned down using a power washer unit, and washed into a dedicated and contained area prior to arrival on site and on leaving site to prevent the spread of invasive aquatic / riparian species such as (but not limited to) Japanese knotweed (Fallopia japonica) and Himalayan Balsam (Impatiens glandulifera). A sign off sheet must be maintained by the contractor to confirm cleaning;
- 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 inspecting and washing vehicles prior to entering the works 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 plague will be adhered with throughout all rehabilitation works and activities.

- All water quality monitoring equipment which has been used in water will be treated with a disinfectant or a strong saline solution and then thoroughly dried (ideally over 24 hours) BEFORE being used in water again.
- Check, Clean, Dry protocol will be adhered with before and after visiting a river or lake for monitoring, in line with Best Practice[5] or for activities such as Sphagnum inoculation.
- Virkon Aquatic will be available as required.

These best practice measures have been included for the protection of watercourses in the receiving environment, downstream connected European Sites (River Shannon Callows SAC / Middle Shannon Callows SPA) and their nutrient sensitive and water dependent habitats and species of Qualifying Interest.

Silt Ponds

Silt Ponds – 27 no. Silt ponds with a total volume of 36058.16823m^3 and area of 2.36ha are in place at Bunahinly-Kilgarvan Bog and connected to the existing drainage network. These silt ponds, already stipulated and in use as mitigation measures in respect of Peat Extraction under IPC license, will continue to function as the primary intervention in terms of sediment release to receiving waterbodies. It should be noted, that the silt pond network at Bunahinly-Kilgarvan Bog site will not be the sole mitigation measure to attenuate silt laden waters emanating from the site during the project construction and operational phases. The design of the PCAS scheme requires the creation of internal drain blocking measures (including terminal dams), which will in itself reduce the possibility of surface run-off to the receiving environment during the rehabilitation works. Once rehabilitation works are completed and the bog has been rehabilitated, the bog will act as a natural repository for surface water, regulating and slowing the movement of surface water from Bunahinly-Kilgarvan Bog to the receiving environment. It is considered that the silt pond network will provide further attenuation and regulation to those measures associated with the PCAS measures during the project construction phase and the rewetted peatland habitat during the project's operational phase.

The water quality emission limit values (under condition 6.2 of the Integrated Pollution Control (IPC) licence issued for Bunahinly-Kilgarvan Bog) are unique to the water quality impacts from peat extraction, and as requested by the EPA. These values are not appropriate to use as a measures of success with regard to the expected water quality improvements that will arise from ceasing the annual peat extraction activity, removal of all stock and the associated rehabilitation of this bog. Existing water quality results from Bunahinly - Kilgarvan Bog indicate that suspended solids are well under the ELV that are applied during peat extraction, with ammonia also well under the associate trigger level. Silt ponds are an IPC Licence requirement to manage expected suspended solids that can arise from peat extraction and are not solely relied upon to mitigate impacts from rehabilitation of the peatlands. The silt pond locations are highlighted on (**Figure 20** and **Figure 21**), and all silt ponds are sized as required under condition 6.10 of the associated IPC Licence with regard to expected impact from the activity of milling peat and associated production processes, and maintained as required under condition 6.7 and 6.8. To that end, it is considered that silt ponds within the Bunahinly-Kilgarvan Bog are sufficiently sized to attenuate any silt or particulate matter

Regular cleaning and reporting on same already forms part of annual (AER) reporting submitted to EPA. All Silt Ponds at Bunahinly-Kilgarvan Bog site are currently compliant with EPA requirements. **Table 22** below, and **Figure 20** and **Figure 21** overleaf summarise and illustrate the onsite Silt Pond locations, the figures also illustrates the current flow regime within the main drainage network (into which any other drains also feed). Continued maintenance and reporting on same will be reported on annually until IPC license Surrender.

[5] https://www.biodiversityireland.ie/projects/invasive-species/crayfish-plague/

Silt pond cleaning is completed using a long reach excavator, at minimum twice per annum, in line with IPC license requirements and an established SOP.

Silt pond is cleaned to the appropriate depth as specified to ensure compliance (25m^3 of silt pond capacity is required for every hectare of bare peat in the associated catchment), typically a minimum of 1.5m deep, as compliance is achieved through length rather than depth in most instances. Excavated spoil will be placed adjacent to the silt pond.

Table 22: Silt Ponds in use at Bunahinly-Kilgarvan Bog site

Bog Name	IPC License Reference	Pond No.	Area (m^2)	Volume (m^3)
Kilgarvan	502_01	n/a	515.91297844700	773.86946767100
Kilgarvan	502_01	n/a	381.75049803100	572.62574704700
Kilgarvan	502_01	BH199	653.54426884600	980.31640326900
Kilgarvan	502_01	BH199A	449.22157770900	673.83236656400
Kilgarvan	502_01	BH200A	1314.39472511000	1971.59208766000
Kilgarvan	502_01	BH200B	757.03050148400	1135.54575223000
Kilgarvan	502_01	BH200C	3408.89100392000	5113.33650588000
Kilgarvan	502_01	BH200D	1104.45291146000	1656.67936719000
Kilgarvan	502_01	BH200D	0.84525888389	1.26788832583
Kilgarvan	502_01	BH200E	1628.28773601000	2442.43160402000
Kilgarvan	502_01	KG190	979.57902974300	1469.36854461000
Kilgarvan	502_01	KG191	379.85634220200	569.78451330300
Kilgarvan	502_01	KG192A	1622.11005285000	2433.16507928000
Kilgarvan	502_01	KG192C	1563.15713458000	2344.73570187000
Kilgarvan	502_01	KG192D	476.22538250000	714.33807375000
Kilgarvan	502_01	KG192E	457.90710977500	686.86066466300
Kilgarvan	502_01	KG193A	446.99025701700	670.48538552500
Kilgarvan	502_01	KG193B	844.60796833400	1266.91195250000
Kilgarvan	502_01	KG194	435.55593152400	1266.91195250000
Kilgarvan	502_01	KG195	712.51792932800	1068.77689399000
Kilgarvan	502_01	KG196	288.87551544100	433.31327316200
Kilgarvan	502_01	KG196A	309.50556451100	464.25834676700
Kilgarvan	502_01	KG197	713.54936406000	1070.32404609000
Kilgarvan	502_01	KG201	2222.86471403000	3334.29707105000
Kilgarvan	502_01	KG201	668.43891064500	1002.65836597000
Kilgarvan	502_01	KG202	676.73066653900	1015.09599981000
Kilgarvan	502_01	KG202A	616.92345241200	925.38517861800
		Total	**23629.72679**	**36058.16823**

The above capacity is considered sufficient for the purposes of decommissioning and rehabilitation.

The attenuation of silt and particulate matter generated as a result of the proposed works is a key mitigation measure for the proposed rehabilitation and decommissioning works. The main source of potential impact to influence significant adverse effects to the downstream areas of the River Shannon Callows SAC relate to particulate matter run-off from the site, during the rehabilitation works. A key consideration in this regard will be drain blocking as described below. This methodology relies on the placement of terminal dams at the extremity of the drain; i.e. that closest to watercourse within the receiving environment. The securing of

strategic peat dams will allow the hydraulic separation between the proposed rehabilitation works and the receiving and downstream aquatic environment, and in so doing isolating these works from sensitive ecological and environmental receptors within the project zone of influence and in the case of Bunahinly-Kilgarvan Bog site and European Sites within the project Zone of Influence.

These mitigation measure has been included for the protection of watercourses in the receiving environment, downstream connected European Sites (River Shannon Callows SAC / Middle Shannon Callows SPA) and their nutrient sensitive and water dependent habitats and species of Qualifying Interest.

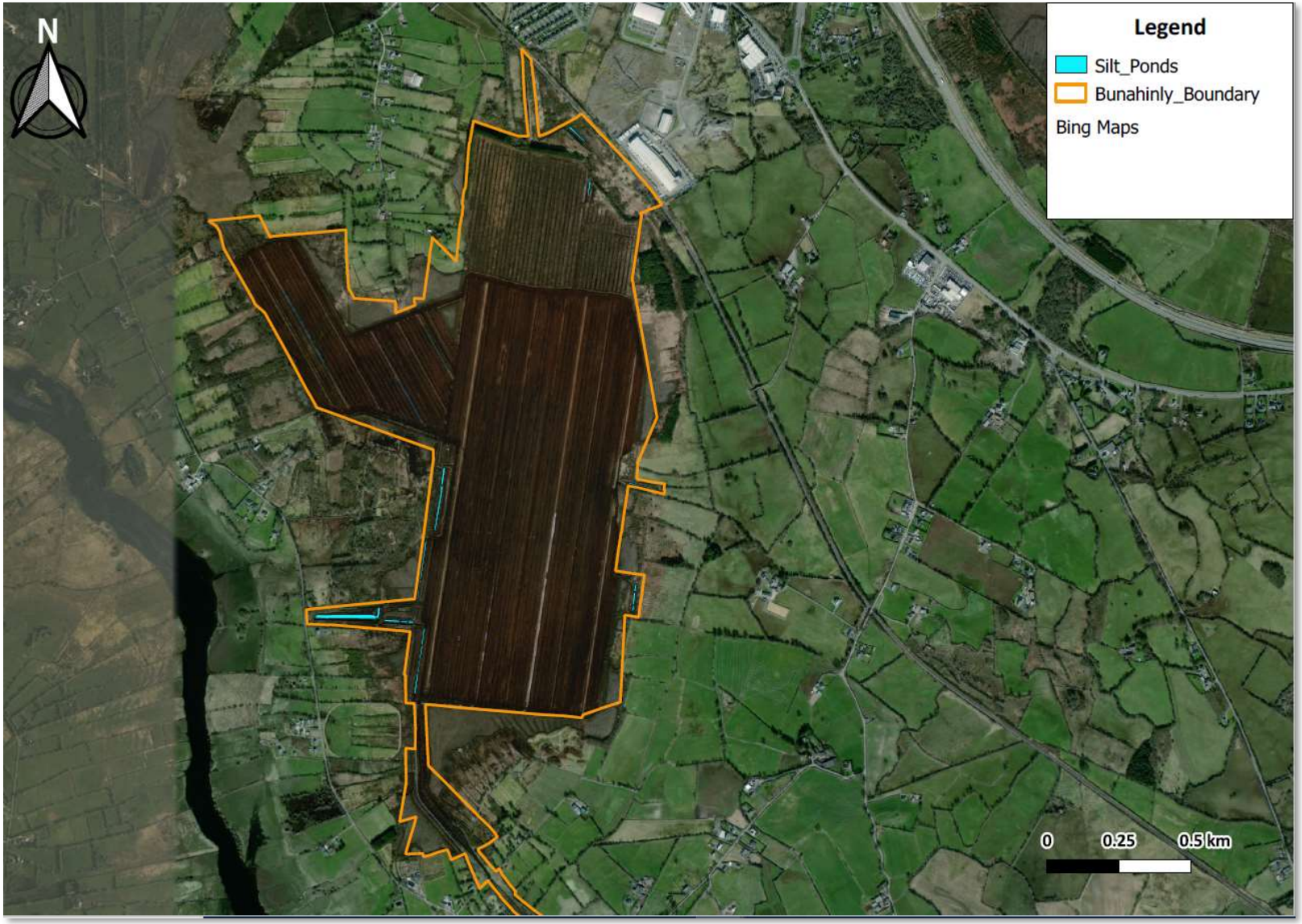


Figure 20: Bunahinly Bog Site Drainage and Silt Ponds

Figure 21: Kilgarvan Bog Site Drainage and Silt Ponds

Measures to avoid runoff when carrying out drain blocking

The principal mitigation for proposed rehabilitation works at Bunahinly-Kilgarvan Bog site will involve securing the works area from the receiving environment when rehabilitation works are ongoing. This will include the creation of terminal dams at the margins of the rehabilitation works. These dams will secure the works area from the receiving environment, in particular downstream watercourses and waterbodies. These terminal dams are an integral part of the rehabilitation design works and comprise mitigation by design.

- All Silt ponds will be cleaned prior to the commencement of upstream drain blocking.
- The current EPA Licence requirement for Bunahinly-Kilgarvan Bog specifies the need to clean silt ponds twice per annum, once before production and once before ditching. For the purposes of the rehabilitation works silt pond cleaning will be undertaken before and after the rehabilitation works. These works will be subject to visual inspections and Water Quality monitoring.
- When blocking drains, terminal dams i.e. the dams at the extremity of the drain and closest to any hydrologically connected watercourses, will be blocked first with AT MINIMUM 2 IN SERIES STANDARD DAMS, to prevent sediment release from subsequent dam insertion. This will form a hydraulic barrier between subsequent drain works and other rehabilitation works at the bog and the receiving and surrounding environment.
- The functionality and efficacy of these terminal dams will be monitored by the Project Ecologist/Environmental Supervisor and audited by the project engineering team. If the structural competency of the terminal dams become compromised, additional mitigation will be secured on site, such as silt fencing or additional check dams.
- Dams will be inspected during periods of dry weather to ensure no 'cracking' of peat has occurred which might allow for discharge.
- Discharge from all rehabilitated areas will be directed into silt ponds.
- Outfalls and overflow pipes from e.g. bunded cells will be directed into silt ponds.
- An Emergency Response Plan will be available in the event of any inadvertent release of a large volume of sediment.
- The above will be overseen by a suitably qualified Environmental Supervisor with support from members of the BnM Ecology Team.

This mitigation measure has been included for the protection of watercourses in the receiving environment, downstream connected European Sites (River Shannon Callows SAC / Middle Shannon Callows SPA) and their nutrient sensitive and water dependent habitats and species of Qualifying Interest.

Measures for cleaning Silt Ponds within EPA Blue line features

Cleaning of silt ponds integrated adjoining or upstream EPA Blue line features, such as the Shannon Upper_120 watercourse, will follow the below best practice measures.

- Consideration of seasonal restrictions for instream works (works to commence between April / May – October inclusive) and requirement to liaise / notify Inland Fisheries Ireland (IFI) in advance of cleaning works commencing.
- Cleaning works to align with best practice measures, including BnM Standard Operating Procedures (SOPs) for works within and near watercourses, works with hydrocarbons, biosecurity measures when working at and different watercourses and waterbodies.
- Cognisance of capture of non-target aquatic species (Crayfish, lamprey, small fish etc.) within the dredged material and the secure rescue and translocation of these species downstream of the pond cleaning works. Cleaning of silt ponds will be completed under licence (where required) and in accordance with strict biosecurity measures. Silt ponds will be cleaned from the inlet point to the outlet point allowing fish and aquatic life to migrate downstream as the works progress. The silt pond cleaning

works and species translocation efforts will be overseen by a suitably qualified Project Ecologist or Environmental Supervisor and ongoing monitoring undertaken by the project ecologist.

- Excavated silt material will be placed at least 20m away from the blue line feature and will be deposited into corralled berms and thereafter secured into the nearby ground with the back of the machine excavator bucket, to ensure particulate matter is not mobilised during or following rainfall events.

It should be noted, that the silt pond network at Bunahinly-Kilgarvan Bog will not be the sole mitigation measure to attenuate silt laden waters emanating from the site during the project construction and operational phases. The design of the PCAS scheme requires the creation of internal drain blocking measures, which will in itself reduce the possibility of surface run-off to the receiving environment during the rehabilitation works. However, the functionality of a silt pond feature is based on its capacity to assimilate and attenuate ongoing surface water flows. Silt ponds need to be cleaned and emptied regularly to ensure they have sufficient capacity to operate efficiently.

Once rehabilitation works are completed and the bog has been rehabilitated, the bog will act as a natural repository for surface water, regulating and slowing the movement of surface water from Bunahinly-Kilgarvan Bog to the receiving environment. It is considered that the silt pond network will provide further attenuation and regulation to those measures associated with the PCAS measures during the project construction phase and the rewetted peatland habitat during the project's operational phase.

This mitigation measure has been included for the protection of watercourses in the receiving environment, downstream connected European Sites (River Shannon Callows SAC / Middle Shannon Callows SPA) and their nutrient sensitive and water dependent habitats and species of Qualifying Interest.

Rehabilitation Design at Bunahinly-Kilgarvan Bog

Further detail is provided in this section on the proposed rehabilitation measures at Bunahinly-Kilgarvan Bog, particularly the provision of measures Deep Peat (DPT2) and Deep Peat 4 (DPT4).

It is proposed to develop these measures across 274.25ha of the Bunahinly-Kilgarvan Bog site. The development of these measures will involve the construction of berms and field re-profiling, blocking outfalls, managing overflows and drainage channels for excess water and *Sphagnum* inoculation.

Once constructed and fully operational, these rehabilitation features will act in the same way as a series individual silt ponds. The functioning of these features will act as an source of surface water retention and attenuation on site, further mitigating the risk of silt release from this area to the receiving environment. The location of the silt control measures and silt ponds for Bunahinly-Kilgarvan Bog are presented in **Figures 20 and 21**, above, as reproduced from the NIS.

In addition to the above design principles and their inherent attenuation capacities, it is considered that the River Shannon catchment affords substantial dilution rates. Given the substantial dilution rates that are achievable, it is not anticipated that the proposed rehabilitation measures will give rise to any perceptible impacts on water quality either alone or in-combination with other activities. Furthermore, the discharge from the bogs will be managed through silt traps which will substantially reduce the quantity of peat silt export from the bog. During low flow conditions when dilution potential will be lowest the silt traps will be most effective, in contrast during large events when silt traps are least effective very substantial dilution will be achievable.

Given the substantial dilution rates achievable within the River Shannon catchment, it is not anticipated that the proposed rehabilitation measures will give rise to any perceptible impacts on water quality either alone or in-combination. Furthermore, the discharge from the bogs will be managed through silt traps which will substantially reduce the quantity of peat silt export from the bog. During low flow conditions when dilution

potential will be lowest the silt traps will be most effective, in contrast during large events when silt traps are least effective very substantial dilution will be achievable within the Daingean and Figile watercourses.

Mortality or disturbance to Otter

- Confirmatory surveys for active Otter holts and breeding activity will be carried out 150m upstream and downstream of suitable habitat prior to the commencement of works in close proximity.
- Should it be confirmed all works within 150m of an active otter holt, will be carried out during daylight hours and outside of 2 hours after sunrise or before sunset during summer and outside of 1 hours after sunrise or before sunset during winter.
- No wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding otter Holts, and light work will not take place within 15m of such holts, except under license.
- The prohibited area associated with otter holts, should they be located in confirmatory surveys, will, where appropriate, be protected from any inadvertent disturbance from any works or personnel occurring nearby such as at a silt pond and declared as 'Ecology Restriction Zone' with no mention of otters to any onsite staff.
- Appropriate awareness of the purpose of the excluded area will be conveyed through toolbox talks with site staff and sufficient signage will be placed on each possible access point. All contractors or operators on site will be made fully aware of the procedures pertaining to Ecology Restriction Zones and subject to audits and non-conformance records in the event of non-compliance, to be included in reports submitted to Local Authorities and relevant Statutory Consultees.
- All PCAS activities will be carried out during daylight hours.
- All works will be carried out and completed in compliance with Bord na Mona's Standard Operating Procedure for otter.

This mitigation measure has been included for the avoidance of ex-situ effects to otter, a feature of Qualifying Interest for the River Shannon Callows SAC.

1.1.1.1 Mitigation when undertaking flood avoidance measures and retention of hydraulic barriers

The following mitigation and best practice measures will be undertaken at the Bunahinly-Kilgarvan Bog site. Although drain blocking and consequent and hydrological rewetting of the Bunahinly-Kilgarvan Bog site will occur, it is not intended to rewet or hydrologically alter adjoining lands or those areas surrounding the Bunahinly-Kilgarvan Bog site. To this end, the following mitigation measures will be implemented:

- Maintenance of peripheral drains and where required, to create hydraulic barriers between the site and the receiving environment. This will mean that lands and local drainage patterns associated with the margins of the BnM site will be maintained;
- Maintenance of specified internal drains to avoid flooding where required to maintain existing drainage of adjacent lands. In some instances this may include re-grading or widening of specific existing drains which currently act as preferential flow paths through the bog.
- Monitoring of adjacent lands will also be specified.

This mitigation measure has been included for the protection of watercourses in the receiving environment, downstream connected European Sites (Middle Shannon Callows SPA / River Shannon Callows SAC) and their nutrient sensitive and water dependent habitats and species of Qualifying Interest.

A map displaying hydraulic breaks is presented in **Figure 22** below.

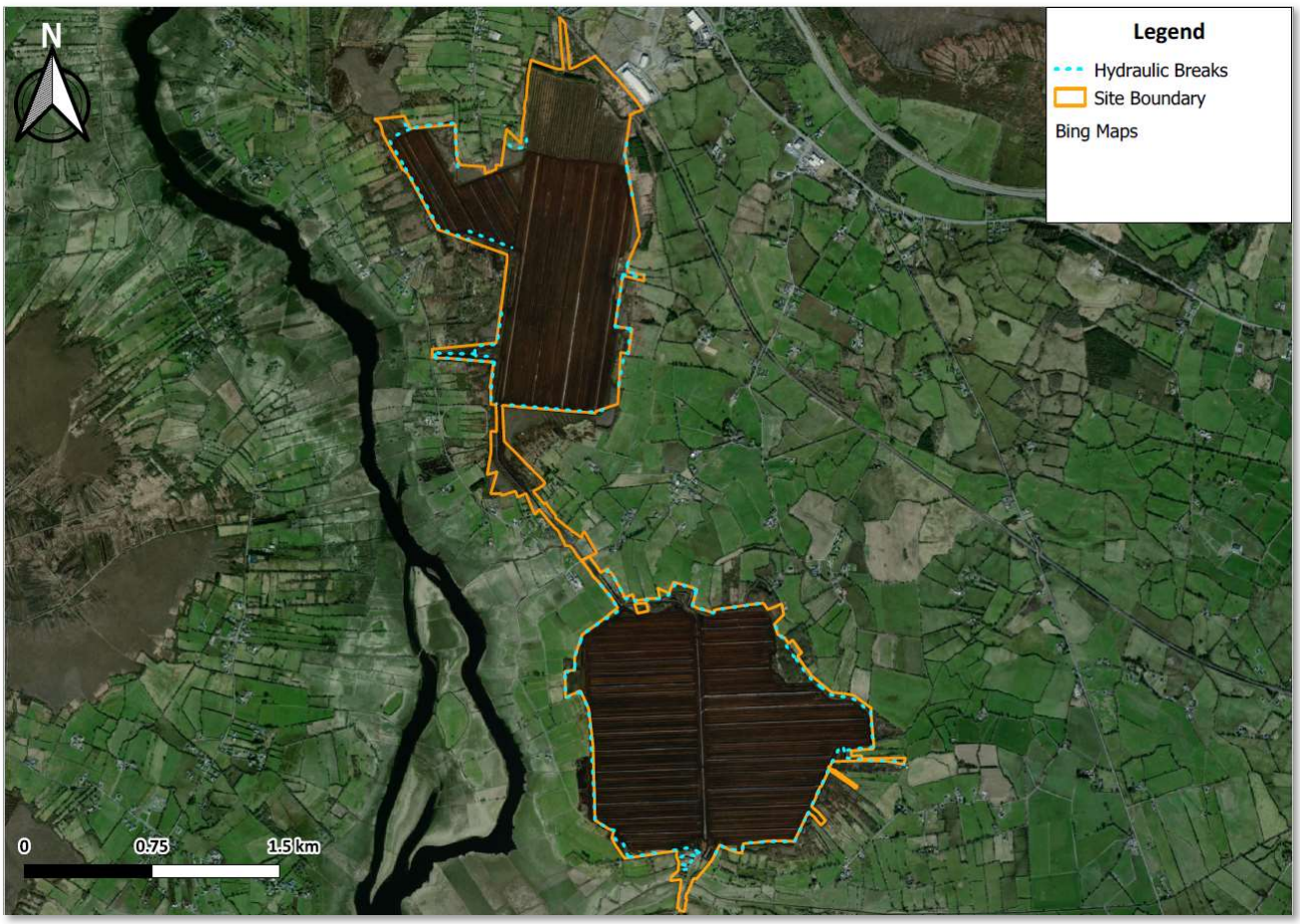


Figure 22: Hydraulic Breaks at Bunahinly-Kilgarvan Bog site

Mitigation during upgrade of boundary or peripheral drains outside of the proposed rehabilitation footprint

Boundary drains may require upgrading to retain their functionality as hydraulic breaks between the site and adjoining lands. These works will be completed during periods of low flow and will follow the below sequencing:

- Prior to commencement of channel works, at least 2 no. check dams will be placed at the downstream end of the drainage channel to control the flow of suspended sediment downstream to receiving watercourses.
- The most downstream check dam will comprise locally sourced turves and double bagged sand bags to initially secure and check downstream flow within the channel. At least 10m upstream of this check dam, a peat dam will be created and keyed into the adjoining drainage channel banks.
- The build-up of silt material upstream of the constructed check dams will be monitored during upgrade works and the silt material will be removed from the drainage channel during works as it builds up. The material will be removed from the channel, spread and levelled into the adjacent field, a minimum of 10m from the nearest drain.
- The constructed check dams will be inspected during periods of dry weather to ensure no 'cracking' of peat has occurred which might allow for discharge.
- Upon completion of the upgrade works, all silt will be removed from the drainage channel immediately upstream of the 2 standard drain blocks prior their removal. The 2 standard drain blocks will only be removed once all upgrade works are completed and once all water within the channel is suitably settled with no evidence of suspended solids within the water column.

- Where a new drain is required, it will be formed and established prior to connecting the drainage channel to wider drainage network. Only once it has formed and become established, with the bed and banks stabilised will it be connected to the wider drainage network. This approach will minimise to a negligible level the potential for suspend solids to be generated in waters within the new drainage channel and conveyed downstream to receiving watercourses and European Sites.
- An Emergency Response Plan will be available in the event of any inadvertent release of a large volume of sediment.

The set up of these features will be overseen by a suitably qualified Ecologist/Ecological Clerk of Works and ongoing monitoring undertaken by the project ecologist.

This mitigation measure has been included for the protection of watercourses in the receiving environment, downstream connected European Sites (Middle Shannon Callows SPA / River Shannon Callows SAC) and their nutrient sensitive and water dependent habitats and species of Qualifying Interest.

Mitigation through Design - Emergency Response Plan for Berm Failure

The below mitigation measures will be put in place when constructing and working with berm features as part of the bog rewetting and rehabilitation process. The berm design adopts an empirical design approach. It is proposed to apply proven sizes, proportions, materials, and assemblies from existing successful rehabilitation measures and flood defense berm features carried out in the past by Bord na Mona. This represents mitigation for the proposed rehabilitation works through design; i.e. integrating key design principles into the rehabilitation efforts to restrict potential berm failure and consequent run-off to the receiving environment. Further to the above, **Figure 19** above presents an Emergency Response procedure to address peat spillage in the unlikely event of berm failure.

- The selection of an appropriate drain block spacing.
- Drain blocks are formed at a minimum of 300mm higher than the adjacent ground level and are relatively wide to create a relatively strong structure out of peat that will mitigate water flow eroding the drain block construction.
- The provision of a key in the drain ensures a tight seal is maintained and a strong structure is developed to mitigate the formation of preferential flow paths around the edges of the drain block.
- Operators assigned to this work element are familiar with the technique and process and provide effective robust drain blocks. The operators are experienced and capable of adapting to the particular conditions encountered within the bog.
- Qualified, experienced Engineers overseeing the works during the installation phase ensure that quality procedures of the various elements are implemented and effectively meet the standards for quality service and performance.

Mitigation through maintenance and avoidance:

- Ongoing monitoring of completed peat drain blocks in the weeks after formation will ensure they have consolidated.
- The risk associated with peat drain block failure from an environmental and rehabilitation measures impact is generally categorised as low as a peat drain block failure will result in an impact that is localised and silt control measures are provided upstream of all discharge points. There is an allowance for a reactive approach to remediation measures where required.

- A post rehabilitation Lidar and imagery survey will take place which will capture any areas where failures occurred resulting in remediation measures in a particular area if required. The Lidar survey will be implemented when the rehabilitation measures have been in place for a reasonable period of time allowing areas of weakness or potential concern to become apparent.
- In the event of a peat drain block failure, the adjacent peat drain blocks will generally have sufficient capacity to accommodate any additional hydrostatic pressures generated ensuring the negative impact is localised.
- If, after heavy rainfall, significant water flows in the drains cause localised drain block failure, the regular and frequent placing of drain blocks along the drain further downstream will mitigate the impact to the immediate area.
- As peat drain blocks are designed to retain water on the cutover resulting in a reduction in discharge into the boundary drains, preventing any negative impacts on adjacent agricultural land.

Further to the above, **Figure 19** above presents an Emergency Response procedures to address peat spillage in the unlikely event of berm failure.

This mitigation measure has been included for the protection of watercourses in the receiving environment, downstream connected European Sites (River Shannon Callows SAC and Middle Shannon Callows SPA) and their nutrient sensitive and water dependent habitats and species of Qualifying Interest.

Mitigation through maintenance and avoidance:

- Ongoing monitoring of completed peat drain blocks in the weeks after formation will ensure they have consolidated.
- The risk associated with peat drain block failure from an environmental and rehabilitation measures impact is generally categorised as low as a peat drain block failure will result in an impact that is localised and silt control measures are provided upstream of all discharge points. There is an allowance for a reactive approach to remediation measures where required.
- A post rehabilitation LiDAR and imagery survey will take place which will capture any areas where failures occurred resulting in remediation measures in a particular area if required. The LiDAR survey will be implemented when the rehabilitation measures have been in place for a reasonable period of time allowing areas of weakness or potential concern to become apparent.
- In the event of a peat drain block failure, the adjacent peat drain blocks will generally have sufficient capacity to accommodate any additional hydrostatic pressures generated ensuring the negative impact is localised.
- If, after heavy rainfall, significant water flows in the drains cause localised drain block failure, the regular and frequent placing of drain blocks along the drain further downstream will mitigate the impact to the immediate area.
- As peat drain blocks are designed to retain water on the cutover resulting in a reduction in discharge into the boundary drains, preventing any negative impacts on adjacent agricultural land.

Further to the above, **Figure 19** above presents an Emergency Response procedures to address peat spillage in the unlikely event of berm failure.

This mitigation measure has been included for the protection of watercourses in the receiving environment, downstream connected European Sites (Middle Shannon Callows SPA / River Shannon Callows SAC) and their nutrient sensitive and water dependent habitats and species of Qualifying Interest.

Measures to avoid disturbance or displacement to SCI bird species

Birds

- An Ecological Restriction Zone will be adopted as part of the proposed rehabilitation works. This will include a buffered area ca. 150m from silt ponds that supported (or has the capacity to support) feeding over-wintering avifauna within Bunakinly-Kilgarvan Bogs – see **Figure 23** overleaf. Any potential disturbance to SCI birds outside of these Ecological Restriction Zones within Bunakinly-Kilgarvan Bog are considered to be reversible and not significant. The proposed Ecological Restriction Zone comprises a 150m buffer offsetting silt pond areas on site (shown in pink). PCAS activities will be restricted within this zone for the non-breeding period associated with the SCI species for which potentially adverse effect pathways exist. The Ecological Restriction Zone will apply in these areas between October and March inclusive.

- The extent of restriction will be overseen by the Project Ecologist dependant on water levels within the Ecological Restriction Zone and the usage of the site by avifauna. Works restrictions may be required between the months of October to March inclusive. The timing and duration of the restrictions and works practices during this period will be considered through ongoing liaison between the Project Ecologist and the project team.

- Once an Ecological Restriction Zone is operational, no PCAS scheme activities will take place within the prescribed zone. Travel and access within these sections of the site to undertake cleaning or maintenance activities may be permitted as they are likely to be intermittent, short term and of low intensity and duration. General usage will be restricted to use of existing rail and travel passes. All will be overseen by the Project Ecologist

- The timing restrictions associated with the Ecological Restriction Zone will be communicated to staff through toolbox talks, incorporated into the EMP for the project and visual markers will be placed on the peat extraction area to delineate the avoidance zone.

- Locations of these restriction zones will also be presented to the machine drivers via the built-in GPS tablet and ESRI application and the machine drivers will use this technology to avoid entering any restricted areas.

- Conformance will be audited through compliance checks by the Project Ecologist (with 'stop-works' authority).

- A standard operating procedure overseen by the Project Ecologist will be in place for all PCAS activities to avoid any significant effects on breeding birds. This will include ground nesting birds and will apply to silt pond cleaning, and cutaway activities. Restriction zones will be in place to avoid effects on any identified ground nesting birds/waterfowl as appropriate.

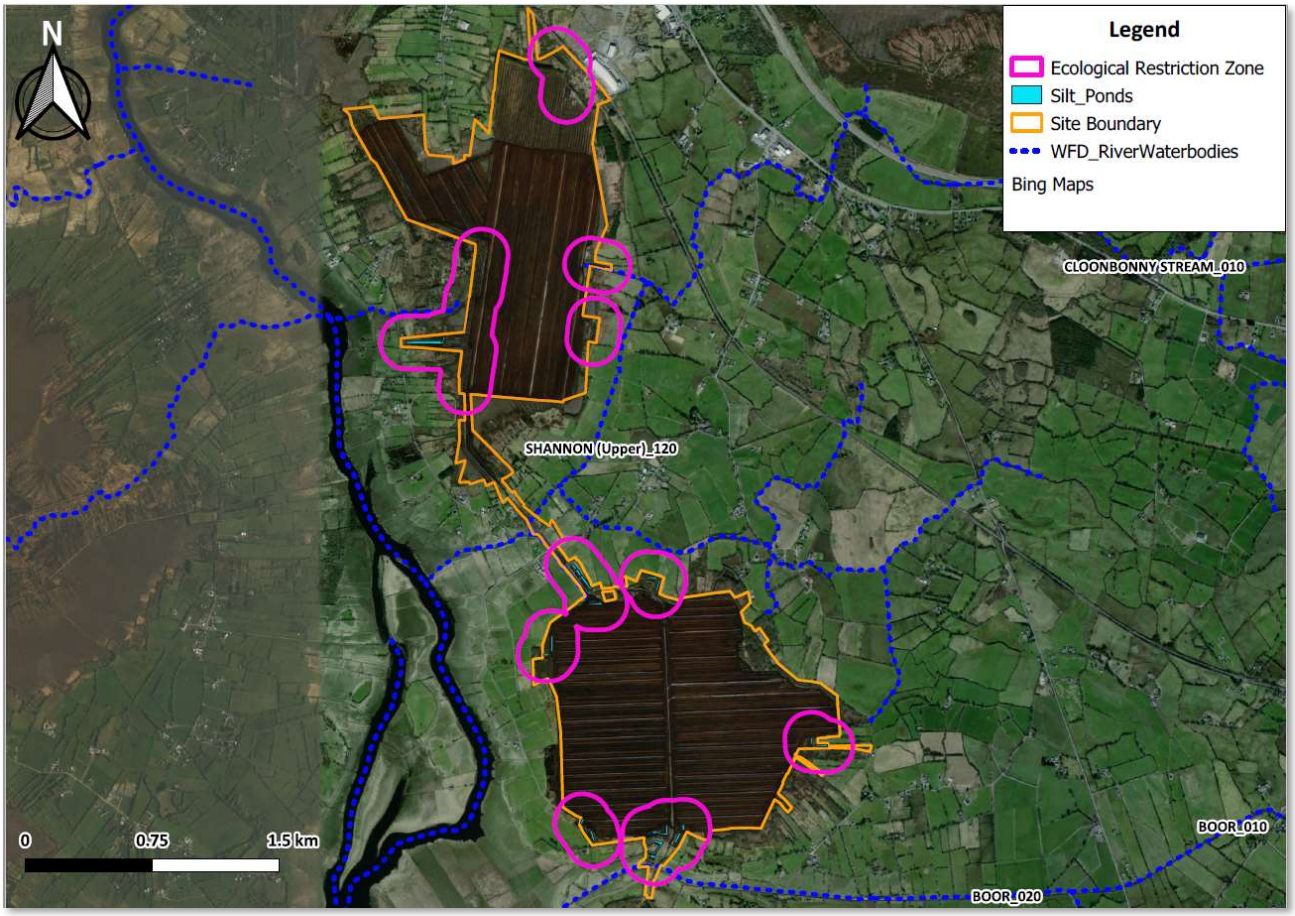


Figure 23: Ecological Restriction Zones in respect of overwintering avifauna

This mitigation measure has been included for the protection (and the avoidance of disturbance and displacement) of SCI species for adjacent and nearby SPA sites (Middle Shannon Callows SPA / Suck River Callows SPA).

The above figure is also reproduced as Appendix D of this document.

Standard Operating Procedures for Loading of remaining Peat Stockpiles within Bunahinly-Kilgarvan Bog

The loading and removal of any remaining milled peat stockpiles at Bunahinly-Kilgarvan Bog will follow the below Standard Operating Procedures (SOPs) (See **Figure 24**). The below schematic / flow diagram displays how peat loading and removal will be completed at the Bunahinly-Kilgarvan Bog site. This will ensure that loading and removal of remaining peat stockpiles will be controlled, will follow an agreed protocol and will not result in the release or spread or milled peat to the receiving or surrounding environment and by extension European Sites within the project Zone of Influence.

This mitigation measure has been included for the protection of watercourses in the receiving environment, downstream connected European Sites (River Shannon Callows SAC / Middle Shannon Callows SPA) and their nutrient sensitive and water dependent habitats and species of Qualifying Interest.

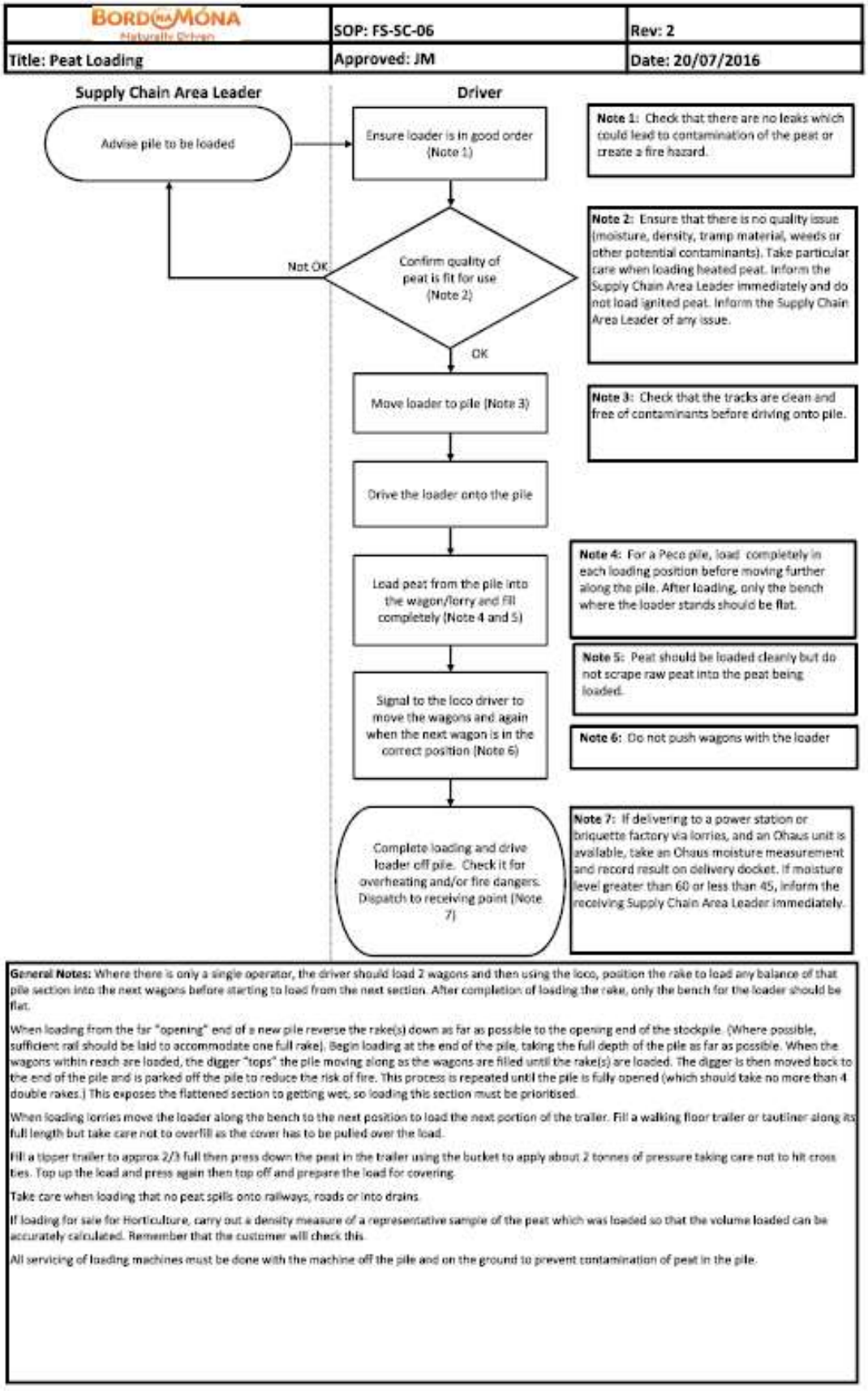


Figure 24: BnM Peat Loading SOPs

General Dust Control Steps:

The following measures will be put in place when loading and removing remaining peat stockpiles from Bunahinly Kilgarvan Bog.

- Wind Socks will be installed at all Bog Areas that have on-going complaints or are classed as Dust
- Sensitive, so that wind speed and direction can be assessed. BNM Item Number (412958).
- Any dust mitigation measures will be recorded and referenced on the daily return sheet.
- Headland peat collection will be recorded on PQMS form 023.
- Idle travel will be avoided as much as practically possible.
- Use grass paths and far headlands where possible when travelling in dust sensitive areas.
- Avoid travelling near main highways, dwellings and areas deemed as problematic regarding dust impact.
- Keep the headlands continuously ridged.
- Shelter Belts and Wind Breaks are used where feasible.
- Stockpiles are covered as per the Area Polycovering Plan.
- Machinery maintains slow speeds when travelling along headlands.
- All Continuous Improvement initiatives regarding Dust Mitigation will be fully investigated and supported by bog areas.

Headland Harvesting

- Keep the headland continuously ridged.
- Harvest headland peat every third crop, as per FS-PR-13 standard.
  · By Haku trailer where possible or,

  · Harvest to fields, disengage crossing drains and outfalls.

  · By utilising headland harvesters.

- Hydraulic Harrows where available, spoons will be lifted when travelling on a headland.
- Headland peat collection will be fully documented and recorded on PQMS form 023.
- Miller drums will be disengaged and lifted when approaching or travelling on a headland.
- Slow speeds should be maintained on a headland.
- Optimise routes to avoid dust sensitive areas.

This mitigation measure has been included for the protection of watercourses in the receiving environment, downstream connected European Sites (Middle Shannon Callows SPA / River Shannon Callows SAC) and their nutrient sensitive and water dependent habitats and species of Qualifying Interest.

Effectiveness of these measures

The Mitigation Measures (Project Design Measures, Management Plans, Environmental Emergency Response Measures and Best Practice Measures), listed above, have been developed by the hydrological/drainage and ecological expert members of the Decommissioning and Rehabilitation project team in Bord na Móna and use best practice water quality protection techniques which are tried and tested regularly across the country. Furthermore, a suitably qualified Environmental Supervisor will be employed during the construction stage to monitor the effectiveness of these measures on a daily basis. The Environmental Supervisor will be supported and assisted by members of the BnM Ecology Team as required.

The watercourse crossing, drainage and water quality measures have been developed using relevant legislation, guidance and literature including:

Watercourse crossing works and aquatic habitat protection guidance

- Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries during construction works in and Adjacent to Waters;
- NRA (2008) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes; and,
- OPW (2013) Construction, Replacement or Alteration of Bridges and Culverts.
- EPA Ireland; Managing the Impact of Fine Sediment on River Ecosystems

Pollution Prevention Guidance Notes (PPGs) & Guidance for Pollution Prevention (GPP)[6]

- PPG 1: Understanding your environmental responsibilities - good environmental practices
- GPP 2: Above ground oil storage tanks
- PPG 3: Use and design of oil separators in surface water drainage systems
- GPP 4: Treatment and disposal of wastewater where there is no connection to the public foul sewer
- GPP 5: Works and maintenance in or near water
- PPG 6: Working at construction and demolition sites
- PPG 7: Safe storage - The safe operation of refuelling facilities
- GPP 8: Safe storage and disposal of used oils
- GPP 8: Safe storage and disposal of used oils
- GPP 8: Safe storage and disposal of used oils
- GPP 19: Vehicles: Service and Repair
- GPP 21: Pollution incident response planning
- GPP 22: Dealing with spills
- GPP 26 Safe storage - drums and intermediate bulk containers
- PPG 27: Installation, decommissioning and removal of underground storage tanks

Construction Industry Research and Information Association (CIRIA)[7]

- CIRIA Report C502 Environmental Good Practice on Site;

[6] https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/

[7] Available from https://www.ciria.org/

- CIRIA Report C532 Control of Water Pollution from Construction Sites: Guidance for consultants and contractors;
- CIRIA Report C648 Control of Pollution from Linear Construction Project; Technical Guidance;
- CIRIA Handbook C650 Environmental good practice on site;
- CIRIA Handbook C651 Environmental good practice on site checklist;
- CIRIA Report C609 - SuDS – hydraulic, structural & water quality advice; and,
- CIRIA Report C697 – The SuDS Manual.

Invasive Species Guidance

- Managing Japanese knotweed on development sites - The Knotweed Code of Practice produced by the Environmental Agency (2013)[8];
- NRA Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (2010)[9];
- Managing Invasive Non-native Plants in or near Freshwater, Environment Agency (2010)[10];
- Best Practice Management Guidelines Japanese knotweed *Fallopia japonica*, Invasive Species Ireland (2015);
- IFI Biosecurity Protocol for Field Survey Work, Inland Fisheries Ireland (2010[11]).

Guidance relating to Bird Disturbance

- Livesey et al., (2016) Database of bird flight initiation distances to assist in estimating effects from human disturbance and delineating buffer areas. Journal of Fish and Wildlife Management 7: 181–191.
- Scottish National Heritage (2009) Monitoring the impact of onshore wind farms on birds - January 2009. Guidance Note.
- Scottish National Heritage (2016) Dealing with Construction and birds. Guidance Version 3.
- Scottish National Heritage (2017) Survey Methods for Use in Assessing the Impacts of Onshore Windfarms on Bird Communities. Version 2. https://www.nature.scot/recommended-bird-survey-methods-inform-impact-assessment-onshore-windfarms
- Fox, T. & Stroud, D.A. (2002). The Greenland White-fronted Goose *Anser albifrons flavoristis.* BWP Update 4:65-88.
- Hayhow, D.B. *Consequences of winter habitat use in a migratory shorebird.* Thesis submitted for the degree of Doctor of Philosophy at the University of East Anglia, Norwich, 2009

[8] http://cfinns.scrt.co.uk/wp-content/uploads/2014/06/2013-code-of-practice.pdf

[9] https://www.tii.ie/technical-services/environment/construction/Management-of-Noxious-Weeds-and-Non-Native-Invasive-Plant-Species-on-National-Road-Schemes.pdf

[10] https://www.midsussex.gov.uk/media/1725/managing-invasive-non-native-plants.pdf

[11] https://www.fisheriesireland.ie/Biosecurity/biosecurity-protocol-for-field-survey-work.html

Guidance relating to Mammal Disturbance

- OPW (2013) Construction, Replacement or Alteration of Bridges and Culverts[12].
- National Roads Authority. Guidelines for the treatment of Otters prior to the construction of National Road Schemes. https://www.tii.ie/tii-library/environment/construction-guidelines/Guidelines-for-the-Treatment-of-Otters-prior-to-the-Construction-of-National-Road-Schemes.pdf

Implementation of Mitigation Measures

The Mitigation Measures (Project Design measures, Management Plans, Environmental Emergency Procedures and Best Practice Measures) will be implemented by the Project Manager/PSCS and BnM Project Staff during the Decommissioning and Rehabilitation stage. Implementation of the Mitigation Measures, will be implemented under the current Environmental Management Plan for Bunakinly-Kilgarvan Bog Decommissioning and Rehabilitation.

All protection measures have been designed in line with Best Practice and constitute the Best Available techniques following scientific literature and field baseline verification. As such there is a very high degree of confidence in their likely success.

Implementation of the mitigation measures for the Decommissioning and Rehabilitation activities will be the responsibility of Bord na Móna Operations and supervision of the works will be carried out by this Bord na Móna Department incorporating Area leaders, Operations Managers and Project Supervisor Construction Stage (PSCS).

In addition, implementation of the mitigation measures will be monitored and inspected by Bord na Móna Environmental, Ecology and Engineering Departments, who are independent of Bord na Móna Operations. Project Ecologists, Engineers and Environmental Compliance Officers will be appointed for each bog and they will ensure that measures are carried out in accordance with an Site-Specific Environmental Management Plan which sets out the required mitigation measures for each bog and defines the pertinent individual roles. The Ecologist, Environmental Compliance Officer, Engineer, H & S Manager, Site Supervisor and PSCS will have a 'stop works' authority.

Degree of confidence in the likely success of the mitigation measure

All protection measures have been designed in line with Best Practice and constitute the Best Available techniques following scientific literature and field baseline verification. As such there is a very high degree of confidence in their likely success.

Monitoring of the Implementation and Effectiveness of the Mitigation Measures

A degree of Monitoring is required under Condition 10.1 of the IPC license under which Peat Extraction and now Decommissioning and Rehabilitation is to take place. This environmental monitoring carried out during the aftercare and maintenance period of Decommissioning and Rehabilitation, has to ensure no Environmental Pollution has been caused, and is subject to an Independent Closure Audit (ICA) followed by an EPA Exit Audit (EA) in order to facilitate IPC License surrender.

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

[12] https://www.gov.ie/en/publication/957aa7-consent-requirements-constructionalteration-of-watercourse-infrastru/

- 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 neighbour's 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, if required, for further practical rehabilitation measures.
- The **baseline condition of the site will be established** post-rehabilitation implementation by using an aerial drone survey to take an up to date aerial photo, when rehabilitation is completed. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated, if required.
- A **water quality monitoring programme** at the bog will be established. The main objective of this water quality monitoring programme will be to establish a baseline and then monitor the impact of peatland rehabilitation on water quality from the bog. Monitoring of key environmental variables will include: Ammonia, Phosphorous, Suspended solids (silt), pH and conductivity. Water quality samples will be collected from the main drainage system from the bog at a designated point, before water leaves the site. Water quality samples will be collected at monthly intervals.
- If, after three years, key criteria for successful rehabilitation are being achieved and critical success factors are being met, then the water quality monitoring programme will be reviewed, with consideration of potential ongoing research on site. The water quality data, the drone surveys and the habitat mapping will be collated and will be submitted to the EPA as part of the final validation report.
- If, after three years, key criteria for successful rehabilitation have **not** been achieved and critical success factors 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, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the appropriate assessment process and planning procedures.

How any mitigation failure will be addressed

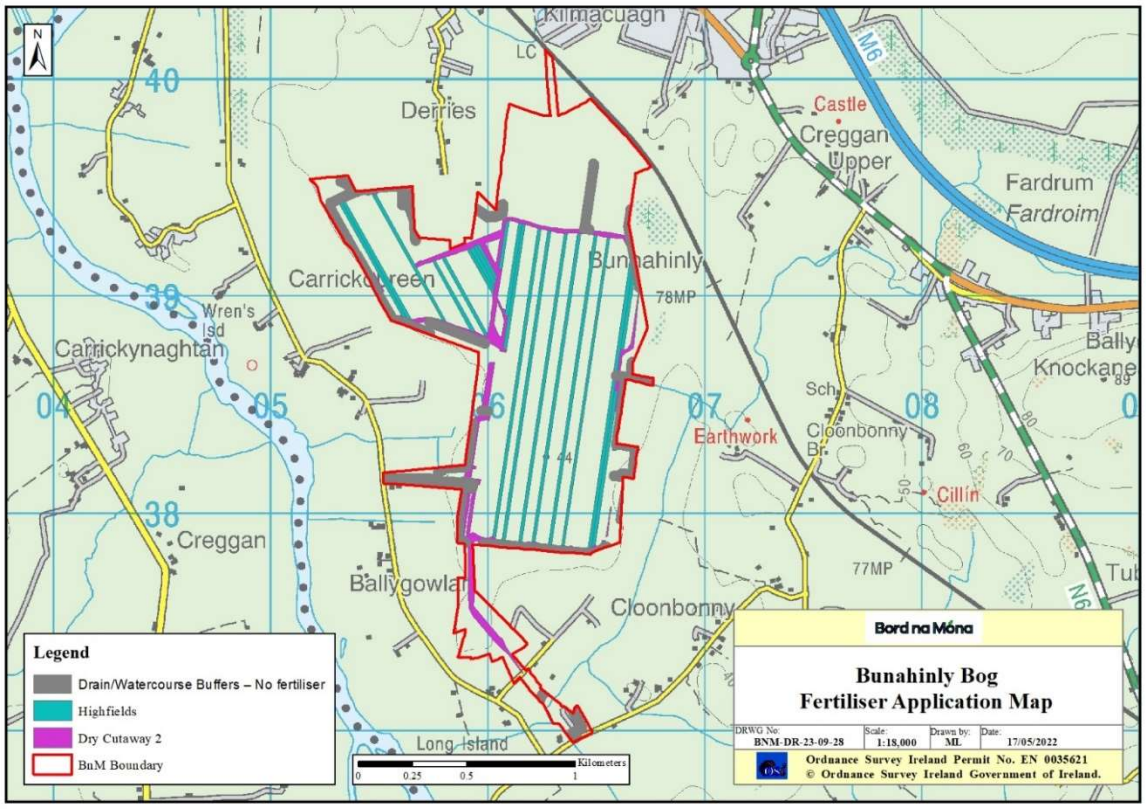
The Mitigation measures prepared specifically for this project have been designed in line with Best Practice and constitute the Best Available techniques following scientific literature and Best Practice. The Mitigation Measures are considered to be robust and proven measures which will avoid adverse effects to European Sites.

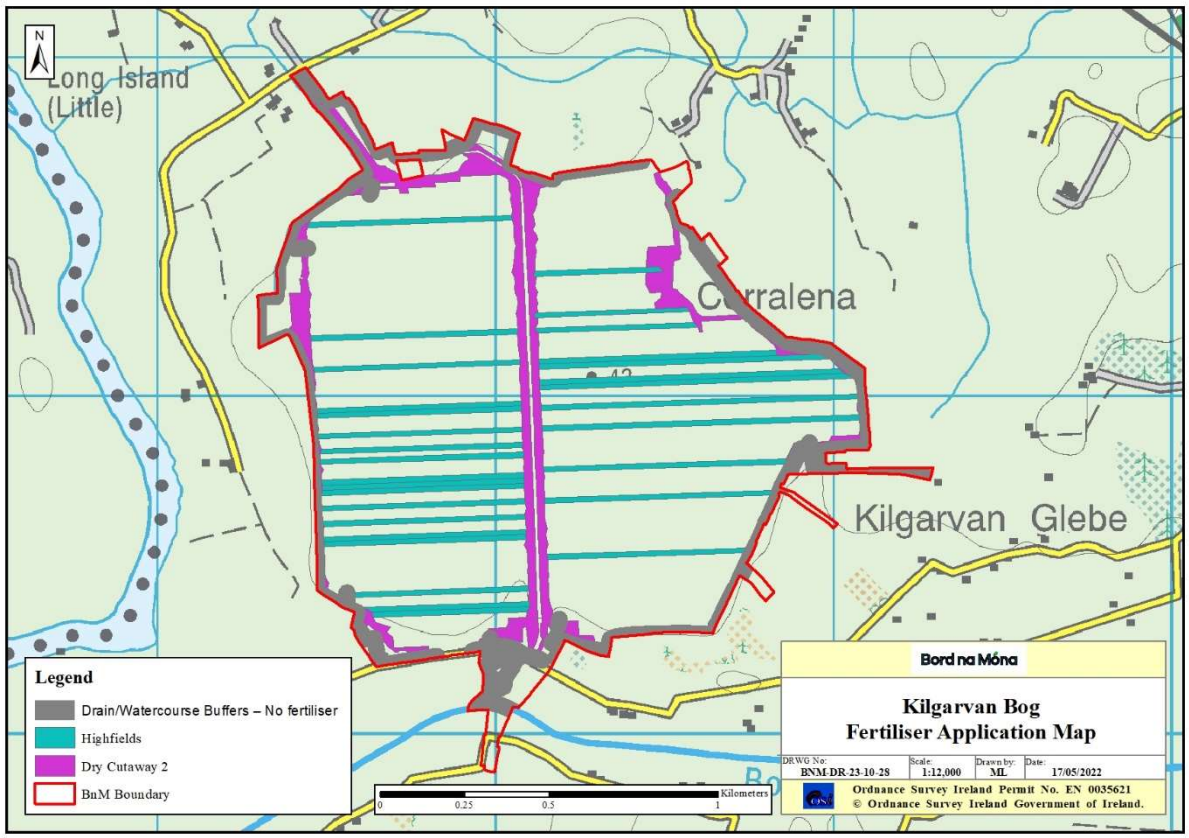
On this basis, it can be confidently concluded that failures in the mitigation measures and their prescribed outcomes will be avoided.

Nonetheless contingency measures will be in place for unforeseen events such as oil/fuel spillages, water pollution or any inadvertent release of sediment. This will ensure any unforeseen potentially adverse effects are identified in a timely manner and appropriate remedial action taken immediately. The Ecologist, Environmental Compliance Officer, Engineer, H & S Manager, Site Supervisor and PSCS will have a 'stop-works' authority to

temporarily stop works over part of the site to avoid an infringement of the Environmental Commitments or an unforeseen environmental event. Works will not be allowed to re-commence until the issue is resolved.

Fertiliser Application Maps





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

In the event that the 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 and Ireland's National Recovery and Resilience Plan.

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 Bunahinly-Kilgarvan.
- EPA IPC Licence - Ref. P0502-01. 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. Bunahinly-Kilgarvan is part of the Blackwater group.
- The current condition of Bunahinly-Kilgarvan. This site has gravity drainage.
- 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 Bunahinly-Kilgarvan will be left unblocked as blocking boundary drains could affect adjacent land.

Rehabilitation goals and outcomes

The key rehabilitation goal and outcome for Bunahinly-Kilgarvan is environmental stabilisation of the site via re-wetting and establishment of pioneer peatland habitats. 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 run-off of suspended solids 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).
- 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.

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 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 wet areas.
- 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:

- 2022. 1st phase of rehabilitation. Field drain blocking.
- 2022-2024. 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.
- 2024-2026. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- 2024-2026. Decommission silt-ponds, if necessary.

Table AP-1. Rehabilitation measures and target area.

Type	Code	Description	Area (Ha)
Dry Cutaway	DCT1	Limited drain blocking, modifying outfalls and managing water levels with overflow pipes	43.41
Deep Peat	DPT1	Regular drain blocking (3/100 m) + modifying outfalls and managing water levels with overflow pipes	269.51
Marginal Lands	MLT1	No work required	63.06
Constraint	Constraint	No work required	11.89
Wetland	WLT1	Modifying outfalls and managing water levels with overflow pipes	2.93
Silt Ponds	Silt Ponds	Silt Ponds	2.33
Total			**393.12**

See Drawing number BNM-DR-23-09-20 titled **Bunahinly Bog: Standard Rehab Measures** and Drawing number BNM-DR-23-10-20 titled **Kilgarvan Bog: Standard Rehab Measures** included in the accompanying Mapbook(s) which illustrate the standard rehab measures to be applied.

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, asses 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.

APPENDIX II: BOG GROUP CONTEXT

The Blackwater Bog Group IPC Licensed area is made up of three sub-groups (Attymon, Blackwater and Derryfadda) and have been in industrial peat production for several decades. The majority of sites are situated alongside the Shannon and Suck Rivers within counties Roscommon, Galway, Westmeath and Offaly and cover an overall area of 15,515 ha. 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 Shannonbridge (WOP) and Lanesborough (LRP).

Industrial peat extraction in the Blackwater Bog Group ceased in 2019. Remaining milled peat stocks were supplied to Shannonbridge (WOP) and Lanesborough (LRP) during 2020. Both power stations closed at the end of 2020. Decommissioning and rehabilitation for the Blackwater Bog Group at part of PCAS started in 2021. Several bog had been rehabilitated in previous years.

A number (6) of bogs were initially drained but have never been used for industrial peat production (three former development bogs (Kellysgrove, Tirrur-Derrymore and Newtown-Loughgore), Clonboley, Killeglan and Derrydoo-Woodlough). The latter three bogs are classed as restored raised bogs, still contain active bog habitat (that qualifies as the Annex I EU Habitats Directive habitat) and now form the core of the Bord na Móna Raised Bog Restoration Project due to their high biodiversity value and bog restoration potential. NPWS have identified the Clonboley bog cluster as having high ecological value within the recent assessment of raised bog SACs, NHAs and non-designated sites (NPWS 2014[13]).

Several sections of Tirrir-Derrymore bog have been leased to NPWS for domestic turf cutting as part of the SAC turf-cutting compensation scheme. Turf-cutters from neighbouring SACs have been relocated to this site by NPWS. Several other bogs are being assessed for similar use.

The depth of remnant peat within Blackwater bog units will have a very significant impact on the development of these sites, with deeper peat (Derryfadda milled peat production bogs) having potential for the establishment of embryonic peat-forming (*Sphagnum*-rich) vegetation communities. Milled peat cutaway (such as at Blackwater) develops in a somewhat different way as in places the underlying gravel is exposed, there is significant alkaline influence on the water chemistry and in many of these cutaway bogs will develop fen and wetlands due to the local topography, hydrology and water chemistry.

A breakdown of the component bog areas for the Blackwater Bog Group IPC License Ref. PO502-01 is outlined in Table Ap-2.

Table Ap-2a: Blackwater Bog Group names, area and indicative status (Attymon sub-group)

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Attymon	336	Cutover Bog Industrial peat production commenced at Attymon Bog in 1941 and ceased in 2019. Attymon is a deep peat cutover bog.	Attymon Bog formerly supplied fuel sod peat. Coillte have developed a portion of the former production area for conifer forestry. Rehabilitation ongoing	2109	Finalised 2018

[13] http://www.npws.ie/peatlandsturf-cutting/nationalraisedbogsacmanagementplan/

Cloonkeen	252	Cutover Bog Industrial peat production commenced at Cloonkeen Bog in 1953 and ceased in 2019. Cloonkeen Bog is a deep peat cutover bog.	Cloonkeen Bog formerly supplied fuel sod peat. Coillte have developed a portion of the former production area for conifer forestry. Rehabilitation ongoing	2019	Finalised 2018
Derrydoo-Woodlough	452	Development Bog Derrydoo-Woodlough Bog was drained in the 1980s in anticipation of industrial peat production. No industrial peat harvesting ever took place.	Bog restoration was carried out in 2013-2014 Rehabilitation (bog restoration) now complete.	N/A	Finalised 2012
Tirrur-Derrymore	422	Development Bog This bog was drained in the 1980s in anticipation of industrial peat production. No industrial peat harvesting ever took place.	This bog has significant raised bog restoration potential. Section leased to NPWS as a SAC turf-cutting relocation site.	N/A	Updated 2020
Newtown-Loughgore	448	Development Bog This bog was drained in the 1980s in anticipation of industrial peat production. No industrial peat harvesting ever took place.	Some sod turf production Bog restoration was carried out in 2019-2020 Rehabilitation (bog restoration) nearly complete.	2020	Finalised 2018
Killeglan	581	Development Bog This bog was drained in the 1980s in anticipation of industrial peat production. No industrial peat harvesting ever took place.	Bog restoration was carried out in 2013-2014 Rehabilitation (raised bog restoration) complete	N/A	Finalised 2016
Cloonboley 1	675	Development Bog This bog was drained in the 1980s in anticipation of industrial peat production. No industrial peat harvesting ever took place on the main section.	A small sub-section has been used for sod turf production. Bog restoration was carried out in 2013-2014 Rehabilitation (raised bog restoration) complete	2020	Finalised 2014
Cloonboley2	203	Development Bog This bog was drained in the 1980s in anticipation of industrial peat production. No industrial peat harvesting ever took place.	Bog restoration was carried out in 2013-2014 Rehabilitation (raised bog restoration) complete	N/A	Finalised 2016

Table Ap-2b: Blackwater Bog Group names, area and indicative status (Blackwater sub-group)

Bog Name	**Area (ha)**	**Stage of development**	**Land-Use and History**	**Peat Production Cessation**	**Rehab Plan Status**
Ballaghhurt	597	Cutaway Bog Industrial peat production commenced at Ballaghhurt Bog in 1981. The majority of the site is	Ballaghhurt Bog formerly supplied a range of commercial functions including horticultural peat and fuel peat. Pioneer cutaway vegetation communities are naturally developing on some cutaway areas.	2020	Draft 2017

		cutaway with some residual deeper peat			
Belmont	316	Cutaway Bog Industrial peat production commenced at Belmont Bog during the 1950's. The majority of the site is cutaway.	There are some areas of pioneer cutaway vegetation communities naturally colonising cutaway sections. Coilte have developed a portion of the bog for forestry. Rehabilitation under the PCAS scheme commenced in 2021.	2020	Finalised 2021
Blackwater	2,303	Cutaway Bog Industrial peat production commenced at Blackwater Bog during the 1950's. The majority of the site is cutaway.	Bloomhill Bog formerly supplied milled horticultural peat and fuel peat. There is extensive development of emergent cutaway vegetation communities across the former production area. The site has been used for experimental forestry (BOGFOR) and other conifer plantations. Part of the site was rehabilitated with lake and wetland creation. An ash facility took ash from Shannonbridge Power station	2020	To be updated 2021
Bloomhill	883	Cutover Bog Industrial peat production commenced at Bloomhill Bog during 1981. The majority of the site still has relatively deep residual peat.	Bloomhill Bog formerly supplied milled horticultural peat and fuel peat. Much of the former peat production area is bare peat.	2020	To be updated 2021
Bunahinly-Kilgarvan	389	Cutover Bog Industrial peat production commenced at Bunahinly-Kilgarvan Bog during the 1990's. Residual Deep peat remains on these bogs.	Bunahinly-Kilgarvan formerly supplied milled horticultural peat and fuel peat. Much of the former production area is bare peat. Part of Bunahinly has been re-wetted.	2020	To be updated 2021
Glebe	132	Cutover Bog Industrial peat production commenced at Glebe Bog during the 1990's. Residual deep peat remains on these bogs.	Glebe Bog formerly supplied milled; horticultural peat and fuel peat. Glebe bog is still listed as a pNHA. Much of the former production area is bare peat.	2020	Draft 2017
Clooniff	523	Cutover & cutaway Bog Industrial peat production commenced at Clooniff Bog during the 1970's. A mosaic of variable peat depths remains on this bog.	Clooniff Bog formerly milled fuel peat. Much of the former production area is bare peat or wetland. Some emergent vegetation communities are naturally colonising cutaway areas. Reduced pumping has created a large wetland in one area. Rehabilitation under the PCAS scheme commenced in 2021.	2020	Finalised 2021
Cornafulla	460	Cutover Bog Industrial peat production commenced at Cornafulla Bog in 1987. This bog still retains relatively deep residual peat.	Cornafulla Bog formerly supplied milled horticultural peat and fuel peat. Much of the former production area or cutaway is bare peat.	2020	Draft 2017
Cornaveagh	492	Cutover Bog Industrial peat production commenced at Cornaveagh Bog in	Cornaveagh Bog formerly supplied milled horticultural peat and fuel peat.	2020	Draft 2017

		1970's and ceased in 2020. This bog still retains relatively deep residual peat.	Much of the former production area footprint or cutaway is bare peat.		
Culliaghmore	442	Cutover Bog Industrial peat production commenced at Culliaghmore Bog in 1960's and ceased in 2020. Much of this bog is cutaway, with some pockets of deeper residual peat.	Culliaghmore Bog formerly supplied milled horticultural peat and fuel peat. Much of the former production area footprint or cutaway is bare peat. Some pioneer cutaway vegetation communities are naturally colonising cutaway areas.	2020	Draft 2017
Garryduff	970	Cutaway Bog Industrial peat production commenced at Garryduff Bog in 1960's. The majority of this bog is cutaway.	Much of the former production area footprint or cutaway is bare peat. Extensive natural development of pioneer cutaway vegetation communities is present on cutaway areas. Rehabilitation measures have commenced at Garryduff in 2021..	2020	Finalised 2021
Kellysgrove	201	Development Bog Kellysgrove Bog was drained in the 1980s in anticipation of industrial peat production. No peat harvesting ever took place.	The site retains degraded raised bog vegetation. Kellysgrove Bog retains significant raised bog restoration potential. A way-marked walking trail is positioned along the old Ballinasloe Canal. Rehabilitation measures have been completed at Kellysgrove in 2021.	2020	Finalised 2021
Kilmacshane	1,294	Cutaway Bog Industrial peat production commenced at Kilmacshane Bog in 1960's. The majority of this bog is cutaway with some pockets of deeper peat remaining.	Kilmacshane Bog formerly supplied milled horticultural peat and fuel peat. Some pioneer cutaway vegetation communities are naturally colonising cutaway areas and water levels have risen as pumping reduced, creating wetlands. Rehabilitation measures have commenced at Kilmacshane in 2021.	2014	Finalised 2021
Lismanny	449	Cutaway Bog Industrial peat production commenced at Lismanny Bog in 1960's. The majority of this bog is cutaway with some pockets of deeper peat remaining.	Lismanny Bog formerly supplied milled horticultural peat and fuel peat. Much of the former production area footprint is bare peat. Some pioneer cutaway vegetation communities are naturally colonising cutaway areas.	2020	Draft 2021

Table Ap-2c: Blackwater Bog Group names, area and indicative status (Derryfadda sub-group)

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Derryfadda	610	Cutover bog Industrial peat production commenced at Derryfadda Bog in 1980's. This bog still retains residual deep peat.	Derryfadda Bog formerly supplied milled horticultural peat and fuel peat. Much of the former production area is bare peat. Some pioneer cutaway vegetation communities are naturally colonising cutaway areas.	2020	To be updated 2021

Boughill	415	Cutover bog Industrial peat production commenced at Boughill Bog in 2008. This bog still retains residual deep peat.	Boughill Bog formerly supplied milled horticultural peat and fuel peat. Much of the former production area footprint or cutaway is bare peat.	2020	Draft 2017
Castlegar	517	Cutover bog Industrial peat production commenced at Castlegar Bog in 2001. This bog still retains residual deep peat.	Castlegar Bog formerly supplied milled horticultural peat and fuel peat. Much of the former production area is bare peat. The adjacent Annaghbeg Bog NHA is an intact undrained raised bog Rehabilitation measures have commenced at Castlegar in 2021.	2019	Finalised 2021
Gowla	650	Cutover bog Industrial peat production by BnM commenced at Gowla Bog in 1970's. Development for sugar production was in place at Gowla since the 1950's. This bog still retains residual deep peat.	Gowla Bog formerly supplied milled horticultural peat and fuel peat. Much of the former production area footprint is bare peat.	2020	Draft 2017

See Drawing number BNM-DR-23-09-24/BNM-DR-23-10-24 titled **Derryfadda Bog Group**, included in the accompanying Mapbook(s) which illustrates the location of Bunahinly-Kilgarvan and the Blackwater Bog Group in context to the surrounding area.

APPENDIX III: ECOLOGICAL SURVEY REPORT

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

Bog Name:	**Bunahinly-Kilgarvan**	**Area (ha):**	393.4 ha (972.0 acres)
Works Name:	Blackwater	**County:**	Westmeath
Recorder(s):	MMC & DF	**Survey Date(s):**	12/11/2010

Habitats present (in order of dominance)
The most common habitats present at this site include:

- Bare Peat (BP) (production bog and travel paths) (Codes refer BnM classification of pioneer habitats of production bog. See Appendix II).
- Bare peat and dry heath mosaic (BP/dHeath) (with or without Purple Moorgrass – gMol) (establishing on older production bog)
- Bare peat, dry heath and Bog Cotton-dominated vegetation (BP, dHeath & pEang) establishing at north of site
- Gorse scrub (eGor)
- Dry grassland (Da-Arr) (along bog margin)
- Silt ponds (including ridges of spoil and adjacent land with gMol and dHeath in general)
- Riparian zones (with scrub along verges)
- Works area

The most common habitats present around the margins at this site include:

- Raised bog (PB1) (several fragments) (Codes refer to Heritage Council habitat classification, Fossitt 2000), See Appendix II.)
- Scrub (WS1) (Gorse scrub and Birch scrub developing of dry high bog around margins)
- Bog woodland (WN7)
- Conifer plantation (WD4) (minor screen of Pine planted around margin at northern end of site).
- Cutover bog (PB4) (several small fragments)
- Improved grassland (GA1) (several small patches where BnM boundary extends over adjacent fields)
- Wet grassland (GS4) (several small patches where BnM boundary extends over adjacent fields)
- Depositing river (Boor River)

Description of site
Bunahinly-Kilgarvan Bog is located 1 km south of Athlone in Co. Westmeath. It is also adjacent to the River Shannon, which is situated between 50-150 m away from the western boundary of the site. The site is actually two separate main bogs that are connected via a narrow strip of peatland with Bunahinly to the north and Kilgarvan to the south. This site is located in a low-lying area and the adjoining grassland to the west is prone to inundation. At the time of the survey, much of this land was experiencing rising water levels and there were groups of wintering waders such as Golden Plover and Lapwing roosting and flying around the general area. Much of the adjacent land to the west of the site is designated as part of the Shannon Callows cSAC and pNHA and Middle Shannon Callows SPA. This area is of ornithological importance for wintering and migratory waterbirds.
The two bogs are relatively young in production terms, and only came into production in the 1990s. Both bogs still have deep peat and the surface peat is a red/brown *Sphagnum* peat and is acidic. This is significantly affecting the type of re-vegetation on parts of the bog where there has been no production for several years with typical raised bog species such as Hare's-tail bog Cotton much more common compared to more typical cutaway bog developing on fen peat. However, *Sphagnum* spp. regeneration is quite rare in extent in the drains and on the production bog. As production is relatively limited and relatively little peat has been removed so far, both bogs are still quite high. The heavy rainfall levels and accumulation of surface water during the of winter 2009 did not affect the production bog but a significant amount of land between the two bogs and along the Shannon Callows was under water for some time, including some of the works area and the silt pond and grassland areas at the southern end of Kilgarvan.

Bunahinly

The majority of this bog was mapped as bare peat and is relatively 'clean' with very little recolonisation of vegetation. There are tall stockpiles regularly spaced through the bog and these seem to have been left in-situ for several years as Heather is growing on the peat that covers the plastic. No actual harvesting has been carried out since 2005 but main production area has been kept 'clean' by the miller etc. These stockpiles will be taken off the site in the near future. This area is mapped as being 'available' for production.

There is a small side-arm to this bog along the western side. The bog is generally quite firm and dry and there are deep (1-2 m) active drains with running water. Activity within this area seems to have been less intensive over the past few years and there has been some recolonisation of vegetation on the bog surface. This is mainly represented by small developing Heather bushes and most of the area is mapped as a bare peat and pioneer dry heath mosaic (BP/dheath) (although the vegetation cover is generally about 33%). There are also some patches of *Campylopus introflexus* moss developing on the bare peat. Other common species include Purple Moorgrass, Common Bog Cotton, Bulbous Rush, Soft Rush and Hare's Tail Bog Cotton. Less frequent species include Birch, Bog Asphodel, Deergrass, Tufted Hairgrass, Heath Sorrel, Heath Bed-straw, Male Fern, Star Sedge, Tormentil, Carnation Sedge, Cross-leaved Heath, *Cladonia* spp., *Polytrichum commune* and *Polytrichum juniperum.*

Recolonisation is best-established along the bases of old stockpiles where a strip of Heather-dominated vegetation has established. Birch, Gorse, Bramble and Broad-Buckler Fern have also established along these strips. Several very small patches of S. *papillosum* were noted in these zones. Some sections are dominated by Purple Moorgrass. Further west, Purple Moorgrass becomes much more prevalent in the production files and in the regeneration along the western stockpile. This area was a former flush (PF2) dominated by Purple Moorgrass on the high bog (visible from the 2000 aerial photos). Bog Myrtle is also present in the recolonising vegetation. Some small areas have 100% vegetation cover dominated by Purple Moorgrass and Heather.

Several drains close to the western stockpile did have impeded drainage and *S. cuspidatum* did appear in the drains with S. *papillosum* and *S. capillifolium* forming some hummocks along the edges of the drains. Other sections of the drains were lined with Soft Rush and Bulbous Rush with no *Sphagnum* cover. Some parts of the drains were infilling with Heather and Purple Moorgrass.

Further north in the small western side-arm there was a small area that had been ditched but it did not seem to have gone into production. This area has re-vegetated well (perhaps the vegetation was never cleared) with about 10% bare peat and was dominated by Heather and Bog Asphodel. There were hummocks of S. *papillosum*, *S. subnitens* and *S. capillifolium* on the bog and *S. cuspidatum* was present in the drains. The bog was quite firm and Birch and pine saplings were also present on the high bog.

Part of the northern end of the site has now been 'cut off' from the rest of the production bog by a fire-break (drainage ditch). This area has come out of production as there is a recent commercial development adjacent to this area and there were concerns about dust and fire risk from the site affecting this development. The stock-piles were removed from this section or production was never intensive. The former production fields are now re-colonising with a mosaic of bare peat, dry heath (dHeath) and Bog Cotton (pEang). Vegetation cover was > 50% in places and recolonisation was more established compared to the western side-arm. (This vegetation community is classified as pEang due to the dominance of Bog Cotton. However, it is significantly different to the pEang community found on cutaway developing on fen peat and there are no base-rich indicators such as Common Mint and Pointed Spear-moss (*Calliergonella cuspidata*) present.). There are several small patches of Purple Moorgrass-dominated vegetation (gMol) and further east this community is greater in extent. Other common species present include Bog Asphodel, Carnation Sedge (*Carex panicea*) and Hare's-tail Bog Cotton. *Campylopus introflexus* is the main moss coloniser and no *Sphagnum* was noted on the former production fields, which were generally quite dry and firm.

The vegetation regeneration is much more typical of regeneration of cutover bog. Lodgepole Pine saplings are relatively frequent around the margins of this section adjacent to the narrow band of conifers that were planted on the margins and are obviously spreading onto the bog. The bog is quite firm and the drains are active with flowing water and relatively 'clean' of recolonising vegetation. *Sphagnum* regeneration was relatively rare in the drains and appeared at the head of some drains where there was some drainage impedance. Drainage of this area seems to flow north towards a head drain running along the boundary of the site and flowing into a series of old silt ponds.

Several areas have been used for the production of mini-sod peat. These small sods were stored in stockpiles along the southern and eastern sections of the site.

A railway line runs along the boundary of the north eastern corner of the site. Between the railway line and the area of bog that was under industrial peat production until 2005 lies a small valley. This area appears to have been used in the past for turf cutting but it has now revegetated. The lowest lying areas here were waterlogged with Bog Cotton, Reedmace (*Typha latifolia*), *Sphagnum cuspidatum*, *S. capillifolium*, *Aulacomnium palustre* and Bottle Sedge (*Carex rostrata*). The sections alongside the railway line were raised and contained a mixture of Birch woodland and wet grassland. Areas of Birch woodland had also developed in this area where the old

cutaway meets the newer industrial peat areas. A silt trap is also located within this area along with a small area that has been planted with Lodgepole Pine (*Pinus contorta*) over 25 years ago. Within the past 10 years, a tree line has been planted along the boundary of the industrial peat harvesting area. This tree line consisted of a mixture of Scot's Pine and Leylandii and was likely planted in order to reduce dust from peat harvesting operations from blowing across the railway line to some of the commercial areas of Athlone.
The vegetation of the marginal areas is quite typical with small patches of remnant raised bog (PB1) being colonised by scrub (Birch and Gorse), with some established Birch woodland (WN7). Some adjacent cutover bog (PB4) is relatively old and has developed Heather-dominated vegetation (typical of face-banks). There is active domestic cutting of peat along the southern side of the western side-arm and this area has some relatively young cutover bog (PB4).

Kilgarvan

There has been ongoing production over nearly all of this bog. The production bog is also quite clean with bare peat and virtually no recolonisation. There is a small area towards the east side where Gorse has been allowed to re-colonise on a small mound. This bog also has deep drains with running water. There is still a definite mound towards the centre of the bog from the margins. A temporary railway divides the bog into two main sections and runs the length of the bog.
The north side and east sides contain some Birch woodland that has developed on old cutover bog. This woodland is dominated by Birch and also contains some Pine. The ground cover is species-poor and dominated by Bramble and Bracken. Gorse is also scattered through the woodland. There are also old dried out remnant patches of high bog along the margins that have tall Heather. The margin of the production bog is also used for drainage and a long drain links several silt ponds.
A narrow access point connects the southern end of Kilgarvan with Bloomhill Bog further south. Four silt ponds are located within this area with mainly wet grassland surrounding the silt ponds. Some scrub is encroaching in some areas. These silt ponds were being cleaned out at the time of the ecological survey. The Woor River flows at the south of the site, this river was in flood at the time of the ecological survey but there were indications that Otter are using it, six Mute Swans were also present on the river. The Woor River is a tributary of the River Shannon.
An important ecological feature of this site was the notable presence of Otter (spraints and footprints). Otter appear to be using the site, particularly along the western edge of the site and along the southern boundary, especially along the Woor River and the nearby silt traps. Otters are present along the nearby River Shannon and are likely to be using the site from time to time to forage for food.

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

River Shannon Callows SAC & pNHA (NPWS site code 000216)
Middle Shannon Callows SPA (NPWS site code: 004096)
The site partially overlaps the River Shannon Callows SAC & pNHA and the Middle Shannon Callows SPA in the south-western section of Kilgarvan. .

Adjacent habitats and land-use

The surrounding landscape is typically low-lying and is dominated by farmland with improved grassland. Much of the low-lying grassland adjacent to the Shannon is prone to flooding and flooding was also noted along low-lying land between the two bogs and along the Boor River at the southern end of the site. Adjacent habitats include those of reclaimed cutover bog such as scrub, Birch woodland and wet grassland. There is a commercial site located adjacent to northern end of the bog.

Watercourses (major water features on/off site)

- This site is located in the River Shannon catchment. The main Shannon channel is between 50-100 m away from the west side of the site.
- Drainage on the site links to several small tributary streams flowing west including the Boor River at the southern end of Kilgarvan.

Peat type and sub-soils

The peat is mainly a brown/red *Sphagnum*-peat. The main peat type is acidic or ombrotrophic as this is a relatively young production bog. No sub-soils have been exposed.
The site is likely to be underlain with limestone tills, as these sub-soils are exposed around the margins of the site in some of the silt ponds and underlie some of the adjacent fields with grassland. Shell Marl was exposed in some of the spoil taken from the silt ponds at the west of Bunahinly.

Fauna biodiversity

Birds

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

- Lapwing (120) loafing around the site and using grassland adjacent to the site for roosting
- Snipe (15) using the revegetating bog at the north of the site.
- Starling (50) over flew the site
- Mute Swan (6)
- Gold Finch (>15)
- Kestrel
- More common birds observed during the survey included Wren, Magpie, Blackbird, Rook (4), Pied Wagtail Blue Tit and Robin
- A Snowy Owl was observed at this site in March 2006.

Mammals

- Signs of Hare and Badger were noted on the site. Badgers seem to forage around the perimeter of the production bog while Hare are using the revegetating bog in Bunahinly.

Signs of Otter using site along the west side adjacent to Shannon. Otter sprints noted along some riparian areas and in some silt ponds.

Fungal biodiversity

Moor Club was relatively abundant on Bunahinly Bog. Other fungal species included Scurfy deceiver and Wax caps.

References

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

Crowe, O., McElwaine, J.G., Boland, H. & Enlander, I.J. 2015. Whooper Cygnus cygnus and Bewick's C. columbianus bewickii Swans in Ireland: results of the International Swan Census, January 2015. 2015. Irish Birds 10: 151-158.

Crowe, O. & Holt, C. 2013. Estimates of waterbird numbers wintering in Ireland, 2006/07-2010/11. Irish Birds 9: 545-552.

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

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

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

Wetlands International. 2015. Waterbird Population Estimates. Assessed 17 October 2015: wpe.wetlands.org.

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 bowsers. Only dedicated trained and competent personnel will carry out refuelling operations.
- Mobile storage such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers 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

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 Móna 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 plague[14] will be adhered with throughout all rehabilitation measures and activities.

[14] 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 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 Blackwater bog group (Ref. PO-502-01). 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 Blackwater 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) understand that it is the Minister's (DECC) intention to impose an obligation on Bord na Móna to develop a programme of measures, 'the Scheme', for the enhanced decommissioning, rehabilitation and restoration of boglands previously used to supply peat for electricity generation within the State. The enhanced decommissioning, rehabilitation and restoration of the peatlands funded by the Scheme (PCAS) 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, under the Scheme (PCAS), and supported by the Climate Action Fund and Ireland's National Recovery and Resilience Plan across a footprint of 33,000 ha (a subset of the BnM estate that has been used for energy production). This 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 additional costs associated with the additional and enhanced rehabilitation, i.e., those activities which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support under the Scheme.

The proposed enhanced rehabilitation detailed in this document, are predicated on the understanding that the element of the activities, over and above the 'standard' rehabilitation necessary to comply with pre-existing Condition 10 IPC Licence requirements, will be deemed eligible costs be the Scheme regulator and funded by the Climate Action Fund and Ireland's National Recovery and Resilience Plan.

For the avoidance of doubt, should the Scheme and the associated statutory obligation on Bord na Móna not materialise, Bord na Móna will not carry out the enhanced decommissioning, rehabilitation and restoration measures described in this plan. Bord na Móna will instead plan to complete an adapted standard decommissioning and rehabilitation measures required under Condition 10 and outlined in Appendix I.

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. Industrial peat production has now ceased and several other decarbonisation measures are being implemented. 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 (agreed in 2015) 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. Some of these principles have now been superseded by the company's decision to cease industrial peat extraction. The National Peatlands Strategy is currently being reviewed by Government.

5 Draft National River Basin Management Plan 2022-2027 (Water Framework Directive)

The National River Basin Management Plan (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 2018-2021 outlined 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) was part of the WFD (2018-2021) programme of measures. The NRBMP 2018-2021 takes account of the fact that Bord na Móna was 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 2018-2021 rehabilitation target was superseded by the acceleration of the Bord na Móna de-carbonisation programme and the Scheme **(PCAS)**.

The development of site rehabilitation plans and the delivery of peatland rehabilitation by Bord na Móna was expected to have a positive impact on water quality and will help the NRBMP 2018-2021 deliver its objectives in relation to the Water Framework Directive and is one of the five key principle actions.

The draft NWBMP 2022-2027 describes how the number of waterbodies impacted by peat, industry and forestry have decreased by 10, 10 and 5 waterbodies, respectively since the second cycle. Impacts on water quality and river habitat arising from peat and peat extraction and associated drainage include the release of ammonium and fine-grained suspended sediments, and physical alteration of aquatic habitats. Drainage of peatlands also results in changes to the hydromorphological condition of rivers.

The draft NWBMP 2022-2027 outlines how maintaining and restoring Irish bogs will lead to a decrease in waterborne carbon leaching to levels comparable with intact bogs as well as reducing losses of peat silt and ammonia. Vegetation on the surface of the peat can also slow the flow of water over the land surface. Based on the EPA's most recent reports, peat extraction and drainage is impacting on 106 water bodies across the country, with peat the single pressure on 28 of these water bodies. However, compared to the data in the second-cycle plan, the number of water bodies impacted by peat has decreased.

The cessation of industrial peat extraction by Bord na Móna in 2021 was expected to have a significant positive impact on water quality of receiving water courses by reducing the impact of peat extraction as a key pressure on particular water courses. This is now being supported by the results and conclusions of the draft NWBMP 2022-2027.

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.

The delivery of rehabilitation via PCAS is expected to significantly contribute in the future to actions and targets of the National Biodiversity Action Plan 2016-2021, particularly in relation to peatland restoration and creation of new habitats such as wetlands and woodlands.

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. PCAS is expected to restore several sites that will contribute to The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 targets in relation to the restoration of raised bog habitat.

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 2021-2025

The All-Ireland Pollinator Plan 2021-2025 outlines key objectives and actions to protect and support pollinating insects and the habitats they rely on. A Bord na Móna specific action in this plan includes 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, renewable energy, and economy/enterprise.

Begnagh Bog is located in an area zoned by Longford County Council as open countryside.

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 adhere to the Archaeology Code of Practise relating to management of any archaeological finds that may arise during cutaway peatland rehabilitation and decommissioning.

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 Móna s 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."*

This 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 polices.

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 industrial 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 would 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 made a further commitment to a significantly larger rehabilitation target. This was 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 planned to restore a further 1,000 hectares of raised bog habitat by 2025.

The above commitments have now been followed by the decision by the company to cease industrial peat extraction and rehabilitate a target of 33,000 ha between 2021-2025.

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, such as renewable energy.

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

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 (draft document). 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, and develop integrated land-uses, 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	Bunahinly-Kilgarvan 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	Not applicable
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.

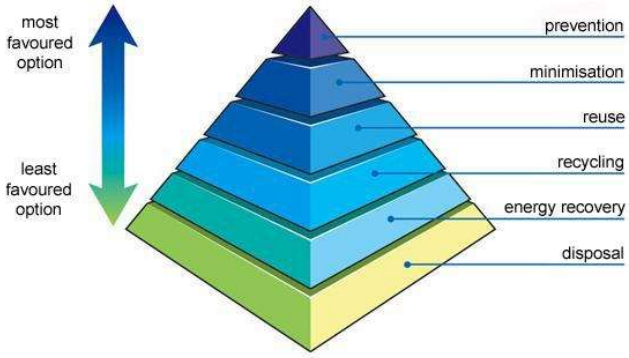
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

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	Bunahinly-Kilgarvan 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 Scheme, which is proposed to externally funded.

Enhanced rehabilitation: This is defined as rehabilitation carried out under 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 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 Scheme.

Environmental stabilisation: The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat, slowing water movement across the bog, minimising effects to downstream waterbodies and meeting the conditions of the IPC Lisence. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Habitats will develop that reflect the underlying environmental conditions. Other after-use development may also serve to act as environmental stabilisation.

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 to 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 has 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 in 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 P0502-01, Blackwater Group of Bogs in Counties Roscommon, Galway, Offaly 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 ores 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 that 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 bogs 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 31' December2012. 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 out 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	**C**lassification	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 Blackwater 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 there 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 of the Blackwater IPPC Licence P0502-01.

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:
    6. The land is waterlogged;
    7. The land is flooded, or it is likely to flood;
    8. The land is frozen, or covered with snow;
    9. Heavy rain is forecast within 48 hours (forecasts will be checked from Met Éireann).
    10. 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	Format	Date Response Received	Response Format
Bunahinly-Kilgarvan	Department of Housing, Local Government and Heritage NPWS	Multiple Staff Members	09/11/2021	Email		
Bunahinly-Kilgarvan	National Museum of Ireland	Multiple Staff Members	09/11/2021	Email		
Bunahinly-Kilgarvan	Department of Housing, Local Government and Heritage	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Dept of Agriculture Food & the Marine	General Email Contact	09/11/2021	Email	11/11/2021	Email
Bunahinly-Kilgarvan	Department of Environment, Climate and Communications	Multiple Staff Members	09/11/2021	Email		
Bunahinly-Kilgarvan	Dept of Rural and Community Development	General Email Contact	09/11/2021	Email	09/11/2021	Email
Bunahinly-Kilgarvan	Department of the Housing Local Government and Heritage	General Email Contact	09/11/2021			
Bunahinly-Kilgarvan	Minister for Environment, Climate and Communications	Minister - Eamon Ryan	09/11/2021	Email		
Bunahinly-Kilgarvan	Minister of state for Agriculture with	Pippa Hackett Minister of State for Land	09/11/2021	Email		

	responsibility for Land use and Biodiversity	Use and Biodiversity)				
Bunahinly-Kilgarvan	Oireachtas	Danielle McDonnell (Minister Malcolm Noonan Secretary)	09/11/2021	Email	15/11/2021	Email
Bunahinly-Kilgarvan	An Taisce	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Environmental Protection Agency	Multiple Staff Members	09/11/2021	Email		
Bunahinly-Kilgarvan	Inland Fisheries Ireland	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Local Authority Waters Programme	Multiple Staff Members	09/11/2021	Email		
Bunahinly-Kilgarvan	NWRA	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Teagasc	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	The Heritage Council	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Waterways Ireland	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	An Forum Uisce (The Water Forum)	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Coillte	Multiple Staff Members	09/11/2021	Email		
Bunahinly-Kilgarvan	Irish Water	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Office of Public Works	Multiple Staff Members	09/11/2021	Email	19/11/2021	Email
Bunahinly-Kilgarvan	CARO (Climate Action Regional	General Email Contact	09/11/2021	Email		

	Office) Eastern and Midlands					
Bunahinly-Kilgarvan	Bat Conservation Ireland	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Birdwatch Ireland	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Butterfly Conservation Ireland	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Eastern and Midland Regional Assembly	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Fisheries Ireland	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Friends of the Earth	General Email Contact	09/11/2021	Email	09/11/2021	
Bunahinly-Kilgarvan	Friends of the Irish Environment	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	ICMSA (Irish Creamery Milk Suppliers Association)	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	ICSA (Irish Cattle and Sheep Farmers Association	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Irish Farmers Association	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Irish Peatlands Conservation Council	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Irish Raptor Study Group	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Irish Rural Link (Community	General Email Contact	09/11/2021	Email		

	Wetlands Forum)					
Bunahinly-Kilgarvan	Irish Rural Link	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Irish Wildlife Trust	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	National Association of Regional Game Councils	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	NPWS Rangers North East	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	NUIG Galway	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	PPN Westmeath Public Participation Network	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Ranger Association Committee	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Shannon Flood Risk State Agency Co-ordination Working Group	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Sustainable Water Action Network (SWAN)	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Trinity College Dublin	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Turf Cutters and Contractors Association	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	UCD / Irish Rural Link	General Email Contact	09/11/2021	Email		

Bunahinly-Kilgarvan	University College Dublin	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Waterways Ireland	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	Woodlands of Ireland	General Email Contact	09/11/2021	Email		
Bunahinly-Kilgarvan	TD/Longford	Peter Burke	09/11/2021	Email		
Bunahinly-Kilgarvan	TD/Longford	Sorca Clarke	09/11/2021	Email		
Bunahinly-Kilgarvan	TD/Longford	Joe Flaherty	09/11/2021	Email		
Bunahinly-Kilgarvan	TD/Longford	Robert Troy	09/11/2021	Email		
Bunahinly-Kilgarvan	Westmeath County Councillors - Chief Exec	Pat Gallagher	09/11/2021	Email		
Bunahinly-Kilgarvan	Westmeath County Councillors - Director of Service	Barry Kehoe	09/11/2021	Email		
Bunahinly-Kilgarvan	Westmeath County Councillors - Director of Service	Mark Keaveney	09/11/2021	Email		
Bunahinly-Kilgarvan	Westmeath County Councillors -	Deirdre Reilly	09/11/2021	Email		
Bunahinly-Kilgarvan	Director of Services Planning, Economic and Tourism Development, Trim MD. Meath	Des Foley	09/11/2021			
Bunahinly-Kilgarvan	Westmeath County	John Dolan	09/11/2021			

	Councillors - Athlone - Moate					
Bunahinly-Kilgarvan	Westmeath County Councillors - Athlone - Moate	Tom Farrell	09/11/2021			
Bunahinly-Kilgarvan	Westmeath County Councillors - Athlone - Moate	Frankie Keena	09/11/2021			
Bunahinly-Kilgarvan	Westmeath County Councillors - Athlone - Moate	Johnny Penrose	09/11/2021			
Bunahinly-Kilgarvan	Westmeath County Councillors - Athlone - Moate	Vinny McCormack	09/11/2021			
Bunahinly-Kilgarvan	Westmeath County Councillors - Athlone - Moate	Aengus O'Rourke	09/11/2021			
Bunahinly-Kilgarvan	Westmeath County Councillors - Athlone - Moate	Liam McDaniel	09/11/2021			
Bunahinly-Kilgarvan	Westmeath County Councillors - Athlone - Moate	Jamie Moran	09/11/2021			
Bunahinly-Kilgarvan	Westmeath County Councillors - Athlone - Moate	Louise Heavin	09/11/2021			
Bunahinly-Kilgarvan	Minister of State at the Department of Housing, Local Government and Heritage	Peter Burke (Longford-Westmeath)	09/11/2021			

Bunahinly-Kilgarvan	Longford-Westmeath	Sorca Clarke	09/11/2021			
Bunahinly-Kilgarvan	Longford-Westmeath	Joe Flaherty	09/11/2021			
Bunahinly-Kilgarvan	Minister of State at the Department of Enterprise, Trade and Employment	Robert Troy (Longford-Westmeath)	09/11/2021			
Bunahinly-Kilgarvan	Iarnrod Eireann	Olivia Condron (Infrastructure)	09/11/2021			
Bunahinly-Kilgarvan	All Land- owners in vicinity of bog	Leaflet Drop	09/11/2021	Leaflet		
Bunahinly-Kilgarvan	All those with turbary rights	Leaflet Drop		Leaflet		

Table APX -2 Response summary from Consultees contacted

Organisation	Summary of Response by Stakeholder	BnM Response
Irish Farmers Association	The IFA made a submission on Bunahinly-Kilgarvan Bog 18/11/2021 raising the following points: 1) Acknowledging need to protect the environment and manage national peatlands 2) Expressing concern about possible impact of peatland rehabilitation on surrounding farmlands, specifically around the following: (a) Flooding/waterlogging of surrounding areas and development of new flood plains. (b) Health and Safety risks if water levels in drains and depressions rise then these could become a hazard for livestock, machinery operation and farmer access. (c) Negative impact on Property Values due to accumulation of risks outlined above. (d) Contingency Planning for potential future ownership of designated bogs in ensuring no negative impacts on property from any new ownership. (e) Protection of existing Turf Cutting rights and resolution of any issues around same. The IFA made a number of proposals to be considered as potential solutions to queries raised.	BnM responded on 23/11/2021 to address the concerns of raised by the IFA. Dialogue is ongoing between BnM and the IFA.

Office of Public Works	Submission received from OPW on 19/11/2021 that was supportive of the measures being undertaken and the benefits arising but also requested clarification on the following: The Bunahinly and Kilgarvan Bogs, do not overlap with any OPW Arterial Drainage Scheme. The OPW supports the BnM bog decommissioning and rehabilitation as a Nature Based Catchment Management measure in managing flood flows in the Shannon catchment and the many other environmental co-benefits from developing this project.	BnM responded on 15/12/2021 acknowledging the submission by OPW.
National Museum of Ireland	Response received 24/11/2021 acknowledging receipt of email and thanking us for making the opportunity to respond. Responded through e-mail throughout 2020/21 in relation to all PCAS bogs. Issues raised were; 1) The request that due diligence be taken during works to protect any archaeologically significant findings or areas 2) The NMI reiterated the importance of peatlands for the preservation of archaeology and requested they be consulted as part of any EIA undertaken	BnM acknowledged on 25/11/2021. Dialogue is ongoing.
Dept. of Agriculture, Food & the Marine (DAFM)	Submission by e-mail to express support for PCAS in general. Submission recommended; 1) That local landowners and stakeholders be considered as part of the consultation process. 2) EIA assessment be carried out prior to PCAS works. 3) Hydrological assessments are carried out with a view to protecting adjoining lands from adverse impacts.	BnM acknowledged and responded via e-mail on 18/11/2021 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. Dialogue is ongoing.

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

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.

Bord na Móna	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 Decommissioning and Rehabilitation at Bunnahinly and Kilgarvan Bogs, Co. Westmeath

Draft

Report For

Bord Na Móna Energy Ltd.

Author

Dr. Charles Mount

Bord Na Móna Project Archaeologist

Introduction

The EPA (2020) *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 of c.393 hectares at Bunnahinly and Kilgarvan Bogs Co. Westmeath 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 Bunnahinly and Kilgarvan Bogs 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.

Bunnahinly Bog is located The bog is located c. 3km southeast of Athlone town centre and 700m east of the River Shannon, and about 1km south-west north of the N62 Road. The overall rehabilitation area occupies the townlands of Bunnahinly, Carrickobreen, Cloonbonny, Derries and Kilmacuagh on OS 6 inch sheets Westmeath Nos. 29 and 35. Kilgarvan is located south of Bunnahinly it is 2km northwest of Ballinahown village, with the River Shannon to the west and the Boor River running along the southern extent of the bog, and about 1km south-west north of the N62 Road. The overall rehabilitation area occupies the townlands of Ballynahownwood, Cloonbonny, Corralena, Kilgarvan, on OS 6 inch sheets Westmeath No. 35.

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 Killaranny Bog. The overall extent of the rehabilitation is indicated in Fig. 1. This area was examined using information from:

- The IAWU Peatland Survey
- The Sites and Monuments Record that is maintained by the Dept of Housing, Local Government and Heritage
- The topographical files of the National Museum of Ireland.
- 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. Westmeath which was established under Section 12 of the National Monuments (Amendment) Act, 1994 was examined as part of the assessment (DAHGI 1997). This record was published by the Minister in 1997 and includes sites and monuments that were known in Bunnahinly and Kilgarvan Bogs before that date. This review established that there are no RMPs located in the proposed rehabilitation area (see Fig. 1).

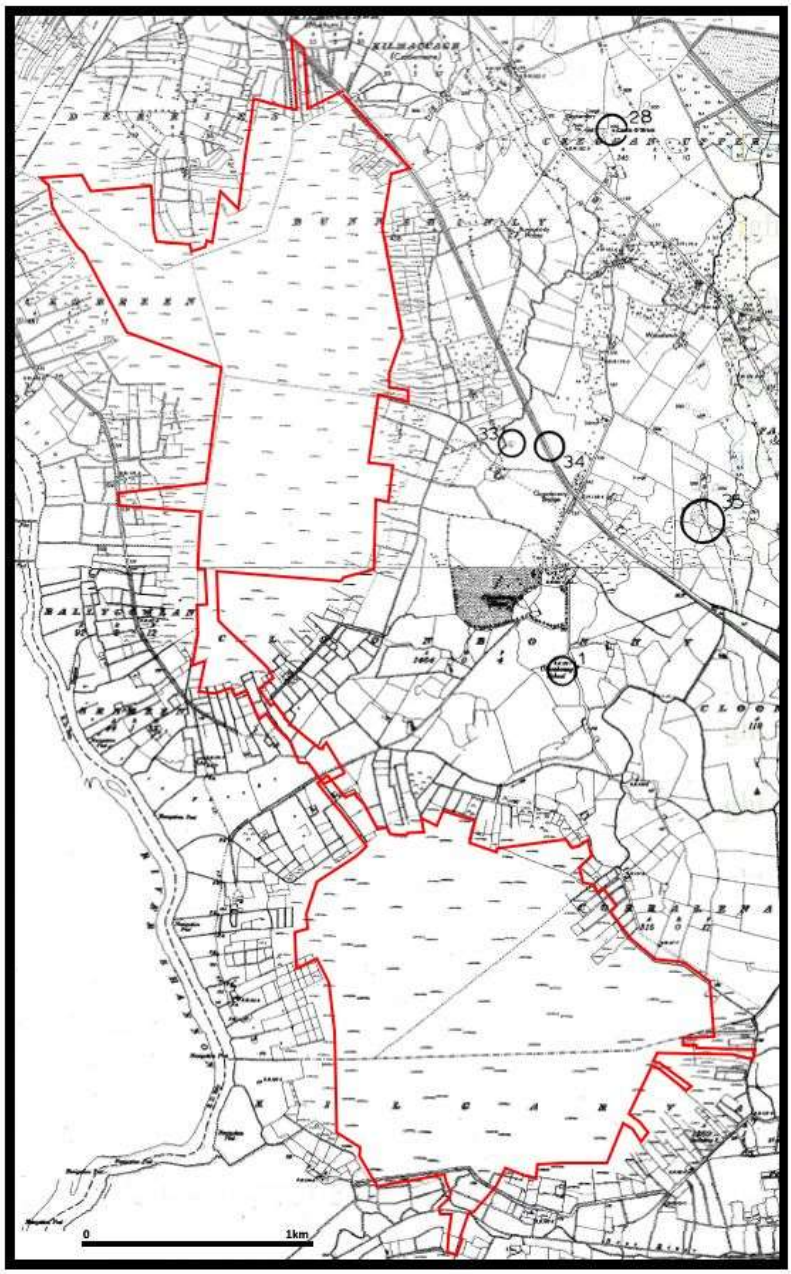


Fig. 1.Bunhinly and Kilgarvan Bogs, Co. Westmeath, detail of the Record of Monuments and Places map sheets No. 29 and 35. The proposed rehabilitation area is outlined with the red line.

Peatland survey

Bunnahinly Bog was not surveyed by the Irish Archaeological Wetland Unit (IAWU) as part of the Archaeological Survey of Ireland Peatland Survey. Kilgarvan Bog was surveyed by the IAWU in 1992 and two sightings of material were made (see Table 1). These archaeological sightings were notified to the Archaeological Survey of Ireland.

SMR_NO	SMR Class	IAWU Cat._No.	IAWU Class	Townland	1 NGR E	1NGR N	2 NGR E	2NGR N
WM035-014	Road - class 3 togher	WM-CBY 0001	TOGH	Cloonbonny	207008	236408	207340	236595
WM035-015	Structure - peatland	WM-CLA 0001	WOWO	Corralena	207660	236199	-	-

Table 1. List of sites recorded by the IAWU in Kilgarvan Bog.

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 20th of October 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 two entries in the SMR in the proposed rehabilitation area which were notified by the IAWU (see Table 1 and Fig. 2).

Later survey

Following the IAWU survey of Kilgarvin Bog in 1992 neither Bunnahinly nor Kilgarvan Bog has been the subject of any subsequent archaeological survey.

Reported finds

The topographical files of the National Museum of Ireland were searched for records of finds from the bog in x 2021 and the finds are included below in Table 3. All the finds are from Bunnahinly Bog.

Townland	Museum No.	Description
Cloonbonny	1983:62	Bronze Axehead
Carrickobreen	P1948:85	Class 4 Late Bronze Age Bronze Sword
Carrickobreen	2002:59	Leather Bag

Table 2. List of archaeological finds from Bunnahinly and Kilgarvan Bos reported to the National Museum of Ireland.

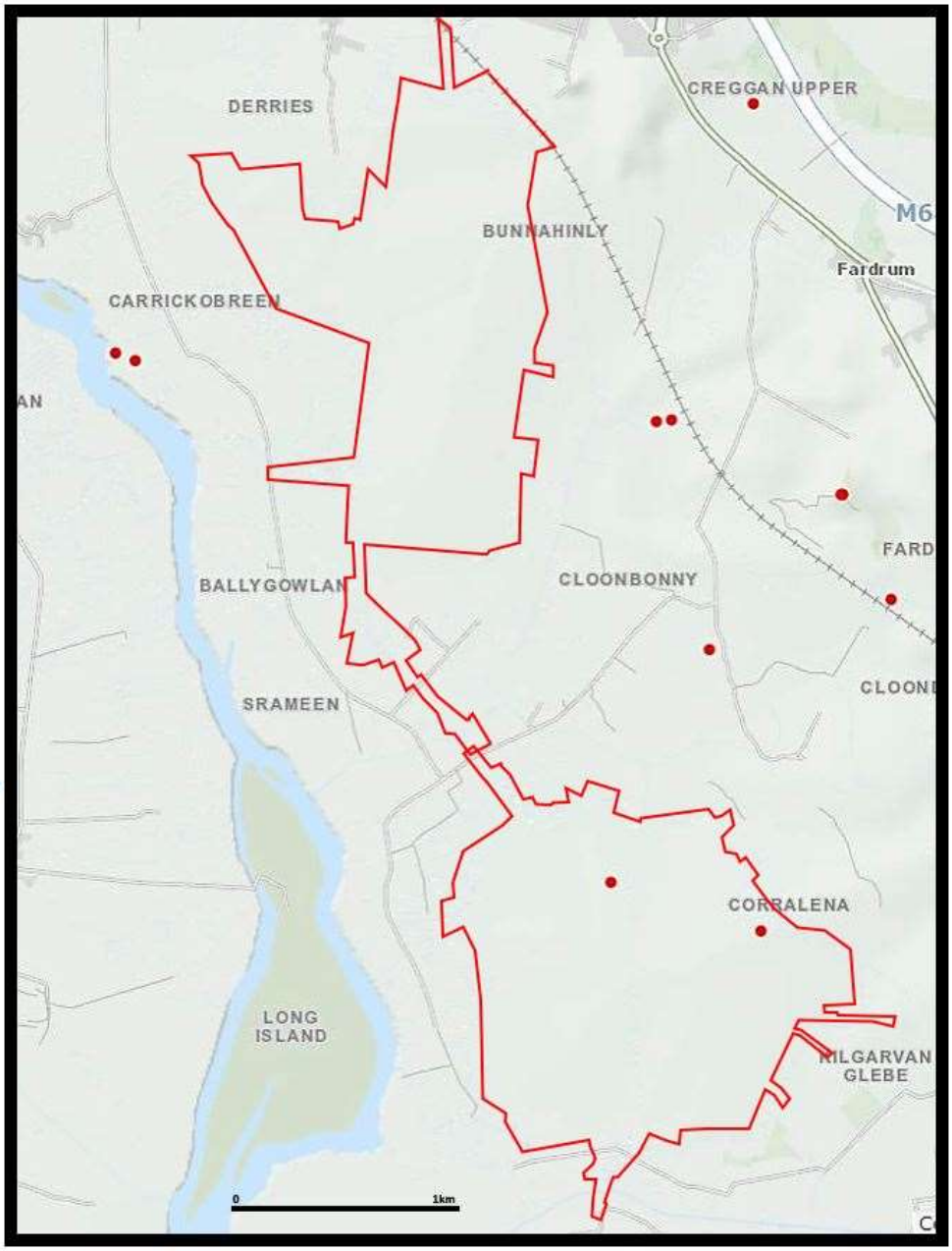


Fig. 2. Bunnahinly and Kilgarvan Bogs, Co. Westmeath, detail of the Sites and Monuments Record. The proposed rehabilitation area is outlined with the red line. There are two SMRs in the rehabilitation area in Kilgarvan Bog.

Archaeological investigations

Reports of archaeological excavations and licensed monitoring in the study area listed in the excavations database at excvations.ie were examined as part of the assessment. There is one report of archaeological investigation carried out in the area south-east of Bunnahinly Bog that identified nothing of archaeological significance.

Cloonbunny RMP 29:34 Licence: 01E678 No archaeological significance
Cloonbonny is approximately 3km to the south-east of Athlone, Co. Westmeath. The site is in an area of low-lying land at the base of a natural hillock. It was tested in advance of the construction of the gas pipeline from Ballough, Co. Dublin, to Goat Island, Co. Limerick. The gas pipeline ran east–west through the constraint area of the site of a castle. The way-leave for the gas pipeline in this area is 60m in width to allow for tunnelling under the railway which runs perpendicular to the pipeline and through the constraint area of the monument.

Six test-trenches were excavated by machine across the way-leave in the constraint area of the monument to the east and west of the railway line. The two trenches to the west of the railway line revealed nothing of archaeological significance. The four to the east of the railway revealed a series of curving linear features and charcoal spreads. Further excavation was recommended. This took place under an extension to the original licence. The features were found not to be of archaeological significance

Previous assessments
Bunnahinly Bog has been the subject of an Environmental Impact Assessment Report caried 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 no archaeological fieldwork had taken place in Bunnahinly bog to date. The assessment noted that as no archaeological survey work had been carried out in Bunnahinly Bog there was a high potential for archaeological features to be uncovered during the course of any future development works in the Bog.

Kilgarvan Bog has been the subject of an Environmental Impact Assessment Report caried 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 archaeological fieldwork had taken place in Kilgarvan Bog in 1992. The assessment noted that that there was a moderate to high potential for archaeological features to be uncovered during the course of any future development works in the Bog.

Impact assessment
A total of two sightings of archaeological material were identified and recorded in Kilgarvan Bog by the IAWU in 1992 and these were subsequently entered into the Sites and Monuments Record. Estimates of the peat removed from the bog based on the results of a 2020 Lidar survey of the bog carried out by Bord na Móna allow the depth of bog at each sighting to be calculated for 2008 and 2020 and also the depth of bog removed calculated for each sighting (see Table 3). This data indicates that all sightings of archaeology have been removed.

SMR_NO	SMR Class	IAWU Cat._No.	Townland	NGR E	NGR N	Depth below surface	Peat removed since 2008	Status
WM035-014	Road - class 3 togher	WM-CBY 0001	Cloonbonny	207008	236408	0.60	1.14	Gone
As above second NGR				207340	236595	0.60	0.94	Gone
WM035-015	Structure - peatland	WM-CLA 0001	Corralena	207660	236199	0.70	1.03	Gone

Table 3. all the known sightings in the rehabilitation area with the Lidar depth data.

Recommendations

There is no known surviving archaeological material in Bunnahinly or Kilgarvan Bogs. 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.

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 is no known surviving archaeological material in Bunnahinly or Kilgarvan Bogs. 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 1997. Recorded Monuments Protected under Section 12 of the National Monuments (Amendment) Act, 1994. County Westmeath.

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

Dr. Charles Mount
21 October 2021

APPENDIX XIII. INITIAL WATER QUALITY DATA FROM BUNAHINLY-KILGARVAN

Table AP13.1. Water quality data for 12 months from November 2020 to December 2021 at Bunahinly-Kilgarvan.

PCAS SW Sampling Scheme					Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids
Bog Group	Licence No	Bog Name	Unique I.D No.	SW Code - GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
					1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21
Blackwater	P0502-01	Bunahinly	127	SW92	4	6	N/S	17	N/S	N/S	<2	5	4	N/S	19	<2	<2	<2
Blackwater	P0502-01	Bunahinly	128	SW93	13	2	N/S	5	N/S	N/S	<2	3	2	N/S	5	<2	<2	<2
Blackwater	P0502-01	Bunahinly	129	SW94	6	3	N/S	2	N/S	N/S	<2	2	5	N/S	2	3	<2	<2
Blackwater	P0502-01	Kilgarvin	182	SW89	N/S	8	N/S	<2	N/S	N/S	<2	9	2	N/S	3	4	<2	<2
Blackwater	P0502-01	Kilgarvin	183	SW89A	N/S	2	N/S	<2	N/S	N/S	2	5	5	N/S	4	Combined outlet from SW89		
Blackwater	P0502-01	Kilgarvin	185	SW91	9	<2	N/S	3	N/S	N/S	<2	4	5	N/S	3	Combined outlet from SW89		
Blackwater	P0502-01	Kilgarvin	186	SW95	6	9	N/S	2	N/S	N/S	<2	<2	3	N/S	3	<2	<2	<2
Blackwater	P0502-01	Kilgarvin	187	SW96	8	6	N/S	5	N/S	N/S	<2	5	8	N/S	9	Combined outlet from SW89		
				ELV	35	35	35	35	35	35	35	35	35	35	35	35	35	35

PCAS SW Sampling Scheme					Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour
Bog Group	Licence No	Bog Name	Unique I.D No.	SW Code - GIS	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co
					1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21
Blackwater	P0502-01	Bunahinly	127	SW92	293	284	N/S	289	N/S	N/S	339	347	360	N/S	325	276	327	211
Blackwater	P0502-01	Bunahinly	128	SW93	320	307	N/S	217	N/S	N/S	250	348	358	N/S	361	300	326	212
Blackwater	P0502-01	Bunahinly	129	SW94	255	235	N/S	221	N/S	N/S	265	284	300	N/S	309	316	286	212
Blackwater	P0502-01	Kilgarvin	182	SW89	N/S	245	N/S	201	N/S	N/S	263	199	216	N/S	226	219	203	178
Blackwater	P0502-01	Kilgarvin	183	SW89A	N/S	215	N/S	215	N/S	N/S	256	203	244	N/S	276	Combined outlet from SW89		
Blackwater	P0502-01	Kilgarvin	185	SW91	174	200	N/S	192	N/S	N/S	242	195	168	N/S	153	Combined outlet from SW89		
Blackwater	P0502-01	Kilgarvin	186	SW95	234	234	N/S	215	N/S	N/S	263	295	263	N/S	285	276	252	192
Blackwater	P0502-01	Kilgarvin	187	SW96	400	374	N/S	325	N/S	N/S	368	376	293	N/S	279	Combined outlet from SW89		

PCAS SW Sampling Scheme					COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD
Bog Group	Licence No	Bog Name	Unique I.D No.	SW Code - GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
					1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21
Blackwater	P0502-01	Bunahinly	127	SW92	66	65	N/S	54	N/S	N/S	78	84	94	N/S	42	81	80	58
Blackwater	P0502-01	Bunahinly	128	SW93	78	76	N/S	25	N/S	N/S	71	97	94	N/S	59	85	78	62
Blackwater	P0502-01	Bunahinly	129	SW94	50	50	N/S	19	N/S	N/S	71	83	83	N/S	44	37	75	61
Blackwater	P0502-01	Kilgarvin	182	SW89	N/S	52	N/S	18	N/S	N/S	64	76	71	N/S	32	67	65	49
Blackwater	P0502-01	Kilgarvin	183	SW89A	N/S	53	N/S	21	N/S	N/S	61	79	81	N/S	43	Combined outlet from SW89		
Blackwater	P0502-01	Kilgarvin	185	SW91	46	41	N/S	16	N/S	N/S	64	73	68	N/S	24	Combined outlet from SW89		
Blackwater	P0502-01	Kilgarvin	186	SW95	50	48	N/S	20	N/S	N/S	64	95	86	N/S	46	66	69	52
Blackwater	P0502-01	Kilgarvin	187	SW96	101	98	N/S	75	N/S	N/S	92	110	106	N/S	74	Combined outlet from SW89		

PCAS SW Sampling Scheme					pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH
Bog Group	Licence No	Bog Name	Unique I.D No.	SW Code - GIS	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units
					1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21
Blackwater	P0502-01	Bunahinly	127	SW92	6.1	6	N/S	5.9	N/S	N/S	3.1	6.5	6.6	N/S	6.6	6.5	5.3	5
Blackwater	P0502-01	Bunahinly	128	SW93	5.3	5.2	N/S	5.1	N/S	N/S	4.8	5.9	6	N/S	6	5.4	5.6	4.9
Blackwater	P0502-01	Bunahinly	129	SW94	6.1	6.1	N/S	6.1	N/S	N/S	6.1	7.2	7.7	N/S	7.5	7.5	6.9	6.3
Blackwater	P0502-01	Kilgarvin	182	SW89	N/S	7	N/S	6.7	N/S	N/S	6.7	7.8	7.8	N/S	7.6	7.5	7.4	7
Blackwater	P0502-01	Kilgarvin	183	SW89A	N/S	7.1	N/S	6.8	N/S	N/S	7	7.5	7.7	N/S	7.5	Combined outlet from SW89		
Blackwater	P0502-01	Kilgarvin	185	SW91	7.7	7.2	N/S	7	N/S	N/S	7.2	7.5	7.8	N/S	7.9	Combined outlet from SW89		
Blackwater	P0502-01	Kilgarvin	186	SW95	6.5	6.9	N/S	6.6	N/S	N/S	6.9	7.5	7.3	N/S	7.3	7.1	6.9	6.8
Blackwater	P0502-01	Kilgarvin	187	SW96	6.9	7	N/S	6.9	N/S	N/S	7.1	7	7.2	N/S	7.3	Combined outlet from SW89		

PCAS SW Sampling Scheme					TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P
Bog Group	Licence No	Bog Name	Unique I.D No.	SW Code - GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
					1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21
Blackwater	P0502-01	Bunahinly	127	SW92	<0.05	<0.05	N/S	<0.05	N/S	N/S	<0.05	0.05	0.05	N/S	0.1	<0.05	<0.05	<0.05
Blackwater	P0502-01	Bunahinly	128	SW93	<0.05	<0.05	N/S	<0.05	N/S	N/S	<0.05	<0.05	0.06	N/S	<0.05	<0.05	<0.05	<0.05
Blackwater	P0502-01	Bunahinly	129	SW94	<0.05	<0.05	N/S	<0.05	N/S	N/S	<0.05	<0.05	<0.05	N/S	0.1	<0.05	<0.05	<0.05
Blackwater	P0502-01	Kilgarvin	182	SW89	N/S	<0.05	N/S	<0.05	N/S	N/S	<0.05	<0.05	<0.05	N/S	<0.05	<0.05	<0.05	<0.05
Blackwater	P0502-01	Kilgarvin	183	SW89A	N/S	<0.05	N/S	<0.05	N/S	N/S	<0.05	<0.05	<0.05	N/S	<0.05	Combined outlet from SW89		
Blackwater	P0502-01	Kilgarvin	185	SW91	0.05	<0.05	N/S	<0.05	N/S	N/S	<0.05	<0.05	<0.05	N/S	<0.05	Combined outlet from SW89		
Blackwater	P0502-01	Kilgarvin	186	SW95	<0.05	<0.05	N/S	<0.05	N/S	N/S	<0.05	0.14	0.08	N/S	0.11	<0.05	<0.05	<0.05
Blackwater	P0502-01	Kilgarvin	187	SW96	0.13	<0.05	N/S	0.12	N/S	N/S	0.08	0.13	0.13	N/S	0.06	Combined outlet from SW89		

PCAS SW Sampling Scheme					TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS
Bog Group	Licence No	Bog Name	Unique I.D No.	SW Code - GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
					1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21
Blackwater	P0502-01	Bunahinly	127	SW92	114	129	N/S	73	N/S	N/S	97	157	157		177	63	139	125
Blackwater	P0502-01	Bunahinly	128	SW93	114	63	N/S	56	N/S	N/S	62	117	124		158	101	77	57
Blackwater	P0502-01	Bunahinly	129	SW94	92	72	N/S	43	N/S	N/S	89	169	211		171	124	25	97
Blackwater	P0502-01	Kilgarvin	182	SW89	N/S	97	N/S	73	N/S	N/S	93	234	250		218	193	37	170
Blackwater	P0502-01	Kilgarvin	183	SW89A	N/S	78	N/S	72	N/S	N/S	117	206	228		183	Combined outlet from SW89		
Blackwater	P0502-01	Kilgarvin	185	SW91	391	134	N/S	68	N/S	N/S	142	254	264		224	Combined outlet from SW89		
Blackwater	P0502-01	Kilgarvin	186	SW95	106	107	N/S	67	N/S	N/S	102	278	253		233	149	153	129
Blackwater	P0502-01	Kilgarvin	187	SW96	270	219	N/S	248	N/S	N/S	231	259	282		313	Combined outlet from SW89		

PCAS SW Sampling Scheme					Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N
Bog Group	Licence No	Bog Name	Unique I.D No.	SW Code - GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
					1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21
Blackwater	P0502-01	Bunahinly	127	SW92	0.414	0.412	N/S	0.369	N/S	N/S	0.428	0.525	0.820	N/S	0.833	0.740	0.337	0.299
Blackwater	P0502-01	Bunahinly	128	SW93	0.244	0.334	N/S	0.218	N/S	N/S	0.209	0.017	0.029	N/S	0.090	0.238	0.334	0.301
Blackwater	P0502-01	Bunahinly	129	SW94	0.375	0.415	N/S	0.321	N/S	N/S	0.368	0.730	0.499	N/S	0.704	0.658	0.734	0.511
Blackwater	P0502-01	Kilgarvin	182	SW89	N/S	1.370	N/S	1.140	N/S	N/S	0.929	0.635	0.808	N/S	1.300	1.460	1.620	0.684
Blackwater	P0502-01	Kilgarvin	183	SW89A	N/S	1.440	N/S	0.936	N/S	N/S	1.440	2.180	2.110	N/S	1.910	Combined outlet from SW89		
Blackwater	P0502-01	Kilgarvin	185	SW91	0.269	1.380	N/S	0.945	N/S	N/S	1.380	2.010	1.580	N/S	1.390	Combined outlet from SW89		
Blackwater	P0502-01	Kilgarvin	186	SW95	0.245	0.320	N/S	0.275	N/S	N/S	0.296	0.009	0.477	N/S	0.240	0.161	0.152	0.230
Blackwater	P0502-01	Kilgarvin	187	SW96	0.217	0.198	N/S	0.163	N/S	N/S	0.091	0.013	0.122	N/S	0.034	Combined outlet from SW89		

PCAS SW Sampling Scheme					DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC
Bog Group	Licence No	Bog Name	Unique I.D No.	SW Code - GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
					1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21
Blackwater	P0502-01	Bunahinly	127	SW92	27.7	23.7	N/S	18.1	N/S	N/S	28.8	31.8	35.8	N/S	33	26.3	29.1	19.9
Blackwater	P0502-01	Bunahinly	128	SW93	30.3	29.5	N/S	16.7	N/S	N/S	24.3	27.9	30.8	N/S	32.5	31.5	28.6	20.5
Blackwater	P0502-01	Bunahinly	129	SW94	21.6	18.7	N/S	14.3	N/S	N/S	24.9	25.3	30.2	N/S	32.1	29.7	27.5	20.1
Blackwater	P0502-01	Kilgarvin	182	SW89	N/S	18.4	N/S	13.4	N/S	N/S	21.8	23.7	26.7	N/S	26.8	23.5	22.8	44.5
Blackwater	P0502-01	Kilgarvin	183	SW89A	N/S	18.8	N/S	14.3	N/S	N/S	23.6	25.7	29.8	N/S	28.2	Combined outlet from SW89		
Blackwater	P0502-01	Kilgarvin	185	SW91	17.3	18	N/S	19	N/S	N/S	23.3	20.7	23.5	N/S	22.2	Combined outlet from SW89		
Blackwater	P0502-01	Kilgarvin	186	SW95	21.3	19.9	N/S	13.7	N/S	N/S	24.6	31.9	32	N/S	30.9	27.6	25.1	20.9
Blackwater	P0502-01	Kilgarvin	187	SW96	48.3	43.3	N/S	38.2	N/S	N/S	40.4	38.9	37.7	N/S	36.6	Combined outlet from SW89		

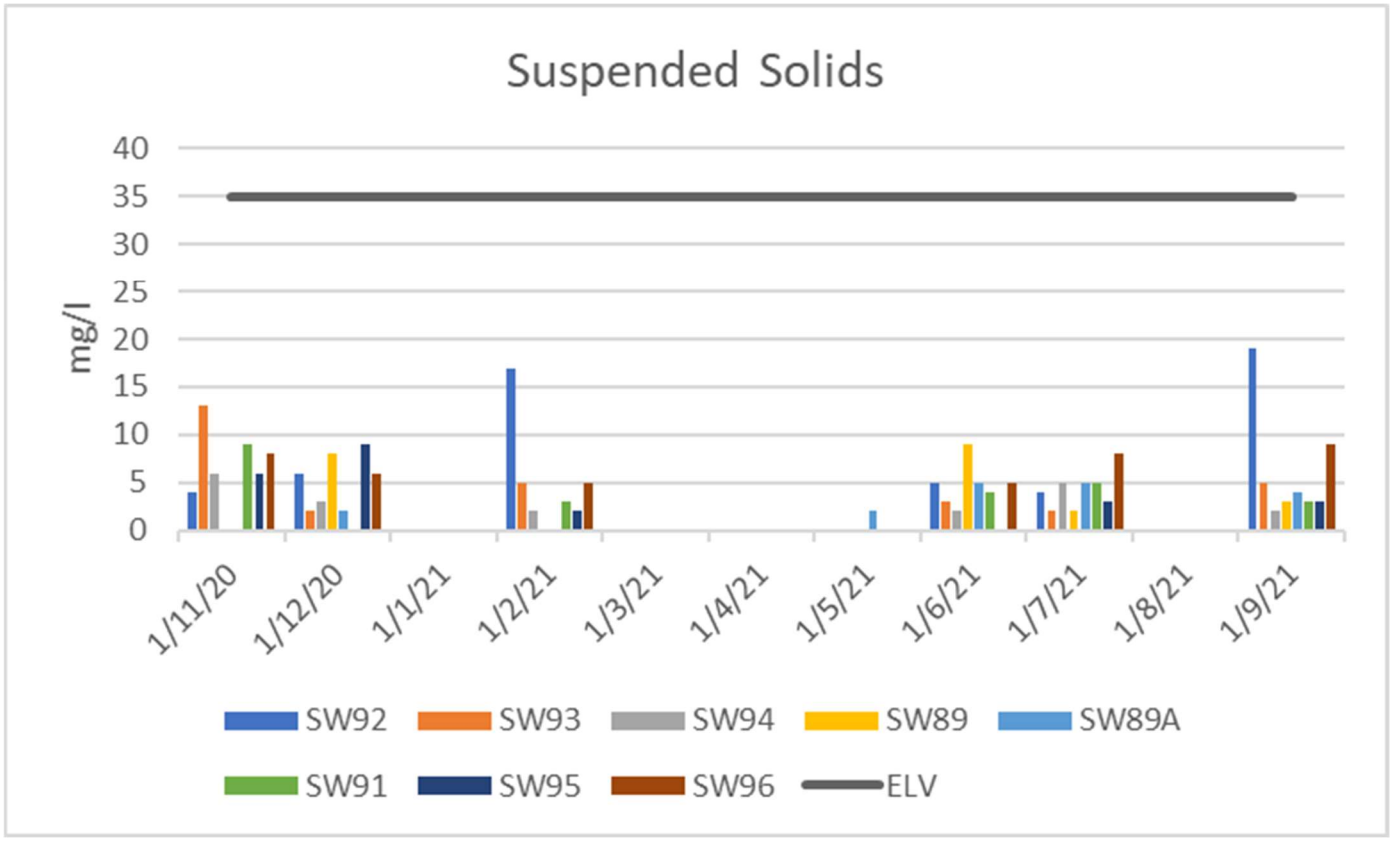


Figure AP13.1. Suspended solids in water sampling at Bunahinly-Kilgarvan from different discharge points.35 mg/l is the emission limit value.

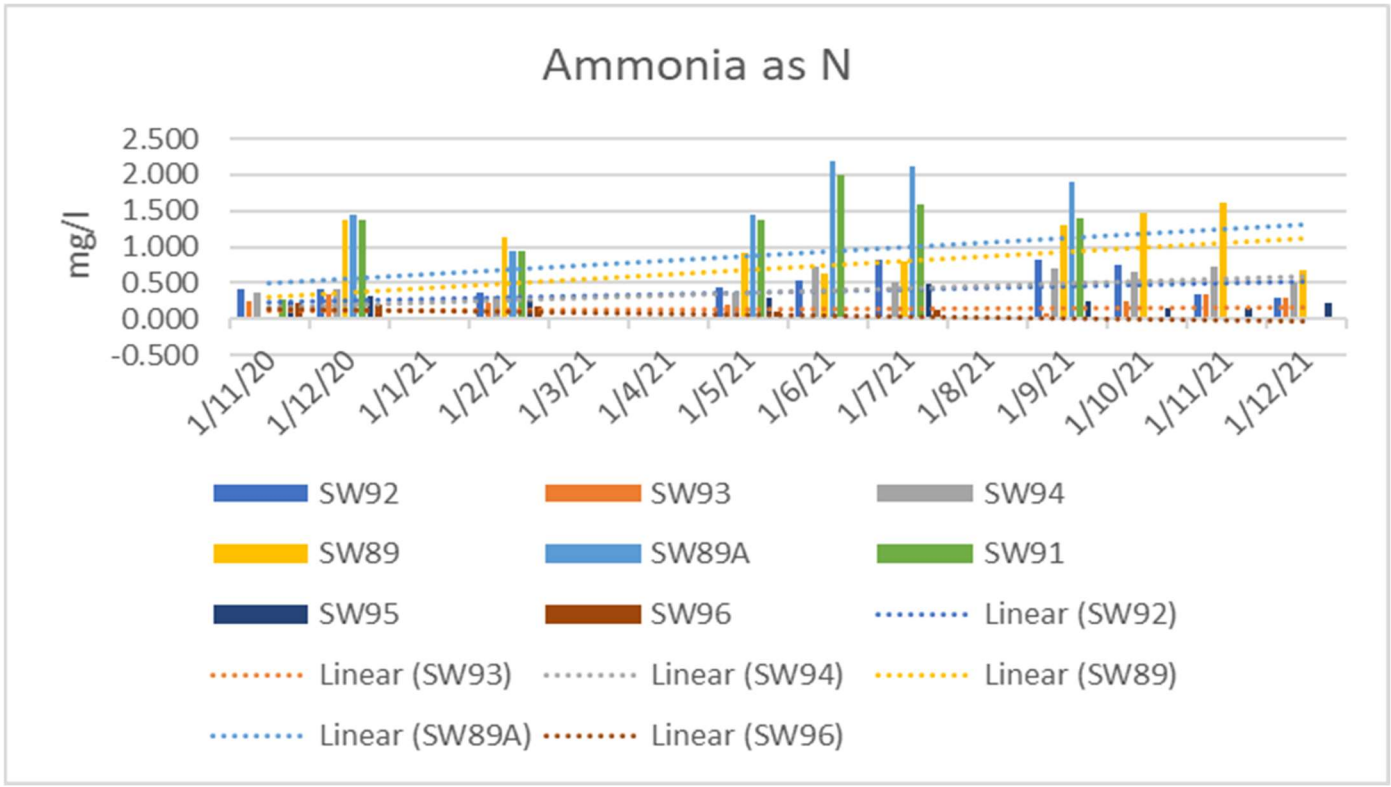


Figure AP13.2. Ammonia concentrations in water sampling from Bunahinly-Kilgarvan from different discharge points. The main trigger level for ammonia is 4.53mg/l for reporting to EPA.